

CLIMASP Minor in Aswan University

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INTRODUCTION

The Climate Change and Sustainability Policy (CLIMASP) minor at Aswan University is an interdisciplinary program funded by the European Commission Tempus under the coordination of the UNESCO Chair ICT in Education for Sustainable Development, University of Crete, Greece. Students from all university faculties choosing the CLIMASP minor as a complement of their major opens to them new opportunities for further studies and career paths. The CLIMASP minor consists of core courses, elective courses and the required capstone course in three concentration areas: 1) Climate Change, Environment and Society; 2) Climate Change, Economics and Public Policy; and 3) Climate Change, Science and Technology. The courses included in the CLIMASP minor are an integral part of the participating disciplines curricula. It is, thus, an advantage for students seeking a meaningful and rewarding complement to their main field of study. Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma ranges from 45-60 ECTS. The increased complexity of the climate change and sustainability policy challenges drives us in preparing our students to become inquirers (1), problem solvers, critical and creative thinkers. The CLIMASP minor provides our students with improved strategies to help them deal with these very complex situations. Problem-based learning (PBL) is one such strategy that is employed throughout the CLIMASP curriculum and teaching methods. Every aspect of climate change is shaped by ethical dispute and covers an array of fields: moral philosophy, science, economics, public policy, global justice, energy, and human rights, among others (2). Applying a values-based and PBL approach, the CLIMASP minor prepares students to comprehend and further explore the intersections of science, ethics, values, climate change and sustainability policy (3).

UNIVERSITY BACKGROUND

Aswan University (Fig: 1) was established as a branch of Assist University by faculty of Education in 1973, and faculty of Science in 1975. After that, university branch became affiliated to South Valley University in 1994. In 1995, faculties of Social Work and Engineering were established (4). In 2000, faculty of Arts was established, after that, the High Institute of Energy was joined to the university in 2006 and changed this name to Faculty of Energy Engineering in 2011. Aswan University was established as an independent University according to the presidential decree no.311 in 11th June 2012. The main building is located in Sahre-

Aswan (81528)-Egypt on 411 acre as well as 98.5 acre in new city of Aswan. Then, the number of faculties is gradually increased to be 18 faculties in 2016 (Fig. 2). These Faculties offer the degrees of bachelor, diploma, masters and Ph.D. It is noticed that, there is a significant increase in the number of new university faculties and bachelor degrees, diploma and master's and doctoral degrees in many disciplines at the under graduate and graduate level, where they cover all higher education sectors and this diversity has a significant impact on increasing the number of university students as well as graduate students, allowing the university implementation of sustainability policy strategy with the plan. Aswan University characterized as covering a large geographic area in upper Egypt, in that sense, Aswan University have undertaken the commitment to the great dimension entrusted in all Upper Egypt society in general and society of Aswan service in particular. Aswan considered as a Gate of Egypt to Africa because it is located on the border with the Republic of Sudan and have natural resources limitless phosphate ore and granite and marble and iron and water resources (River Nile and Lake Nasser) and very nice climate in winter.





THE CLIMASP CASE DESCRIPTION

Sustainability is one of Egypt's development priorities. Simultaneously, education for sustainability in Aswan University would be about learning to design and implement actions for the present, in the knowledge that the impact of these actions will be experienced in the future. In this respect, the students would be developed to be able for contribution in sustainable development of Aswan region and consequently in Egypt. The climate of the area in which Aswan University was established is characterized by extremely arid conditions with mean occasional precipitation of less than 4 mm per year and hot with high maximum temperature that may reach or sometimes exceed 46 °C in summer (5). The pressure exerted by the global climate change may have an impact on the region of south Egypt including Aswan in which Aswan University was sited. Therefore, the concept of climate change and sustainability policy may be effectively incorporated into curricula in order to enable students to be aware for contribution to climate change mitigation and sustainability. Hence, the concept of climate change challenges may be embedded in the curricula of the various faculties. Education for sustainability can enable students to become effective citizens and active change agents by helping them to deal with complexity and uncertainty (6). It can also help them to understand that there is rarely a single solution because new knowledge is continuously generated, and diverse viewpoints exist in society (7).

The Structure and Courses of the CLIMASP Minor

CLIMASP Orientations	Course ID	Course title	Offered	Faculty	Notes
Climate Change, Environment and Society	0900171	Science and Society	65	Science	University elective, group 2
Climate Change, Economics and Public Policy	0900115	Social ethics		Languages and Communication	University elective, group 3
Climate Change, Science and Technology	0900170	Energy and the Environment	90	Science	University elective, group 3

Course ID	Course title	Offered	Department	Faculty	Theme	notes
0900116	Bio ethics		Basic Sciences and Humanities	Science	Society	University elective (g3)
0900112	Civic Education	67	Basic Sciences and Humanities	Languages and Communication	Society	Faculty compulsory
201323	Applied Plant Biology	8	Biology and Biotechnology	Science	Science/technology	Department compulsory
201331	Microbiology + lab		Biology and Biotechnology	Science	Science/technology	Department compulsory
201415 201416	Ecology Ecology lab	3	Biology and Biotechnology	Science	Science/technology	Department compulsory
201417	Applied Ecology		Biology and Biotechnology	Science	Science/technology	Department elective
201472	Selected Topics in Environmental		Biology and Biotechnology	Science	Science/technology	Department elective
303240	Food Science		Nutrition and Dietetics	Health Sciences	Science/ technology	
0900150	Introduction to Economics	63	Biology and Biotechnology	Science	Economy	University elective(g 2)
505101	Principles of Risk management	119	Risk management	Business	Economy	-
505321	Corporate Environmental management **	22	Risk management	Business	Economy	-

In this context, 24 courses related to three main concentrations namely: environment and society; economics and public policy; science and technology were reoriented and evaluated internal and external. In addition, Euro-Arab pass Diploma was adapted and through it, the students will be provided a formal credential by transcript documentation (Euro-Arab pass) to certify that they have developed leadership in the field of climate change and sustainability

policy. Furthermore, the Information and Communication Technology Laboratory was integrated into the Euro-Arab Centre for Interdisciplinary Studies and Climate Change.

Challenges faced during the CLIMASP project

The problem of granting a certificate or degree to the student after the study is the first of those challenges faced by the research team during the work on the project. To solve this problem Aswan University Council agreed to give the students a certificate until the end debate and controversy about grants approved by the Supreme Council of Universities. Also of the challenges faced by researchers during this work is having a graduation project in various faculties. In most cases, there was nothing related to the climate change. Therefore, it was proposed that Euro-Arab Centre to complete this part by teaching or embedding something related to climate change for the completion of this ellipse part in the graduation project.

Exploitation and Dissemination

Regarding to exploitation and dissemination, Aswan University team performed many activities such as; training workshops, meetings, web site page, mailing list, brochures, banners, flayers and student guidelines. Euro-Arab Centre provides opportunities for staffs and students to explore topics related to Climate Change. The centre will function as an essential site and mechanism through and across which facilitation of interdisciplinary work on climate change occurs.

CONCLUSION

The activities carried out by Aswan University team participated in development of interdisciplinary minor in climate change and sustainability policy. This could be in part considered as an active participation for building more sustainable futures at regional and national levels. These minors will help teaching staff for better understanding and teaching the concept of climate change and sustainability. It will also help students to be aware of environment and the alterations that may take place in its conditions. In addition, they will be able to participate actually in solving problems. Consequently, the students can learn how to solve a real-life issue/problem.

Learning process and curricula in Aswan University could be positively influenced through the activities that were performed by CLIMASP. The established centre in Aswan University will participate to address gaps in knowledge concerning environment, sustainability policy, and interdisciplinary minor of climate change.

Acknowledgement

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REFERENCES

1- Khadri, H. O. (2014). A strategy for developing and enhancing interdisciplinary research and graduate education at Ain Shams University (ASU). European Scientific Journal, 10(28), 87–106.

2- Makrakis, V. & Kostoulas–Makrakis, N. (2013b) A methodology for reorienting university curricula to address sustainability: The RUCAS-tempus project initiative. In S. Caeiro et al.(Eds.), Sustainability assessment tools in higher education institutions (pp. 23–44).Switzerland: Springer.
3- Makrakis, V., & Kostoulas-Makrakis, N. (2013a). Sustainability in higher education: A comparative study between European Union and Middle Eastern universities. International Journal of Sustainable Human Development, 1(1), 31–38.
4- http://www.aswu.edu.eg/
5- http://www.aswan.climatemps.com/
6- https://www.wigan.gov.uk/Council/Strategies-Plans-and-Policies/Climate-change-and-sustainability.aspx
7- http://climate-l.iisd.org/



CLIMASP Minor in Heliopolis University for Sustainable Development

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Introduction

Heliopolis University for Sustainable Development (HUSD) has always had a very unique perspective on the CLIMASP programme. Seeing as how HUSD's main aim and purpose is to promote the sustainable development (SD) of Egypt and the world, developing a degree addressing the challenges and opportunities of both Climate Change and Sustainability Policy fit exceptionally well within the framework of the university.

University Background

The beginnings of HUSD start with the establishment of Heliopolis Academy back in the early 2000s. The academy was developed as part of the SEKEM initiative in Egypt. As SEKEM was already engaged in various fields of sustainable development, Heliopolis Academy served as a turning point in which the academy acted as SEKEM's first dedicated center for conducting research with a special emphasis on SD. As the academy continued to grow in both size and relevance, it became obvious that in order to fully address the SD needs of Egypt, a university dedicated towards SD must be established. From this thought, the idea of the Heliopolis University for Sustainable Development emerged.

HUSD was officially established in 2009, but it did not fully begin operations or accepting students until 2012 when its core facilities and infrastructure was completely established. The mission of HUSD is as follows:

"At Heliopolis University, we empower our students to be the champions of sustainable development in different spheres of life. We provide a place where new ideas meet fertile ground for further research and teaching. Our education combines teaching, research, and practice with a uniquely humanistic core program, developing curious and creative minds."

HUSD began with the establishment of 3 faculties: Business & Economics, Engineering, and Pharmacy & Drug Technology. However, despite the faculties being traditional in nature, the main idea of each of the faculties is to address the traditional fields of study in a way that directly addresses the critical needs of Egypt as well as Sustainable Development

Context of HUSD in the CLIMASP Project

Considering that Climate Change is considered one of the greatest challenges of the 21st Century, HUSD takes Climate Change as a critical issue to be addressed with the utmost importance. As such, Climate Change takes a prominent role in the research and advocacy activities conducted by the university. However, despite the importance placed on Climate Change in the university, it hasn't taken a prominent role in its overall curricula. While it is addressed to some degree, mainly from Engineering courses directly related to the subject, it was rarely taught to students within the given lectures.

The CLIMASP Case

Strategic Plan

Vision

The Euro-Arab Center's vision is derived from HUSD's vision.

"HUSD strives for the sustainable development of individual consciousness, economic solidarity, social justice, and environmental balance in Egypt and the world."

Mission

At the Euro-Arab Center for Interdisciplinary studies, we empower instructors and students alike to engage in interdisciplinary studies to face the greatest of the world's burning, social and technological issues. We realize that specializing in only one discipline isn't enough to face the biggest challenges of the world; thus, we encourage all stakeholder engaged in the center to find a balance between specialization and general knowledge. The Euro-Arab Center will always be focused on the major issues of our time; during this time, it will be focused on the issue of climate change.

Core Values

The Core Values of the Center are the same as those of the university, they are: Research, Practice, Character Building, and Learning.

1) Research: All faculty members in the Euro-Arab center must engage in research. This research can cover any and all aspects regarding to curriculum development, climate change, social issues, sustainable development, and interdisciplinary subjects. This is in an attempt to build upon the body of knowledge regarding these issues as well as to increase our own understanding of the world around us.

2) Practice: It is essential that all students (and instructors) engage in practical activates. This practice is to combine academia with real world knowledge. Furthermore, it is a core tenant of Education for Sustainable Development (ESD) as it is "Learning to Do".
3) Character Building: This is directly related to the vision and mission of the University as it has to do with immersing students in culture, music, painting, and the arts. As part of the center, students will be taught to appreciate nature and understand the underlying concepts of Sustainable Development which will lead to greater care of the world around them
4) Learning: The learning process is derived from the three previous value. Through research, practice, and character building, the students become ready to learn. They become capable of internalizing the different concepts of Sustainable development and its impact on their world. Furthermore, they obtain the scientific knowledge of the world around them to understand exactly the challenges facing them. All of the concepts of the center are culminated into the learning aspect.
5) Interdisciplinary/Multidisciplinary Focus: The Euro-Arab Center at HUSD will always focus on multi-pronged efforts to address the major issues of our society. As such, the guiding principles of the center will be to have a multidisciplinary aspect in which the key stakeholders of the center

The ICT Lab

The ICT lab will be a core aspect of the CLIMASP project. Seeing as how it is an international project with global implications, the ICT lab will be the key tool in establishing lectures and partnerships with international universities. This will facilitate the teaching and learning process in the Euro-Arab Center. The lab will be used for teaching students on the use of technology and computers in Sustainable Development and in making models and predictions for Climate Change. Furthermore, the students will be trained on using the computers for connecting with international partners in order to enhance their learning and experience. The lab will also doubly serve as a research center for anyone wishing to do research on Climate Change.

The ICT lab consists of 35 desktop PCs, and 5 Laptops for the operation of the center. The PCs were selected on the basis that they would be able to cover any course (with a limit of 30 students) and allow for the students to participate in any digital activities. The lab will be on the first floor of the Faculty of Business and Economics as part of its expansion, but it will be available for all faculties in the university. The space is approximately

Strategic Goals

1) Establish the Center with cooperation from all of the faculties in HUSD
2) Reorient select courses agreed upon by the different faculties to address Climate Change
3) Establish the CLIMASP minor
4) Identify and address other burning issues in society that require an interdisciplinary approach to solve

Key Strategic Goals	Activities	Short-Term Key Outcomes	Mid-Term Key Outcomes	Long-Term Key Outcomes
What we plan to do	**How we plan to do it**	**2016 Expected Outcomes**	**2020 Expected Outcomes**	**2025 Expected Outcomes**
SG1: Establish the Center with cooperation from all of the faculties in HUSD	A1.1: Communicate with the deans of the faculties for establishing courses and a curriculum for the center	Have full cooperation from the different faculties in the process. Have a location of the center approved by the president of the university	Have the center established with full-time staff dedicated to operating and coordinating activities on a university-wide level	The center should be in a central position of the university with council comprised of faculty members from each of the university's faculties
	A1.2: Agree upon a single center in the university for the interdisciplinary studies			
SG2: Reorient select courses agreed upon by the different faculties to address Climate Change	A2.1: Select the relevant courses to the CLIMASP studies	Have at least 20 courses reoriented to address Climate Change registered in the center	Have a process established for the continuous revision and revisiting reoriented courses to ensure that all meet minimum standards	Have courses from 9 faculties represented in the center reaching to over 100 courses in total for preparing students on the challenges of climate change
	A2.2: Choose a method and template for the reorientation of the courses			
	A2.3: Reorient the first batch of courses with an amount consistent with the 60ECTS requirement for a minor in CLIMASP.			
SG3: Establish the CLIMASP minor	A3.1: Create a unified curriculum for the entire university to follow for the CLIMASP minor	Have the initial curricula established and begin the submission process to the SCU	Have the minor programme approved by the SCU and begin the feedback and enhancement process	Have the programme accredited by AQAS or another accreditation body
	A3.2: Get approval from the Supreme Council of Universities (SCU)			
	A3.3: Begin a pilot testing of the CLIMASP minor			
	A3.4: Make adjustments based on the feedback of the students, instructors, and the Euro-Arab Center			
	A3.5: Resubmit to the SCU the updated			

	version of the CLIMASP minor			
	A3.6: Look for external accreditation bodies for programme accreditation of the minor			
SG4: Identify and address other burning issues in society that require an interdisciplinary approach to solve	A4.1: Find another major issue facing the world in the 21st century	Identify a major issue that can be addressed by the center	Have the guidelines prepared for education on this issue	Have at least 3 major, burning issues addressed within the Euro-Arab Center

Core Courses

CLIMASP Orientations	Course ID	Course title	ECTS*	Department	Faculty
Climate Change, Environment and Society	2472	**Natural Resources Management**	5	Management	Business & Economics
Climate Change, Economics and Public Policy	2373	**Environment Economics**	5	Economics	Business & Economics
Climate Change, Science and Technology	1364	**Water Soil Relationship**	5	Water Engineering	Engineering

Capstone Course

Course ID	Capstone course title	ECTS	Department	Faculty
2399	Graduation Project[a]	10	Any	Business & Economics

a: It is important to note that each department, and each faculty have their own graduation projects. The graduation project of the students' faculty or major will determine which will be included in the CLIMASP minor. However, it is essential that the students make the project in a Climate Change related subject.

Elective Courses

Course ID	Course title	ECTS	Department	Faculty
2441	Entrepreneurship	5	Management & Human Development	Business & Economics
2453	Business Ethics	5	Management & Human Development	Business & Economics
2265	Green Marketing	5	Marketing	Business & Economics
2271	Corporate Social Responsibility	5	Marketing	Business & Economics
2321	Macro-Economics	5	Integral	Business &

			Economics	Economics
2341	Developmental Economics 1	5	Integral Economics	Business & Economics
2471	Global Social Issues	5	Management & Human Development	Business & Economics
2465	Politics, Policy, and Polity	5	Management & Human Development	Business & Economics
2365	Economic Policies	5	Integral Economics	Business & Economics
2355	Ethical Economics	5	Integral Economics	Business & Economics
2362	Political Economy	5	Integral Economics	Business & Economics
2463	Media and Public Communication	5	Management and Human Development	Business & Economics
2252	Services Marketing	5	Marketing	Business & Economics
1344	Basics of Water Engineering	5	Water Engineering	Engineering
1354	Water Engineering Project	5	Water Engineering	Engineering
1374	Sanitary Engineering	5	Water Engineering	Engineering
1384	Waste Water Treatment	5	Water Engineering	Engineering
1398	Groundwater Flow	5	Water Engineering	Engineering
1027	Social Research and Networking	5	Basic Sciences	Engineering
1394	Desalination	5	Water Engineering	Engineering
1155	Renewable Energy Project	5	Energy Engineering	Engineering
1194	Bioenergy Conversion	5	Energy	Engineering

			Engineering	
3620	Microbiology and Immunology	5	Microbiology and Public Health	Pharmacy
3211	Pharmacognosy 1	5	Pharmacognosy and Medicinal Plants	Pharmacy
3221	Pharmacognosy 2	5	Pharmacognosy and Medicinal Plants	Pharmacy
3232	Phytochemistry 1	5	Pharmacognosy and Medicinal Plants	Pharmacy
3242	Phytochemistry 2	5	Pharmacognosy and Medicinal Plants	Pharmacy
3200	Botany	5	Pharmacognosy and Medicinal Plants	Pharmacy

The Pilot Phase

In order to accurately measure the potential impact of the reoriented courses and to assist in the adjustment process, a pilot testing of the courses were conducted during the 2014/2015 spring semester. The courses that were chosen to be a part of the pilot study were chosen as follows in Table 1.

Table 1: Courses included in the Pilot Implementation

CLIMASP COURSE CURRICULUM PILOT PHASE	
NAME OF UNIVERSITY: Heliopolis University for Sustainable Development	
No	**Course name and Faculty/Department**
1	Services Marketing/Faculty of Business
2	Public & Media Communication/ Faculty of Business
3	Renewable Energy Applications/ Faculty of Engineering
4	Pharmacology 1/ Faculty of Pharmacy

As part of the pilot implementation of the courses, students were requested to answer a questionnaire with the purpose of being used in a comparative study of a pre and post

analysis. As such the results of the a-priori questionnaire conducted is described in the following section.

Students' perceptions of interdisciplinary teaching and learning

The pre-questionnaire had a sample size of 50 respondents (n=50) and asked students a variety of questions regarding their education up till that point. The respondents were from a variety of faculties as shown in Figure 1:

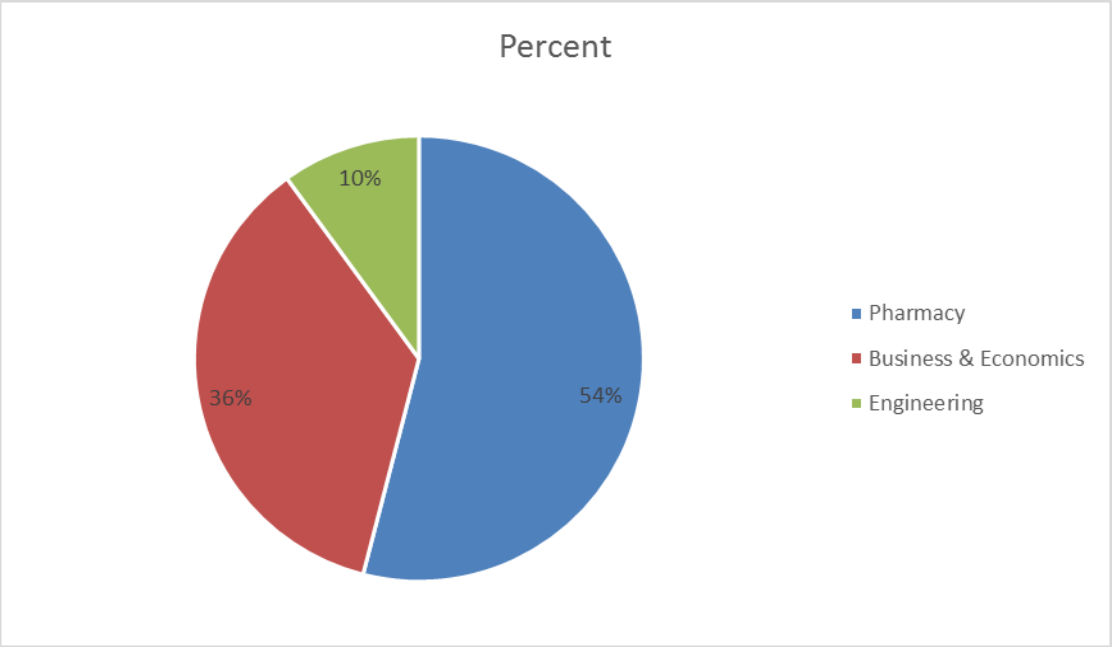


Figure 1: Bar Chart of Distribution among Faculties

This is a positive beginning as the concept of the CLIMASP project is aimed at being inter-disciplinary and should include a variety of majors and fields of study. Moreover, when measuring the types of teaching and methodology of learning used in the university, major areas of improvement were identified as can be seen in Figure 2.

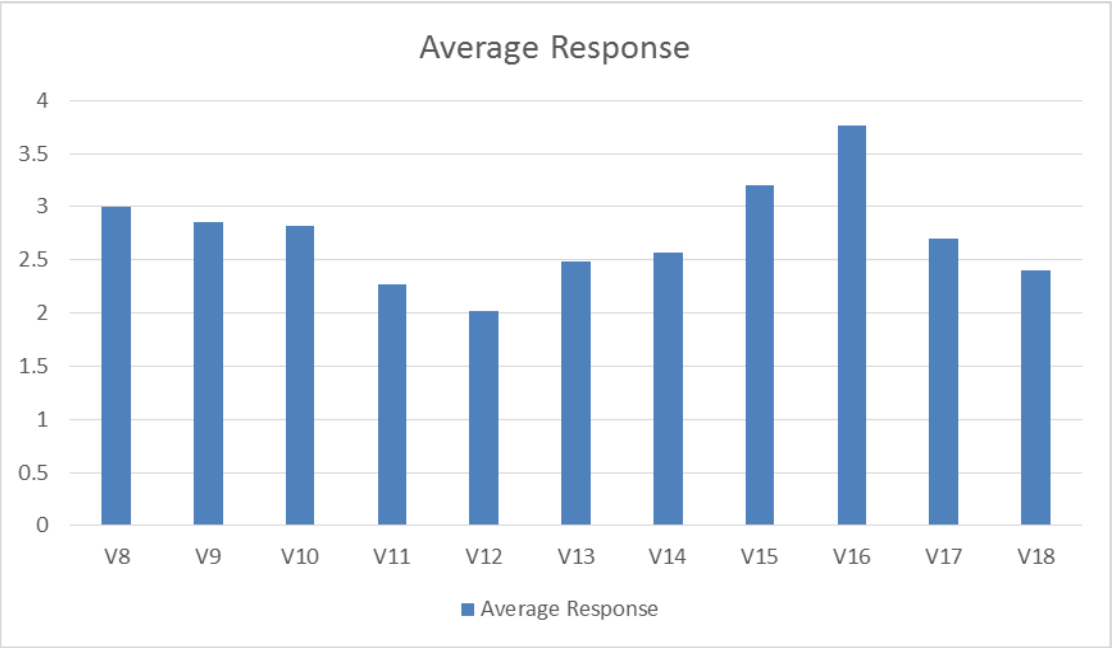


Figure 2: Average Student Response on Teaching Techniques

As it can be seen in Figure 2 question V16, which asked students on using presentations in class, had the highest average response as almost all courses in HUSD used this tool in assessing students. However, V12, which asked students if the content of the courses were tied to practice outside of the university was the lowest response. This was found to be an issue of major concern and one that was considered in the design of the courses

In developing the courses, these, as well as other aspects of the survey were taken into consideration. As such, it was decided that a very heavy emphasis would be placed on the practical side and project aspect of the courses in terms of both content and assessment. Furthermore, the instructors also emphasized using online learning techniques such as online video lectures for delivering knowledge in a different way to the students.

Achievements

After gathering information regarding the state of climate change and its education in the country and the region, CLIMASP project entered the phase of developing the existing curricula to design a minor and diploma for Climate Change. The main achievement in doing this was related to infusing climate change within seemingly unrelated topics and fields. For example, one of the greatest achievements was the successful infusing of Climate change within the course of Public and Media Communication. While at a glance, this course seemed to be wholly unrelated to the topics of climate change, the HUSD team was able to infuse concepts of sustainable development throughout the course. The course thus became focused on not just communication in a public setting, but on teaching students how to communicate and increase awareness of Climate Change in the region using modern tools and methods of communication. This course proved to be one of the standards for interdisciplinary courses within the university.

During the pilot implementation phase of the CLIMASP project, various lectures were given within the context of Sustainable Development and Climate Change. Each of these lectures held on their core ideas, ILOs, and purposes within the faculty and overall curricula, but with

the added benefit of an inter/multi-disciplinary approach. Another major success within the university was the infusion of Climate Change concepts within the seemingly unrelated course of Services Marketing. Within this course, students were challenged to come up for an idea for a company that addresses climate change through the services industry. An example of the projects that students came up with was the idea of solar leasing in which the students developed the idea for a company that helps reduce the barrier to entry and prohibitive costs of solar panels through innovative leasing and financing methods.

During the full implementation phase of the CLIMASP project, further achievements were made through ever more interesting and innovative methods within traditional courses. One of the most successful of these courses was the course of Marketing Research. Alongside teaching students on traditional methodological research in the social sciences, students were told to implement the ideas of the course in-practice through finding a research model/theoretical frame work that blends both marketing concepts and Climate Change concepts. Each student was tasked with taking this model and researching it following the requirements of methodological rigor.

Furthermore, among the achievements of the implementation of the project was the shift in students' perception towards the courses and their overall usefulness. As can be seen in Table 1, there has been a very positive increase in the different constructs and dimensions of student learning. This was measured using a pre-post questionnaire using a 4-point Likert Scale. Thus it can be seen that the basic concepts of Education for Sustainable development and its transformative approach to education has had a significant effect on the overall impact on the students and their attitude and perception towards the usefulness of the courses taken.

Table 2: Results of Pre-Post Survey

Construct	Average Response Pre Implementation	Average Response Post Implementation	Percentage Chang
Relevance to real life issue	2.4	3.0	26.34%
Turning Imaginative Ideas into reality	2.65	3.10	16.72%
Overcoming Obstacles	2.9	3.23	11.23%

The major achievement of HUSD, however, is the full design and preparation of a diploma/minor degree in Climate Change that brings together disciplines and courses from each of the university's three faculties. A further result is the equitable ratio of male to female students in the various course demonstrating diversity in the interest in climate change topics (see: figures 1, 2, & 3) The result is a strong and comprehensive programme that can provide students with a solid foundation on the fundamentals of Climate Change and Sustainability Policy.

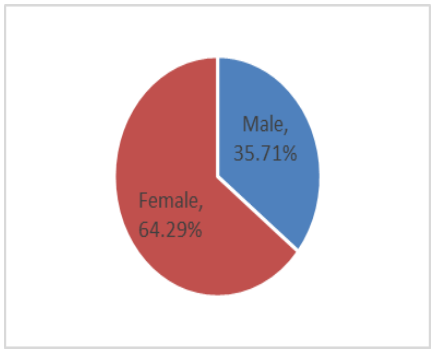


Figure 3: Gender Distribution of Media and Public Communication

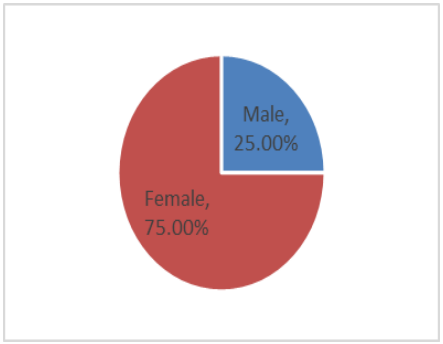


Figure 4: Gender Distribution of Graduation Project

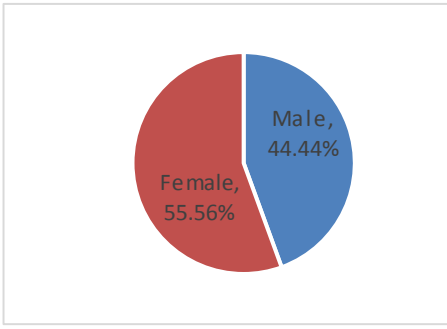


Figure 5: Gender Distribution of Marketing Research

Challenges faced during the CLIMASP project

While the implementation of the CLIMASP project went very well and smoothly, the implementation was not without its challenges and obstacles. These came from three sources: teaching faculty, students, and regulatory bodies. The main challenge from the teaching faculty was either a resistance to change the overall curricula that they were used to teaching, or it was in the fact that many of the teaching faculty are, while experts in their own field of study, only somewhat familiar with the concepts of Climate Change and how it relates to their specific field of study.

With regards to the students, the main challenge was that the students were mostly resistant to learning a subject outside of their direct study programme, and expressed confusion and a general unwillingness to engage in topics that were so unfamiliar to them. Finally, the regulatory bodies that regulate private universities served as an obstacle to getting the programme accredited and officially a part of the university curricula.

Solutions

In order to help the teaching faculty and to prepare them for implementing the CLIMASP courses, a series of National and Regional Training Workshops throughout the implementation of the CLIMASP Project. In these workshops, teaching faculty members from each of the three faculties were invited to participate, and their spreading of the knowledge from the workshops were disseminated within the faculty.

As for the students, as the lectures went on and the students became more familiar with the concepts and topics of Climate Change, they became more engaged and willing to learn more about the issue and the challenges facing them from it. As their awareness of the issue grew, so too did their interest and engagement on the topic.

The challenges posed by the regulatory bodies remain challenges that face HUSD till today. As such, a plan is being developed in order to get the programme to be accredited using the experiences of other relevant programmes in Sustainable Development that were approved and accredited.

Exploitation and Dissemination

The CLIMASP Programme and degrees was disseminated through various challenges throughout the CLIMASP project. The project was disseminated through various media

channels by publishing various articles in local newspapers highlighting the major results and accomplishments of the project. Furthermore, representatives of the university were sent to various events in order to present the purpose of the CLIMASP project and to disseminate the degrees that would be established from its implementation. For a detailed look at the dissemination activities, see Table 3.

Table 3: List of Dissemination Activities by HUSD

No	Event	Date	Place	Target	Outcomes
1	Mass emails to students from different faculties.	15th December 2014	Heliopolis University, Cairo	Students from different faculties interested in the minor	The project was introduced to students and announced the starting of the pilot phase it reached all members of the university and SEKEM reaching around 800 stakeholders
2	Presentations and conferences on CLIMASP for the pilot phase	30th of December, 2015	Heliopolis University, Cairo	Students from different faculties interested in the minor	Resulted in reaching many students, of which over 100 participated in the pilot phase of the project.
3	Regional Action on Climate Change	22nd February – 24th February, 2015	Bibliotheca Alexandrina, Alexandria	External Stakeholders	The project was disseminated to participants rom around the world attending the conference on climate change. There were over 100 participants at the event.
4	Students presentations about CLIMASP in university Forums	13th April 2015	Heliopolis University, Cairo	Students and faculty staff members from all faculties	Students presented to their colleagues their projects about climate change and introduced to them the concept and the CLIMASP minor in the university, The forum was attended by nearly 80 students and faculty members from the university and they will introduced to the pilot phase of the project.
5	Newspapers	August 2015	Nationally, Egypt	Faculty members and Students from all over Egypt	News about CLIMASP project and the NTW in Jordon were published in nearly 5 newspapers and it was reached to approximately 400 readers from all over Egypt. The main purpose was to introduce the project and its objectives to the interested parties in Egypt and announcing the start of the implementation phase of the project.

All of these actions were carried out through the Euro-Arab Center for Interdisciplinary Studies and CLIMASP (EAISC). Furthermore, the main benefits of the CLIMASP project will be continued and overseen by the EAISC. To help the EAISC in its purpose, the ICT Lab which was established and funded through the CLIMASP project and will be managed through the EAISC.

The future and sustainability of the CLIMASP project is also inextricably linked with the EAISC. A key objective will be the full accreditation of the CLIMASP project by the Supreme

Council of Universities in Egypt in order to provide it with the necessary recognition and acceptance as well as to allow for other universities to replicate the results. Furthermore, the CLIMASP project will hopefully continue to influence and educate students on the great challenges faced by both Egypt and the World from the ever-increasing threat of Climate Change.

Conclusion

The impact of the CLIMASP project on HUSD cannot be overstated. Bringing together the various faculties in an interdisciplinary minor degree addressing one of the greatest challenges of our time remains a highly ambitious aim, and yet it was successfully implemented across not only HUSD, but universities across the region. It is apparent through the implementation of the CLIMASP and through the pilot and full implementation phases that while there will always be resistance to change and new ideas in higher education, when students and teaching faculty are exposed to the incredible threats posed by issues such as Climate Change, they can quickly adapt and begin to see the importance and relevance of taking such topics and learning more from an interdisciplinary perspective. Finally, it is important to note that while the CLIMASP project is ending, its impact will continue through the minor programme as well as through the continued integration of Climate Change concepts within the curricula at Heliopolis University.

Acknowledgement

This work has been developed within the framework of the CLIMASP (Development of an interdisciplinary programme on climate change and sustainability policy) project that has been funded from the European Commission (543879-TEMPUS-1-2013-GR-TEMPUS-JPCR). The content of the paper reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

References

Ramzy, O., & Wahieb, R. (2012). Education for Sustainable Development: a Myth or Opportunity - The Case of Egypt. In *International Conference New Technologies, Education for Sustainable Development and Critical Pedagogy*. Crete: University of Crete.

Holland, C., Judge, M., Rami, J., Mulcahy, C., Ramzy, O., & Lotfy, N. (2013). Evaluation of the Infusion of Sustainability within Heliopolis University and Suez Canal University, Egypt. *RUCAS Case Studies and Student Practicum Placement Projects*, *1*(1), 45–56.

Ramzy, O., & Wahieb, R. (2012). Branding the Green Education: Challenges facing Implementation of Education for Sustainable Development in Egypt. *Discourse and Communication for Sustainable Education*, *3*, 83–99.

Khalil, D., Ramzy, O., & Mostafa, R. (2013). Perception towards Sustainable Development Concept: Egyptian Students' Perspective. *Sustainability Accounting, Management and Policy Journal*, *4*(3), 307–327.



TITLE: Developing and Implementing the CLIMASP Minor in Port Said University

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INTRODUCTION

Climate change is a serious challenge that threatens the existence of the human race. Facing such a challenge is best achieved through education and adopting sustainable policies. Again, like other human concerns, the successful management of climate change threats depends on faithful international co-operation. Here arises the significance of the European commission-funded CLIMASP project. The project embodies a real international co-operation to establish an educational program that implants sustainable policies for the management climate changes in the educational programs of 10 universities from four countries. The project can be an adaptable model for other universities in the world.

The present work reports Port Said University (PSU) experience in the establishment of specialized CLIMASP centre for the management of climate changes issues and development of sustainability policies. It describes the efforts, policies, measures, challenges, outcomes and lessons learnt during the three-year journey of PSU CLIMASP project

UNIVERSITY BACKGROUND

Port Said University (PSU) was established in 2010 (Fig 1). Before that date it was a branch of the Suez Canal University which was established in 1976. PSU serves around 27000 students served by 600 administrative staff and 1100 (700 junior and 400 senior) academic staff members. It incorporates 13 faculties: Engineering, Commerce, Education, Physical Education, Faculty of Specific Education, Nursing, Science, Arts, Kindergarten, Medicine, Pharmacy, Law; and the Higher Institute of Management and Computer.

In addition to the above there is a number of higher education institutions in e.g.: the Arab Academy for Science and Technology and Maritime Transport; and Sadat Academy for Management Sciences.

Port Said University plays leading role in the development of local, national and regional community. It is located in one most important Egyptian cities: Port Said (pronounced (Borsaʿīd) city lies in north east Egypt mid-way between the Europe and Asia (Fig 2). It extends about 30 kilometres along the coast of the Mediterranean Sea, north of the Suez Canal, with an approximate population of 680,000. The city was established in 1859 during the building of the Suez Canal.

Port Said has been ranked the second among the Egyptian cities according to the Human Development Index. The economic base of the city is fishing and industries, like petrochemicals, food processing, steel and garments. Port Said is also an important harbour for exports of Egyptian products like cotton and rice. It provides ship services (maintenance, fuel, etc...). Port Said, which is a duty free Zone together with its twin city Port Fuad is one of the most famous destination for both local and international tourists (Figs. 3-8). The two cities are connected by free ferries running all through the day, and together they form a metropolitan area with over a million residents that extend both on the African and the Asian sides of the Suez Canal (Fig 9). Nowadays, tunnels are built under the canal to serve the same purpose.

Port Said acted as a global city since its establishment and flourished particularly during the nineteenth and the first half of the twentieth century when it was inhabited by various nationalities and religions. Most of them were from Mediterranean countries, and they coexisted in tolerance, forming a cosmopolitan community. Referring to this fact Rudyard Kipling once said "If you truly wish to find someone you have known and who travels, there are two points on the globe you have but to sit and wait, sooner or later your man will come there: the docks of London and Port Said". Again, Port Said is twinned with: Volgograd, Russia (1962) and Bizerte, Tunisia (1977).

Port Said seaport is the 28th-busiest one for container transport, the second busiest in the Arab world (narrowly behind the port of Salalah in Oman), and the busiest in Egypt. It is divided into: Port Said Port and East Port Said Port. The port is bordered, seaward, by an imaginary line from the western breakwater boundary till the eastern breakwater end. And from the Suez Canal area, it is bordered by an imaginary line extending transversely from the southern bank of the Canal connected to Manzala Lake, and the railways arcade livestock. Navigation channels include: Main channel, East verge channel and Approach area. Two breakwaters protect the port entrance channel: the western breakwater is about 5.6 km long, and the eastern breakwater is approximately 2.4 km (Fig 10).

The Suez Canal dwelling area is situated between latitudes 31° 21' N and 31° 25' N and longitudes 32° 16.2°' E and 32° 20.6' E. where vessels awaiting to accede Port Said port stay whether to join the North convoy to transit the Suez Canal to carry out stevedoring operations or to be supplied with provisions and bunkers. The dwelling area is divided into two sections: The Northern Area is allocated for vessels with deep drafts. The Southern Area is for all vessel types.

Port Said is served by several means of transport. Port Said is linked by the Ferry to its twin city Port Fouad which is considered the Asian part of this Afro-Asian governorate "Port Said" on the eastern bank of the Suez Canal, the ferry is used to cross the Canal between the two cities holding both people and cars as well for free, the time between the two cities across the canal by using the ferry doesn't exceed 10 minutes. There is an international Airport located about 6 km away from city centre. There are also three main highways that connect Port Said to other cities in Egypt. These are: the international coastal road - a 257 kilometres east-west highway that connects Port Said to Alexandria along the Mediterranean coast, the desert Road - a 215 kilometres north-south route via Ismailia-Port Said and Cairo-Ismailia Desert Road; and International Coastal Road - a 53 kilometres east-west highway Port Said - Damietta. Port Said train station was built in 1904 to connect Port-Said to the Egyptian rail road network. Other means of public transport include buses, Saloon cars and Taxicabs are also available with reasonable price.

Culture aspects include: Libraries, theatres, museums and movie houses. The Public Library is located near the beach with a total area of the library about 12,500 meters (41,000 ft). It is surrounded by a garden with a cafeteria to serve the visitors. The library has special halls for children, training centre, seminars and audio-visual materials. Port Said Opera House, provides classical and oriental music, opera shows and ballet performances. The

National Museum contains about 9000 artefacts that narrate the story of Port Said and Egypt. The Military Museum narrates the story of the Egyptian resistance in Port Said for the tripartite aggression during the Suez Crisis in 1956, the wars of 1967 and 1973, and the genesis of the city and the Suez Canal. Add to the above sport halls, courts and stadiums are available for local, national, regional and international activities, events and championships. Ashtoum el-Gamil is a national park and Natural protectorate area Location: 7 km west of Port Said on "Port Said-Damietta" coastal road, located in the Tanees Island. It serves an area of 180 km2. Its main activity is the conservation and management of migratory birds (Fig. 11).

Port Said has a hot desert climate. But the winds blowing from the Mediterranean Sea greatly moderates the temperatures, typical to the northern coast of Egypt, making its summers moderately hot and humid while its winters mild and moderately wet when sleet and hail are also common, yet less common than in Alexandria because Port Said is drier. January and February are the coolest months while the hottest are July and August. The highest temperature - 44 °C (111 °F) - was recorded on June 20, 1988. The lowest temperature - 0 °C (32 °F) –was recorded December 25, 1979. Port Said, Kosseir, Ras El Bar, Baltim, Damietta and Alexandria have the least temperature variation in Egypt, additionally, Mersa Matruh and Port Said have the coolest summer days of any other cities or resorts, although not significantly cooler than other northern coastal places.

SETTING THE CONTEXT

This part describe the situation in terms of policies and practices related to climate change and sustainability policy curricula as well as professional development (capacity building) at PSU prior to initiation of the CLIMASP project.

The historical development and current practices of PSU provide strong evidence and an adaptable model for sustainability policy and interdisciplinary curricula. In other words, it is a truly evolutionary model. The university was a branch of Suez Canal University. A cell division model illustrates its growth. In other words the faculty of education was divided into three faculties now known as: Education, Arts and Science. The faculty of Specific Education was divided into: Specific Education, Physical Education and Kindergarten. The faculties of Science and Nursing represented a base for faculties of Pharmacy and Medicine. Moreover the faculties of Engineering and Commerce supported the growth of the Higher Institute of

Management and Computer. The same cell division model applies to academic departments of each faculty.

With regard staff development, PSU depended on the parent (Suez Canal) university plus other neighbouring ones e.g. Mansoura, Zagazig, Ain Shams, ... etc), who worked as part timers. Parallel to this intensive staff recruitment policy was adopted starting from 1998. Next step depended on the appointment of PSU distinguished graduates as junior academic staff, who soon have become PhD holders – some of them have been promoted to higher ranks (i.e. assistant and full professors). The number of junior staff is around 700, out of them around 50 are studying abroad for MA and PhD degrees. There is around 400 Senior staff members, out of the 60 are emeritus professors. In addition, there is a number (40) of senior staff are working in the Gulf States universities.

Curricular wise, the interdisciplinary approach is clearly reflected in the syllabuses and courses of all PSU faculties. That is why six faculties were involved in the CLIMASP project (Table 1). Also, the derivative model of the university growth - explained above - prove this fact.

Table (1): Faculties involved in PSU CLIMASP

Faculty	No. of courses
Science	14
Education	5
Engineering	4
Commerce	3
Medicine	2
Arts	2

PSU CLIMASP CASE DESCRIPTION

CLIMASP is one TEMPUS European Commission funded programs. It aims at establishing a Euro-Arab centre for interdisciplinary studies. Accordingly, it deals with the development of an interdisciplinary (minor) program on climate change and sustainability policy across. The program has an international nature. It incorporates ten partner universities from Egypt, Jordan and Lebanon. It is led by the University of Crete, Greece. CLIMASP deals with one of the most pressing issues affecting all regions in the world and especially the Middle East and

Mediterranean region. The climate change is a topic that affects and is affected by almost all other sciences. In other words, it is not limited to natural sciences; rather it is one of inter-disciplinary topics including science, educational, economic and sociological orientation. The CLIMASP initiative aims to develop, implement and assess interdisciplinary programs for undergraduate students of various disciplines (e.g. as minors) that raise the awareness, inspire ideas and recruit efforts to face climate change and its dangerous results; that might lead the extinction of the human race. In other words, CLIMASP is intended to face climate change challenges through education and sustainability policy. That is, we came to the point that human beings have to choose between education and extinction.

PSU CLIMASP project decided to make the best investment of the above described unique location, distinguished potentials and promising future of Port Said – the city and university. In other words, PSU CLIMASP aims to:

A) Enhance the interdisciplinary nature of its academic programs and syllabuses.
B) Build on the sustainable nature that guided its growth that started in the fourth quarter of the 20th century with one faculty to date.
C) Enhance and highlight the already existing but embedded types of education dealing with climate changes and sustainability.

In order to achieve the above, PSU team actively participated in the following activities (Table 2):

1- Workshops/Meetings/Conferences:

Table (2): Chronologically ordered list of activities attended by PSU CLIMASP team

Date	Event	Type	Place	Audience
Feb, 2014	Kick-off meeting	International	Greece	Partner Countries
March, 2014	1st National workshop	National	Heliopolis University Cairo	Partner Egyptian Universities/ Institutions, Germany representatives
April, 2014	Stakeholders survey	Local	Port-Said , Port-Foad cities	Local community/institutions
April, 2014	2nd National Workshop	National	EBWA-Cairo	Partner Egyptian Universities/Institutions.
Oct., 2014	1st Regional Workshop	Regional	Jordon	Partner Countries

March, 2015	Monitoring visit by TEMPUS National office	National	Heliopolis University Cairo	Partner Egyptian Universities/ Institutions.
Sept., 2015	PSU CLIMASP Course Development Workshop	Local	Faculty of Education	PSU faculties especially those involved in teaching CKIMASP courses
Oct., 2015	3rd National Workshop	National	Aswan-Egypt	Partner Egyptian Universities/ Institutions, Lebanon and American university Cairo representatives
Nov.,2015	PSU Council meeting	Local	PSU	Presentation of a proposal to establish PSU CLIMASP RESEARCH CENTER*
May, 2016	2nd Regional Workshop	Regional	Cyprus	Partner Countries

2. Parallel to the above events, the following took place:

2.1. The syllabus of Euro -Arab Pass was developed and coded (Table 3).

Table (3): Coded course-list for Euro-Arab Pass

Course Code	Course Title	ETCS per Course	Total of ECTS
A- Capstone Course			
CS100	Graduate Project	10	10
B- Elective Courses			
1- Environment and Society			
ES101	Community Medicine	3	12
ES102	Environmental Psychology	3	
ES103	Biological and Social Anthropology	3	
ES104	Environmental Sciences	3	
ES105	Environmental Studies	3	
ES106	Man and Environment	3	
ES107	Scientific Culture	3	

2- Economics and Public Policy

EP101	Architectural Design	5	18
EP102	Decision Support Systems	5	
EP103	Environmental Control in Architecture	5	
EP104	Developmental Geography	5	
EP105	Human Rights	3	
EP106	Industrial Quality Management	5	
EP107	Egyptian and International Environmental Law and Policy	3	
EP108	Lighting & Building Acoustics	5	
EP109	Macroeconomic	3	
EP110	Human Resources Management	5	
EP111	Regional Planning	5	
EP112	Environmental Impact Assessment of Projects	5	

3- Sciences and Technology

ST101	Air Pollution Management	5	20
ST102	Meteorological Physics	5	
ST103	Basics of Environmental Sciences	5	
ST104	Hydro-Geo- Chemistry and Environment	5	
ST105	Soil Pollution Management	5	
ST106	Energy and Environment	5	
ST107	Climate Geography	5	
ST108	Microbiology and Environment	5	
ST109	Remote Sensing and Graphical Geology	5	
ST110	Renewable Energies	5	
ST111	Water Pollution Management	5	

2.2. Measures and procedures to purchase the equipment for PSU CLIMASP Centre were initiated. The centre's building reconstruction process started.

2.3. Project brochure and flyers for students, faculties and community (Fig.12) were produced and distributed.

2.4. PSU CLIMASP Centre for Interdisciplinary Studies (Fig. 13) was established to:

1. Promote stainable practices and encouraging interdisciplinary collaboration.
2. Disseminate sustainable leadership in the local community and neighbouring ones.
3. Create more interdisciplinary and multi- stakeholder driven curricula catering for community needs.
4. Enhance the already existing climate change and sustainability policy educational programs with extra-curricular/community-oriented activities.
5. Enable students to acquire a Euro-Pass supplement diploma that qualifies them as students and researchers to work or study in the European community.

More specifically, the PSU CLIMASP ICT-equipped interdisciplinary centre targets:

- Building qualified academic, professional and technical CLIMASP cadres.
- Offering CLIMASP education, training and consultation services on the area at local, national, regional and international levels.
- Conducting research and studies CLIMASP-related issues.
- Grant Euro-Arab pass (degrees: diploma, certificate).

2.5. The proposal for PSU the academic and administrative hierarchy together with its academic units (Figs. 14 & 14) was approved.

2.6. PSU CLIMASP E-mail: (climasp@psu.edu.eg).

2.7. Launching of CLIMASP Home Page: http://staff.psu.edu.eg/climasp.

2.8. Intensive modular CLIMASP course development process took place. It proceeded as follows:

Institutional approach was adopted. Faculties involved in the project were invited to attend modular course development workshop. The two-day workshop was hosted by PSU faculty of education. Three experts in curriculum design were invited to assist PSU project coordinator in guiding the others during course development process. Staff members involved in teaching CLIMASP courses were invited to attend course restructure workshop. The process proceeded as follows:

- Presentation of guidelines presented by Prof. Makrakis in EBWA (2014), later developed by e-mail.

- Distribution of targeted course outcomes (knowledge, skills attributes and competencies) among the thirty courses to avoid redundancy or ignorance of any; and to insure the interdisciplinary nature of the syllabus.
- In the first day, a model course was presented. Later it was transformed into a kind of template that facilitates the task for those who are not specialized in curriculum development. The template also helped the attendance to overcome English language barriers.
- In the second days the attendance presented sample modules that underwent group discussion and focused revision.
- The work continued for ten days more where each participant worked in his own with remote (phone) consultation and discussion with the project coordinator - when needed.
- By the end of September 2015 courses were immediately e-mailed for external reviewer.

It is worth to note that the organization of the CLIMASP Capstone Course was intended to reflect the student's acquisition of CLIMASP targeted knowledge, skills attributes and competencies. The capstone course guides the students should be involved in activities such as:

- Reading, surveying, web surfing to gain KNOWLEDGE on CLIMASP-related concepts, theories, processes.
- Engagement in field practices that develop SKILLS of using self- and continuous learning Tools, methodologies, dynamic.
- Proving the acquisition of ATTRIBUTES (Innate abilities) such as: social responsibility, Justice, Intergenerational equity, Stewardship, Social & ecological justice.
- Reflection of their post course CLIMASP CORE COMPETENCES needed to Explore, Survey, Analyze, Compare, Assess, Identify, Evaluate CLIMASP issues, problems and concerns.

The very significant outcomes of the workshop were not limited to producing 30 courses. Rather, :

- Participants were train on how to restructure their courses using modular design.
- It served as part of dissemination strategy where more information about the project were presented and thoroughly discussed.
- CLIMASP local network was created
- Participants involved in teaching CLIMASP minors were familiarized with nature of the project and its targets.
- It created a sense of ownership among the involved faculties.
- It was a good chance to respond to any concerns and clarify any ambiguity about the project.

Very positive received the feedback was received from the external reviewer in the third week of October 2015. Almost all ratings ranged between 3-4 levels. Few items were rated 2-3. These will be re-considered in the lights of the second reviewer feedback together with collected field evaluation of course implementation that took place in the second semester 2015/2016

2.9. Seven courses were taught according the regular plan during the second semester of the academic year 2015 – 2016. The implemented courses belong to two domains: Science and Technology (4 courses, Economic & Public Policy (3 courses). Students attending each course belong to different disciplines - even to different educational levels as shown in table (4).

Table (4): List of Implemented courses

Faculty	Course ID	Course Title	Grade	No. of Students
Arts	ST107	Climate Geography	2nd	6
Science	ST101	Air Pollution Management	3rd	15
	ST106	Energy and Environment	2nd	10
	ST110	Renewable Energies	4th	12
	EP107	Egyptian and International Environmental Law and Policy	2nd	10
	EP112	Environmental Impact Assessment of Projects	4th	12
Engineering	EP103	Environmental Control in Architecture	3rd	20

Results obtained show that the total number of the students who studied the implemented courses is 85. The majority (93%) are females. The can be described as heterogeneous population who belong to three faculties. Moreover, 3 courses were studied by 2nd graders, 2 by 3rd graders and 2 by 4th graders.

However, positive feedback was received after the analysis of post course questionnaire results. In other words:

- While students expressed their dissatisfaction with other courses because they tend to follow a teacher-centered teaching style, students show positive signs through in-class involvement and active participation in the modular courses.
- Students declared that the new course format encouraged them to be involved in extra-curricular/community-based activities.
- Classroom discussions indicated the students' increasing awareness, motivation and concern towards various environmental issues; not only climate changes.

Challenges and their Management

Serious challenges and problems faced the completion of the PSU CLIMASP project/experience. On the top comes the change of the university presidents several times for different reasons. So far, five presidents took over. Three of them were acting presidents. This change in the top management of the university – you can guess – negatively affected decision making process. There was a delay in the completion of vital tasks, which resulted in the delay or even cancelation of others.

- For example, the delay in the project courses development resulted in the cancelation of their piloting.

This challenge was solved by arranging intensive course development workshop - as described above (see 2.8).

- When it comes to modular course implementation, it is not easy to do any changes on the students program of study without the approval of the Supreme Council of Egyptian Universities. This means to pass through a long chain of procedures – which means a very long time.

However, the necessary arrangement were made with course teacher who participated in the course development workshop to teach those courses – using the modular format – without making any crucial changes the students regular plan of study.

- Again, there was a delay in the purchase of equipment. Unfortunately, this delay was accompanied with 15% currency loss. So, we had to reduce the number computer machines to seven only – due to budget insufficiency.

The above problem was recently solved where we succeeded in ordering eight computer machines; in addition to one data show projectors and screens, white boards, chairs, desks and furniture for the six- room centre. All these will be financed by PSU own budget

- In addition, the change in presidents resulted in changing the location of the Euro-Arab Centre. It was found that the new location needs reconstruction. Consequently, the equipment installation was postponed.

Still the new location is more capacious so that it can meet the centre's ambitions and future expansions of its activities. The current rooms will be flexibly equipped as multi-purpose ones (e.g. teaching conferencing, research ...etc.)

- Staff-wise CLIMASP team members are volunteers, who have other commitments. This may apply to the partner universities. However with PSU case most of them left for various reasons.

To solve the above problem, Euro-Arab center for interdisciplinary studies was declared as an independent academic unit with the hierarchies illustrated in Figs (14 & 15). Full time academic and administrative staff members are currently recruited.

Exploitation and Dissemination

The exploitation and dissemination strategy of PSU CLIMASP Minor aims at giving information about the functions of the Euro-Arab Centre for Interdisciplinary Studies and CLIMASP, the ICT Lab, the Euro-Arab pass diploma and how it will be handled through the Centre. This strategy can be summarized as follows:

- Vision: PSU CLIMASP Euro-Arab Centre should be a model resort for Egyptian citizens (students, researchers staff members, parents and other stakeholders) who want to learn, study, know about, receive training, seek consultation or design programs related to CLIMASP issues.

- Mission: PSU CLIMASP Euro-Arab Centre should follow institutional and scientific approaches to achieve the above visions i.e. via reliable and practical channels with stakeholders institutions such as faculties, departments, and youth & business communities to explain and promote the center's role in providing services, knowledge training, consultation as well as programs of relevance to CLIMASP issues.

- Scope: PSU CLIMASP Euro-Arab Centre role should not be limited to Port Said city; rather it will be extended to neighboring ones. Moreover, the center will reflect the interdisciplinary as well as global nature of CLIMASP issues, problems and concerns.

- Tools: To achieve its goals, PSU CLIMASP Euro-Arab Centre should use Face-to-face, online and traditional tools of communications.

CONCLUSION

In the lights of the above, it can be concluded that:

- Education is a great blessing without which man would have met the same destination of dinosaurs. The author came to this conclusion after a quite long experience in the field of education that goes back the early eighties of the twentieth century. However, working as a team member, then the project coordinator of PSU CLIMASP project assured the same conclusion.

- In other words, it is through education that man can manage any challenges and threats including climate changes. However, adopting a) interdisciplinary and modular approaches in course design; b) sustainable policies in implementation; teamwork strategies; and c) institutional approach in management would guarantee successful and fruitful educational practices.

- The establishment of the Euro-Arab Centre – despite all the challenges reported above – remains an easier task in comparison with the coming challenges. In other words, a hard work is needed to safeguard what has been achieved so far. A lot of effort is needed to help the centre grow and flourish. Clear sustainable plans and dissemination strategies need to be carefully

adopted. This in turn indicates the role to be played by media and dissemination unit Fig. (15).

- PSU CLIMASP Centre needs to build on what has been achieved (i.e. remains sustainable); invest the potentials and positive aspects available in Port Said - the city and University – on the dissemination of 'CLIMASP' culture.

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This work has been developed within the framework of the CLIMASP (Development of an interdisciplinary programme on climate change and sustainability policy) project that has been funded from the European Commission (543879-TEMPUS-1-2013-GR-TEMPUS-JPCR). The content of the paper reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

However, the accomplishment of PSU CLIMASP project would have been impossible without the faithful efforts its coordinator prof. Makrakis whose wisdom and sound academic experiences guided us during the three year journey of the project – particularly during the truly hard times faced as mentioned above.

Thanks are due to all the Egyptian partners Dr omar Ramzy, Dr Nehal Lotfy and Dr Adel Abdelfaheim whose faithful support and advice Helped us to manage a lot of challenge we faced.

Thanks are extended to Prof. Enas El-sheikh, the previous coordinator of the project, for the efforts she exerted during the earlier staged of the project.

Thanks are further extended to PSU team members – particularly Prof. Ayman Ibraheim who recently joined the team. Special thanks are extended to Eng. Ahmed Fahmy, the technical and administrative team member whose efforts are undeniable.

REFERENCES

1. *Heidi Hayes Jacobs (1989) ed. Interdisciplinary Curriculum: Design and Implementation, Association for Supervision and Curriculum Development.*
2. William H. Newell (1990). Interdisciplinary Curriculum Development Issues in Integrative Studies No. 8, pp. 69-86

Websites

1. Laura Crowder (2011). How to Develop Modular Content in 4 Easy Steps. © 2013 THE LEARNING HOUSE, INChttp://www.learninghouse.com/blog/publishing/how-to-develop-modular-content-in-4-easy-steps
2. **http://www.portsaid.gov.eg/magals/ascan/Lists/List8/DispForm.aspx?ID=1**
3. *http://www.rosaonline.net/Daily/News.asp?id=36636*
4. http://www.portsaid.gov.eg/tourism/default.aspx
5. http://www.myportsaid.info/Brief%20History%20of%20 PS.html
6. *"Port Said/El Gamil, Egypt". Voodoo Skies. Retrieved 29 October 2014.*
7. *"Port Said/El-Gamil Climate Normals 1961–1990". National Oceanic and Atmospheric Administration.*
8. *"Appendix I: Meteorological Data" (PDF). Springer.*
9. *"Port SaidEl Gamil, Egypt: Climate, Global Warming, and Daylight Charts and Data". Climate Charts. "New Suez Canal". Government of Egypt (Suez Canal Authority).*
10. http://english.ahram.org.eg/NewsContent/3/12/738/Business/Economy/Port-Said-Airport-to-be-inaugurated-in-February.aspx
11. http://www.anna.aero/2011/08/03/egyptair-launches-new-route-to-port-said-from-cairo/
12. http://www.myportsaid.info/Brief%20History%20of%20PS.html
13. http://www.portsaid-shoreexcursions.com/port-said-transportation
14. http://www.mpl.org.eg/arabic/history-intro.htm
15. http://www.almasryclub.com/topic.php?post=134
16. *touregypt http://www.touregypt.net/parks/Ashtum.htm#ixzz3lYzEXZvw*. Missing or empty |title= (help)



TITLE: Developing and Implementing the CLIMASP Minor in Suez Canal University-Ismailia- Egypt

Case study: Faculty of Veterinary Medicine

Authors: Prof. Dr. Atef Mohamed Kamel Ahmed, Professor and Suez Canal University

INTRODUCTION

Describe the general perspective of the CLIMASP case study in your university. Toward the end, specifically state the objectives of your case study.

Main Objective: The main focus of the CLIMASP is to address the issue of climate change and sustainability policy from an environmental, social, economic, cultural and political perspective, with regional reference, through transforming the current unsustainable practices that prevent interdisciplinary collaboration and promote interdisciplinary curricula in the partner countries universities..

Specific objectives

1. Develop capacity-building workshops for training university teaching staff for building interdisciplinary climate change curricula responsive to societal needs.
2. Develop an undergraduate interdisciplinary program on Climate Change and Sustainability Policy (CLIMASP) in each partner country university.
3. Integrate, implement and assess the CLIMASP program as an integral part to existing undergraduate academic degrees.
4. Contextualize the Euro-Arabpass supplement diploma in the partner universities and the region

What is CLIMASP Project? CLIMASP is a European Commission TEMPUS funded project entitled “Development of an Interdisciplinary Program in Climate Change and Sustainability Policy” that is being designed and implemented across 10 universities in Jordan, Egypt and Lebanon. The CLIMASP project is coordinated by the University of Crete, Greece through The UNESCO Chair on ICT in Education for Sustainable Development. CLIMASP program gives the students the opportunity to earn a formal credential (Euro-ArabPass Diploma) in climate change and sustainability policy in addition to the bachelor’s degree granted within each specialty.

Why choose the CLIMASP minor?

• Could open for you significant career opportunities
• Provide you with more hands-on experiences
• Could help you shape your future path
• Enrich your major study programmes
• Add depth and breadth to your studies
• Chance for future postgraduate studies (MSc)in Climate Change and other fields.

UNIVERSITY BACKGROUND

Provide background on your university, history, structure, faculties, number of students and staff, strategic planning, especially in relation to sustainable development, organizational culture, and any other issues that you feel are necessary to provide the reader with a comprehensive understanding of the background of the CLIMASP case study.

University Vision :
Suez Canal University is looking forward to occupy a prominent place among higher education institutions based on its contribution to university education development and its interaction with its community through pioneering research associated with its community.

University Mission :
We are university heading for its community aims to provide opportunities to its student for learning and education which capable of competition and provide work opportunities in its wide field at globalization era responding its community needs and eager to develop values within it without compromised to abandon our identity

University Objects:

1. To ensure the quality of outputs, activities and processes of the university.
2. To create new scientific programs for graduate and postgraduate studies.
3. Enforce the university achievements on the national, regional, and international levels.
4. To switch to the electronic administration governance and to increase the potential of excellence present in the university.
5. Maximize the utilization of learning resources and information.
6. Increase the collaboration between SCU and the international centers of Excellence.
7. Innovate new modalities of learning and teaching.
8. Increase the capacity for students without compromising the quality.

History
The history of Suez Canal University dates back to 1976 when the university was established by the presidential decree no. 93 for 1976. Study began in 1977 in six faculties; namely, the faculty of science, the faculty of agriculture, the faculty of commerce, the faculty of engineering and technology (in Port Said) and the faculty of education (in Suez). In the 1980s and 1990s, steady expansion in the university has been going on with a new faculty opening its doors almost every year. Today, there are 49588 students registered at the university studying in more than twenty faculties distributed in more than six Branches located in Ismailia, Port Said, and Suez and El-Arish. Two more faculties, one for arts and humanities and the other for fish, are to be established soon. The number of senior staff members today exceeds 1497 assisted by 1485 junior staff, members teaching to more than 74097 at the undergraduate level. Till now, 87500 students have received their first degree from the university, in addition to 15082 who have received different graduate degrees.
As for the administration, the university employs more than 6481 employees in 25 central directorates shouldering the administrative work in collaboration with the university and faculty administrations.

Faculties (13), number of students and staff

- Faculty Of Medicine
- Faculty Of Science
- Faculty Of Education
- Faculty Of Commerce
- Faculty Of Arts
- Faculty Of Engineering
- Faculty Of Agriculture
- Faculty Of Pharmacy
- Faculty Of Nursing
- Faculty Of Dentistry
- Faculty Of Veterinary
- Faculty Of Tourism And Hotels
- Faculty Of Computers And Information

تخصص دراسات عليا	شعبة دراسات عليا	شعبة دراسات عليا	تخصص من قسم علمي	قسم علمي	تخصص	شعبة	قسم	الكلية	م
0	15	15	0	9	0	7	9	كلية الأداب بالإسماعيلية	1
14	0	0	0	15	0	3	15	كلية الزراعة بالإسماعيلية	2
1	0	0	0	12	0	0	12	طب الأسنان بالإسماعيلية	3
14	0	0	0	23	0	0	23	كلية الطب البيطرى بالإسماعيلية	4
0	0	0	0	4	0	0	4	كلية الحاسبات و المعلومات بالإسماعيلية	5
0	0	0	0	5	0	0	5	كلية السياحة و الفنادق بالإسماعيلية	6
0	0	0	0	37	0	0	37	كلية الطب بالإسماعيلية	7
0	0	0	0	7	0	17	7	كلية التمريض بالإسماعيلية	8
0	19	19	0	9	0	5	9	كلية هندسة البترول والتعدين- السويس	9
0	0	0	0	9	0	0	9	كلية الصيدلة بالإسماعيلية	10
141	7	7	0	10	42	18	10	كلية العلوم بالإسماعيلية	11
0	0	0	0	6	0	2	6	كلية التجارة بالسويس	12
0	5	5	0	6	0	11	6	كلية التجارة بالإسماعيلية	13
0	0	0	0	4	0	8	4	كلية التعليم الصناعى	14
0	9	9	0	5	33	0	5	كلية العلوم السويس	15
0	3	3	0	18	3	24	18	كلية التربية بالسويس	16
0	0	0	0	26	2	26	26	كلية التربية بالإسماعيلية	17
0	0	0	0	34	2	19	34	كلية التربية بالعريش	18
0	28	28	0	11	0	0	11	علوم زراعية العريش	19
0	0	0	0	7	6	6	7	هندسة الإسماعيلية	20
0	0	0	0	2	0	0	2	كلية الثروة السمكية	21

Strategic Planning;

1.providing the global climate data.

2.Assess the vulnerabilities of climate change impacts.

Decision-Making;

1.Ascertain which types of decisions require or warrant the incorporation of climate change considerations.

2.Identify the key people whose participation is essential for the successful implementation of the climate change program.

3.Provide guidance on optimal ways to incorporate climate change considerations into critical decision-making.

4.key stakeholders to catalyze the key decisions relative to mitigating and/or adapting to climate change.

SETTING THE CONTEXT

Describe the situation in terms of policies and practices related to climate change and sustainability policy curricula as well as professional development (capacity building) at your university prior to initiation of the CLIMASP project.

Dealing with problems of environmental, economic and social concern emphasis is placed on developing learners' interdisciplinary and action competence to participate actively in building more sustainable futures. Higher education is called to play a critical role in this process. This paper deals with a European Commission funded programme CLIMASP that aims to develop interdisciplinary minors in climate change and sustainability policy in 10 Middle-Eastern universities. In this chapter, we present the results of the pre-test and post-test surveys that were carried out during the piloting phase in the spring semester of 2014–2015 academic year. Our aim was both to test reliability and validity of learning models as well as to examine possible changes during the implementation process. The statistical analyses show that the instruments are reliable, although improvement and enrichment is possible as well as increased changes experienced by students at the end of the piloting courses.

THE CLIMASP CASE DESCRIPTION

Provide a detailed overview of the CLIMASP project/experience. Suggested coverage includes:

1. Determining CLIMASP Competencies Suez Canal University Development of Interdisciplinary Program on Climate Change and Sustainability Policy-CLIMASP Development of Interdisciplinary Program on Climate Change and Sustainability Policy.
2. A competency is... A competency is a combination of knowledge, skills, abilities and behaviors which, when acquired, allows individuals to perform a task or function at a specifically defined level of proficiency. A competency is... A functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving.
3. In determining CLIMASP competencies, our mission is to use innovative educational approaches to; 1. Help students understand, address, mitigate, and adapt to the impacts of climate change. 2.Encourage the changes in attitudes and behaviors needed to put our world on a more sustainable development path, and 3.Build a new generation of climate change-aware citizens.
4. Key action areas; 1.Provision of guidance and resources to mainstream climate change into curricula. 2. Preparation of country-based reviews and case studies. 3. Facilitating regional and inter-regional dialogue on climate change education. Expected outcomes; Climate change education for sustainable development will be integrated into curriculum frameworks.
5. Promoting lasting change toward sustainability through education requires that; 1.Teachers' attitudes, motivation and skills contribute fully to the effort. 2.Teachers understand the implications of such change. 3.Recognize the need for change. 4.Have the competence and confidence to introduce it into their classroom teaching. Role of teachers and other educational personnel;

6. Core Competencies; The following sets of knowledge, experience, and skills encompass the most comprehensive set of competencies to be addressed in CLIMASP;

1.Foundational knowledge and skills include climate science literacy and environmental literacy.
2.Knowledge and experience in strategic planning, decision-making and risk management.
3.Strategic execution competencies such as helping to mitigate risk and engaging stakeholders.

7. Science Literacy;

1.Possess an understanding of climate change with a sound basis in climate science.
2.Engage others in obtaining credible information on climate-related opportunities and risks related.
3.Apply systems thinking to identify opportunities and risks and to address potential challenges posed by climate disruption. Environmental and Economic Literacy;
1.Identify the impact of climate change on the availability of natural resources of strategic importance.
2.Maintain up-to-date knowledge of current trends seen in the impacts of climate change.
3.Identify adaptation strategies for ecosystem impacts resulting from climate change.

Achievements

In detail, describe the outcomes of the CLIMASP project in your university, providing facts about all the phases and the final study programme.

"Courses Mapped to be Considered in the CLIMASP Program with Short Description of Each Suez Canal University Development of Interdisciplinary Program on Climate."

CONCENTRATION AREAS

1. **Climate Change, Environment and Society**
2. Climate Change, Economics and Public Policy. And
3. Climate Change, Sciences and Technology.

1st Semister 2015-2016

Courses Name:

1. Wildlife Conservation and Responses to Climate Change
2. Species Extinction crisis & Climate Change
3. Biodiversity, Nature Resources Sustainability and Climate Change
4. Protected Areas, Biosphere Reserves Management and Climate Change

2nd st Semister

Suggested Course Name:

5. Conservation Medicine & Climate Change

The results up till now include a list of 5 courses that have been reoriented to be used in the CLIMASP minor in Veterinary Medicine- Department of Wildlife Conservation. Furthermore, 4 other courses are currently in a Pilot phase in order to assess their impact.

1. **Core Courses: Concentration Area (Climate Change, Environment, Society)**

No	Faculty	Concentration Area (Climate Change, Environment, Society)	Course Name	Course Description
1	Veterinary Medicine	1	**Wildlife Conservation and Responses to Climate Change**	This course aims to give you an understanding of the ways to conserve wildlife and better management and the role of governments to address environmental issues such as climate change adaptation and mitigation , conservation, and management, Disaster management . It discusses the role of government and other interest groups in formulating Wildlife Conservation policy and law enforcement through outlining and applying key principles used to do so.
2	Veterinary Medicine	1	**Species Extinction crisis & Climate Change**	The course provides an overview for the participants to get a clear understanding on the concept of protected areas and Biosphere Reserves, and also learn about some good practices in marine and terrestrial protected area management. Participants also get an overview of the protected area

				management in Egypt.
3		1	**Biodiversity, Nature Resources Sustainability and Climate Change**	The course provides an overview on "biodiversity", mainly from a natural scientific point of view, to qualify students to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy. Basic biological facts relevant in the context of biodiversity will be discussed as well as methods, all in the context of value of organisms for ecosystem functioning and sustainable use by humans. A main goal is creation of understanding of complexity of organisms' roles and interactions. Working out of case examples provides training for literature searches and presentations. Changes of biodiversity due to human impacts, including alien species and global change, will be considered at various levels.
4		1	**Protected Areas, Biosphere Reserves Management and Climate Change**	The course provides an overview for the participants get a clear understanding on the concept of protected areas and Biosphere

				Reserves, and also learn about some good practices in marine and terrestrial protected area management. Participants also get an overview of the protected area management in Egypt.
5		1	**Conservation Medicine & Climate Change**	The course has the following goals**:** •Understanding how Ecological Systems, altered by human activities, are "drivers" of emerging diseases •To understand the ways in which host, agent and environmental interactions influence the transmission of Wildlife infectious agents. •Studying Contemporary Environmental Issues to see how systems are altered •Familiarity with the principles of epidemiology (the study of disease on the population level) • Using epidemiology to research specific emerging diseases

II. Capstone Course: Research Project in Climate Change and Sustainability Policy (Early Warning System application in Suez Canal Governorates to Assess and Mitigate the Environmental Hazards Induced by Climate Change).

III. Elective courses

CONCENTRATION AREA 1: Climate Change, Environment and Society	**Environmental Impact Assessment (EIA)**	**Climate Change**	**Environmental Awareness**	**Environmental Stability**
CONCENTRATION AREA 2: Climate Change, Economics and Public Policy	**Environmental Legislation and Policy**	**Environmental Sociology**	**Sustainable Nature Resources**	**Sustainable Conservation**

Challenges faced during the CLIMASP project

In detail, describe some of the challenges and problems that your university faced at the completion of the CLIMASP project/experience. Furthermore, it would be helpful to the reader if you describe the current status of the aforementioned challenges and problems in relation to CLIMASP.

1. There is a need of additional training materials for enhancing your knowledge and skills in implementing and assessing the CLIMASP minor programme
2. There is a need to develop a MSc degree at Suez Canal University
3. The project communication, and this almost always leads to problems further down the line. We need to start off by making this a priority and then keeping it in mind all the way through to the end of the project. If you genuinely don't think you will have time for this then you could think about assigning the role of communications officer to one of the team.
4. Higher Education should plays a critical role in contributing to climate change-neutral and sustainable society and help in dissemination of Climate change and sustainable policy to all high education institutions in Egypt.

1. **Solutions**

Discuss how you tackled these challenges and provide recommendations in dealing with the issues, controversies, or problems presented in the preceding section.

2. The world's climate is rapidly changing due to global warming, and will continue to do so for the decades and centuries ahead. This poses major challenges for future agricultural systems to provide food and other bioresources for the nine billion people that will occupy the planet by 2050.

We need to develop a postgraduate degree (MSc) in Climate Change, sustainable agriculture and food security.

3. **Risk Management;** 1.Apply the climate change perspective to the risk management programs. 2.Compile necessary data for the relevant climate change considerations to be incorporated into the compliance and enterprise risk management programs. Risk Mitigation and Engaging Stakeholders; 1.Perform economic risk assessments of climate change impacts. 2.Demonstrate to stakeholders the strategy for addressing climate risks through risk mitigation plans and actions. 3.Address the climate-related risks stakeholders through risk mitigation plans and actions. 4.Ensure that risk mitigation plans are articulated and executed.

Exploitation and Dissemination

Discuss the exploitation and dissemination of the CLIMASP Minor in your university, giving information about the functions of the Euro-Arab Center for Interdiscplinary Studies and CLIMASP, the ICT Lab, the EuroArab pass diploma and how it will be handled through the Center. Provide also insight about the future of the CLIMASP Minor and its impact on the university and the local society.

Strengthen the Strategic Goals of Euro-Arab Center of Interdisciplinary Studies, Climate Change and Sustainability Policy at Suez Canal University

Center objectives:

- The center will generally help SCU graduate qualified and resourceful students who will be more capable of finding suitable responses to various challenges. This can be accomplished, at least partially, by supporting interdisciplinary courses and providing resources necessary to study and discuss sustainable development and climate change along with the other challenges at the local, regional and global levels.
- Facilitate more effective, nontraditional education techniques
- Facilitate communication and cooperation and promote dialogue among scholars and students in various institutions and across the globe.
- Establish an institutional framework for providing advice and capacity building in developing and revising courses and programs, especially those related to sustainable development and climate change.

develop into a renowned source of information and advice for various stakeholders including policy-makers about issues related to sustainable development and climate change

Values

The CLIMASP minor consists of core courses, elective courses and the required capstone course in three concentration areas: 1) Climate Change, Environment and Society; 2) Climate Change, Economics and Public Policy; and 3) Climate Change, Science and Technology. The courses included in the

CLIMASP minor are an integral part of the participating disciplines curricula. It is, thus, an advantage for students seeking a meaningful and rewarding complement to their main field of study. Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma ranges from 45-60 ECTS. The CLIMASP minor program is administrated by the Euro-Arab Center for Interdisciplinary Studies and promotes five key learning processes and outcomes. We have made a selection of SCU's core values to accentuate the ones most important to the center.

- **Truth and Knowledge** – To honor the pursuit of truth in all its manifestations by any ethical method, especially through the integration of knowledge across disciplines, and the imaginative and creative exploration of new ideas.
- **Collaboration –** To work as teams and collaborate with international institutions to extend educational opportunity, enhance knowledge exchange, and enrich intellectual discourse, quality of education, and research.
- **Civic Engagement –** To devote adequate resources and energies that create a supportive and productive community serving the citizens of Jordan and, where appropriate, extending to the region and the world.
- **Sustainability –** To intelligently apply the best scientific and ethical principles for the care and sustainability of natural resources in view of environmental changes, especially climate change
- **Responsibility and Merit –** To practice ethical judgment on the basis of equity, merit and moral principles and nurture responsible citizenship.
- **Quality –** To maintain an inspiring, encouraging and rewarding center as the basis for steady and enlightened progress.

CLIMASP DISSEMINATION ACTIVITIES					
Name of CLIMASP Partner					
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Student Field Visit to Ashtum El Gamil Protected area	25/10/2015	Port Said	Student Dissemination	To assess the current status of the protected areas and the impact of Climate change *SLR, Drought, others.
2	Review Article	10/1/2016	SCU, Faculty of Veterinary Medicine	Student assignment	To highlight on the Impacts of climate change on Biodiversity
3	Review Article	3/2/2016	SCU, Faculty of Veterinary Medicine	Students assignment	To highlight on on Biodiversity, Climate change and

					Sustainability.
4	Presentation	1/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Protected Areas & Biosphere Reserves and Climate Change: Role & Challenges
5	Presentation	7/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Biodiversity Conservation & Climate Change Impacts and Sustainability
6	Student Field visit to African Safari Park	19/3/2016	Cairo-Alexandria Desert Road	Student dissemination	To know how the wild animals accommodate to desert environment and drought
7	Regional African Research and innovation Conference with cooperation African Union	24-26/4 /2016	National Research Center, Doki, Egypt	Instructor dissemination	To highlight on the Climate Change & Sustainable Development in AFRICA
8	The African Mistrial Conference on the Environmernt- 6th Special session	16-19/4/2016	Dussit Hotel, Cairo	Instructor (Expert) Dissemination	1. Implementation of the 2030 Agenda for sustainable development and SDGs in Africa 2. The African Adaptation Initiative 3. African Strategy on combating illegal trade in wild fauna and flora
9	Egyptian Third National Communication (UNFCCC)	March 2016	EEAA	Instructor contribution (Expert) Dissemination	

* Any type of event such as training workshop, meetings, website, media/press releases, briefings, mailing lists, newsletters, etc.

** To whom the event was addressed?

*** Describe shortly what has been achieved, giving quantitative and qualitative information.

LIST OF SCIENTIFIC PUBLICATIONS				
No	**Title of publication**	**Author(s)**	**Title of periodical/proceedings/book**	**Vol., No., Pages, Year, Publisher/Editors**
1	Role of protected Areas in Conservation and sustainability in Arab Countries	Prof. Dr. Atef Mohamed Kamel Ahmed	Quarterly Periodical Egypt MAB Bulletin Egyptian National MAB Committee for Man and Biosphere Programme (MAB)	Volume 1,2 (292 pages), 2014
2	Egyptian Third National Communication (UNFCCC)	Prof. Dr. Atef Mohamed Kamel Ahmed (Contribution incapacity building, Institutional and Technical Needs	Vulnerability to Climate change- (Biodiversity)	Egypt National Climate Change Strategy 2016

CONCLUSION

Provide discussion of the overall coverage of the CLIMASP case study and concluding remarks.

The Climate Change and Sustainability Policy (CLIMASP) minor at the Suez Canal University in Egypt is an interdisciplinary programme funded by the European Commission Tempus under the coordination of the UNESCO Chair ICT in Education for Sustainable Development, University of Crete, Greece. Students from different study areas choosing the CLIMASP minor as a complement of their major opens to them new opportunities for further studies and career paths.
The CLIMASP minor consists of core courses, elective courses and the required capstone course in three concentration areas: 1) Climate Change, Environment and Society; 2) Climate Change, Economics and Public Policy; and 3) Climate Change, Science and Technology. The courses included in the CLIMASP minor are an integral part of the participating disciplines curricula. It is, thus, an advantage for students seeking a meaningful and rewarding complement to their main field of study. Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma ranges from 45-60 ECTS.
The CLIMASP minor programme is administrated by the "Euro-Arab Center for Interdisciplinary Studies" which is part of the SCU's Center for Training and Consultation. The program promotes five key learning processes and outcomes:

1. Increase creativity, critical thinking, communication, and collaboration. In addition, students will be prepared to grasp the skills of connectivity, critical consciousness, critical reflection, cross/inter-cultural competence, co-responsibility and constructing knowledge. All these skills are being highly recognized as the skills that CLIMASP students should be prepared for tackling the complexity of climate change and sustainability policy.
2. The increased complexity of the climate change and sustainability policy challenges drives us in preparing our students to become inquirers, problem solvers, critical and creative thinkers. The CLIMASP minor provides our students with improved strategies to help them deal with these very complex situations. Problem-based learning (PBL) is one such strategy that is employed throughout the CLIMASP curriculum and teaching methods.
3. Applying a values-based and PBL approach, the CLIMASP minor prepares students to comprehend and further explore the intersections of science, ethics, values, climate change and sustainability policy.
4. Transformative learning in a climate change context involves climate risk negotiation, identification of vulnerabilities, and both proactive and reactive adaptation. The CLIMASP minor prepares students to learn how to transformative adapt to the climate change vulnerabilities by seeking out relationships that potentially will help them deconstruct their frames of reference, habits of mind, and unsustainable practices.
5. The CLIMASP curriculum blends classroom learning with experiential, constructivist and transformative practices, incorporating critical self-reflection, argumentation, community service, civic engagement and practicum placements. It adopts a critical pedagogy of sustainability that involves inter- and trans-disciplinary engagement with students and community members in an effort to involve students in the process of sustainable thinking and action. In that way, it helps students experience the synergies of the 3Hs- head (cognition), heart (ethics and sentiment) and hand (praxis).

Acknowledgement

This work has been developed within the framework of the CLIMASP (Development of an interdisciplinary programme on climate change and sustainability policy) project that has been funded from the European Commission (543879-TEMPUS-1-2013-GR-TEMPUS-JPCR). The content of the paper reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

We would like to show our gratitude **Prof. Dr. Vassilios Makrakis, Project Coordinator, Director of RCE Crete** for giving us a good guideline for Project instructions throughout numerous consultations in CLIMASP. We would also like to expand our deepest gratitude to all those who have shared directly and indirectly this project and peer reviewers who guided us in preparation of core, Capstone and elective courses.

REFERENCES

References should relate only to the material you actually cited within your case study. References should be in APA style and listed in alphabetical order.

LIST OF SCIENTIFIC PUBLICATIONS

No	Title of publication	Author(s)	Title of periodical/proceedings/book	Vol., No., Pages, Year, Publisher/Editors
1	Role of protected Areas in Conservation and sustainability in Arab Countries	Prof. Dr. Atef Mohamed Kamel Ahmed	Quarterly Periodical Egypt MAB Bulletin Egyptian National MAB Committee for Man and Biosphere Programme (MAB)	Volume 1,2 (292 pages), 2014
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Figures/Images:

It is very important to provide illustrations in the form of figures and images. All images must be included as separate .tif files, NOT included within the text of your case. Please include captions within the text of your case to indicate where images should be placed.

1. CLIMASP Regional meeting




AUM



2. Student field work visit and dissemination

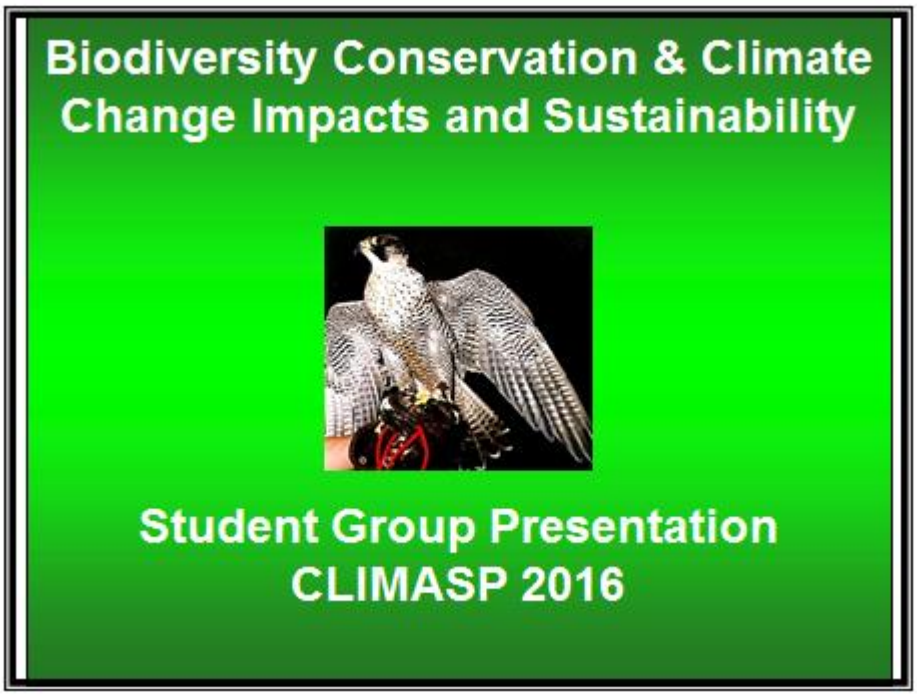


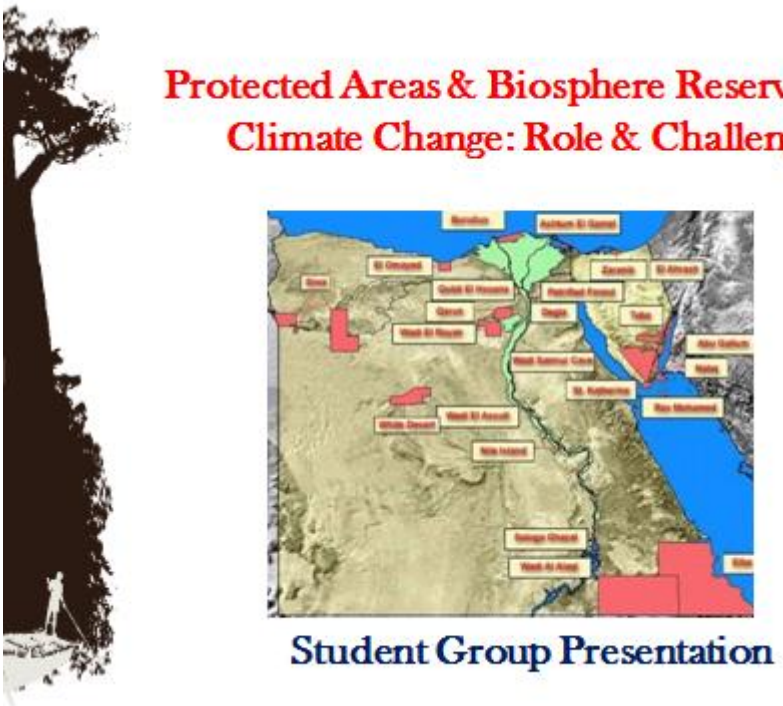




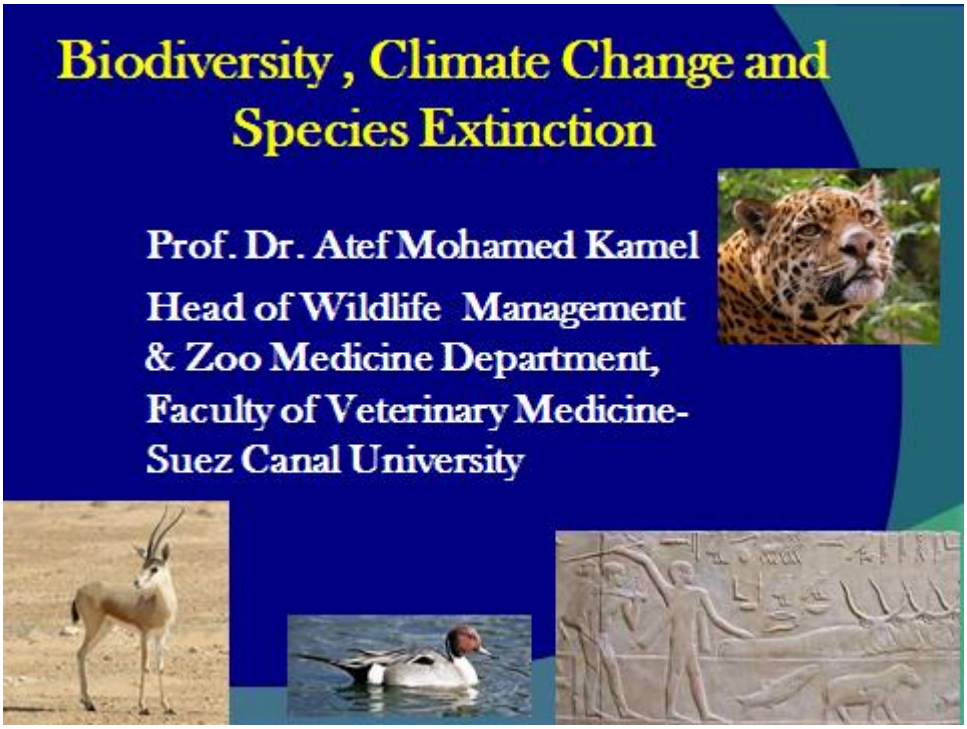


3. Student Group presentation

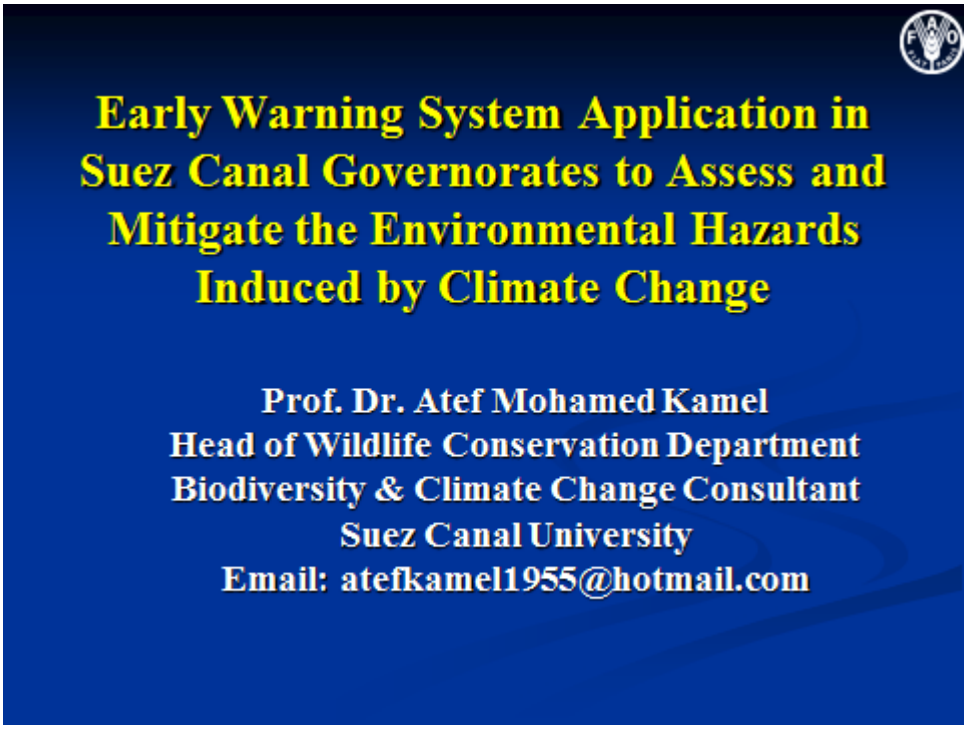




4. Student Dissemination (Faculty presentation)



5. Scientific Research Project "Early Warning System application in Suez Canal Governorates to Assess and Mitigate the Environmental Hazards Induced by Climate Change" Prof. Dr. Atef Mohamed Kamel (Project PI and Coordinator (UNESCO, Paris).



Project Team:



Research Project in Climate Change and Sustainability Policy (Early Warning System application in Suez Canal Governorates to Assess and Mitigate the Environmental Hazards Induced by Climate Change).



Map.1. Locations of Study Sites at Suez Canal Governorates

Nehal L. Khalil, PhD

Educational psychology Dept., Faculty of Education

Suez Canal University

INTRODUCTION

CLIMASP is a European Commission TEMPUS funded project entitled “Development of an Interdisciplinary Programme in Climate Change and Sustainability Policy”. It is designed and implemented across 10 universities in Egypt, Jordan and Lebanon. The CLIMASP project is coordinated by the University Of Crete, Greece through its UNESCO Chair ICT in Education for Sustainable Development. The objective of the current case study is to highlight the experience of designing, creating and implementing the CLIMPAS minor within Suez Canal University.

Main Objective

The main focus of the CLIMASP is to address the issue of climate change and sustainability policy from an environmental, social, economic, cultural and political perspective, with regional reference, through transforming the current unsustainable practices that prevent interdisciplinary collaboration and promote interdisciplinary curricula in the partner countries universities.

Specific objectives

1- Develop capacity-building workshops for training university teaching staff for building interdisciplinary climate change curricula responsive to societal needs.
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3- Integrate, implement and assess the CLIMASP program as an integral part to existing undergraduate academic degrees/certificates.
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• Enrich your major study programmes.

• Add depth and breadth to your studies.

• Chance for future postgraduate studies (MSc) in Climate Change and other fields.

University background

The history of Suez Canal University dates back to 1976 when the university was established after 1973 war by the presidential decree no. 93 for 1976. The main objective of establishing the university is to rebuild the Canal community after being devastated and the people were evacuated.

Study began in 1977 in six faculties; namely, the faculty of science, the faculty of agriculture, the faculty of commerce, the faculty of engineering and technology (in Port Said) and the faculty of education (in Suez). In the 1980s and 1990s, steady expansion in the university has been going on with a new faculty opening its doors almost every year. Today, there are 49588 students registered at the university studying in more than twenty faculties distributed in more than six Branches located in Ismailia, Port Said, and Suez and El-Arish. Two more faculties, one for arts and humanities and the other for fish, are to be established soon. The number of senior staff members today exceeds 1497 assisted by 1485 junior staff, members teaching to more than 74097 at the undergraduate level. Till now, 87500 students have received their first degree from the university, in addition to 15082 who have received different graduate degrees.

As for the administration, the university employs more than 6481 employees in 25 central directorates shouldering the administrative work in collaboration with the university and faculty administrations.

SCU has 15 faculties:

- Faculty Of Medicine
- Faculty Of Science
- Faculty Of Education
- Faculty Of Commerce
- Faculty Of Humanities& Arts
- Faculty Of Engineering
- Faculty Of Agriculture
- Faculty Of Pharmacy
- Faculty Of Nursing
- Faculty Of Dentistry
- Faculty Of Veterinary
- Faculty Of Tourism And Hotels
- Faculty Of Computers And Information

This year 2016 two more faculties were approved by the supreme council of higher education to start registering students in the academic year 2016-2017; the faculty of languages and the faculty of physical education.

University Vision:

Suez Canal University is looking forward to occupy a prominent place among higher education institutions based on its contribution to university education development and its interaction with its community through pioneering research associated with its community.

So, community is the focus of Suez Canal University's vision; links has always been made between theory and practice to raise the wellbeing of the whole community served by SCU.

University Mission:

"We are university heading for its community aims to provide opportunities to its student for learning and education which capable of competition and provide work opportunities in its wide field at globalization era responding its community needs and eager to develop values within it without compromised to abandon our identity".

It is noticed that SCU' mission highly relates to sustainability and its pillars; providing equal opportunities for effective learning during globalization era, responding to community needs, developing values and reserving identity all relates to environmental, social, economic and cultural pillars of sustainability.

Based on SCU orientation towards community needs, and its aim to enforce the university achievements on the national, regional, and international levels, SCU represented by different faculties members, has taken part in many projects that address community's needs and enhance decision makers' ability to take informed decisions based on the results and recommendations of these projects.

University Objectives:

9. To ensure the quality of outputs, activities and processes of the university.
10. To create new scientific programs for graduate and postgraduate studies.
11. Enforce the university achievements on the national, regional, and international levels.
12. To switch to the electronic administration governance and to increase the potential of excellence present in the university.
13. To maximize the utilization of learning resources and information.
14. To Increase the collaboration between SCU and the international centres of Excellence.
15. To Innovate new modalities of learning and teaching.
16. To Increase the capacity for students without compromising the quality.

Sustainable development in Suez Canal University

Suez Canal University is actively addressing sustainable development in different activities and projects. The faculty of education participated in two Tempus projects that paved the way to Climasp to be a success story; the first is RUCAS (reorient university curricula to address sustainability) and the second is EduCamp (education for sustainable development beyond campus).

In RUCAS (2010-2013), three faculties were involved in the process of reorienting courses to address sustainability, namely; faculty of education, faculty of arts and humanities and faculty of agriculture.

A total of twenty seven courses were reoriented in terms of content and teaching methodologies. The total number of students who studies the reoriented courses was **2337 students** in undergraduate and post graduate levels. Those students participated in different activities that reflected what they learned about sustainable development.

A center of excellence (Education for Sustainable Development, RUCAS) was established and equipped in the faculty of education and continues providing counseling based on past experiences to all SCU staff members who wish to infuse sustainable development in their courses.

Teaching the reoriented courses in the post graduate level resulted in four registrations for Master degree in education for sustainable development which was not addressed before in the faculty of education.

Some scientific publications were done based on RUCAS case studies (Khalil, 2012, Khalil, 2015, El-Deghaidy, 2012). An electronic book was created to document all the case studies and best practices in all the partner universities during the three years of the project.

In Educamp (2010-2013) five staff members from the faculty of education in SCU were trained in four EU universities for almost 300 hours to be trainers of trainers in the field of education for sustainable development.

EduCamp project commenced in October 2010 and was carried out over a period of three years. It involved three consecutive phases: first, producing school kits on sustainable development, energy, water, agriculture and biodiversity to enhance the existing curriculum based on a needs analysis; second, training school teachers on the newly developed kits at one of seven centres of excellence in education for sustainable development and integrating student-focused approaches such as: debates; games and experiments; and finally, pilot implementation in grades five to nine in public schools across seven different governorates, which were twinned with partner universities. The project also involved analysing public school textbooks in terms of content on sustainability.

The trainers from SCU as well as the training material (kits) were accredited by the National Authority for Quality Assurance and Accreditation in Education (NAQAAE). Now the centre of excellence of ESD in SCU trains teachers from government schools in Ismailia to infuse activities related to SD in their teaching.

SCU strategic plan (2013-2023)

Suez Canal University has been organizing several seminars and projects related to sustainability issues and conserving the environment.

Based on previous efforts related to SD, climate change and other environment issues, Suez Canal University developed its ten-year strategic plan that dedicated one of its basic aims to the "Protection, Preservation and Development of Natural Resources in Suez Canal Region and Sinai".

This main aim stated sub-themes such as:

- Epidemics, Environmental Pollution and Climate Changes

- Climate and Environmental Changes and their Effects on Plants and Productivity of Agricultural Crops.

This achievement was the effort of some of the CLIMASP team members who participated in the drafting of the research plan for the University

Suez Canal University is also a partner in the United Nation Sustainable Development goals (SDGs) and it aims at the environmental conservation for sustainable urban and rural development

Its ultimate aim is to enhance and conserve ecosystems and habitats in a sustainable base through the following:

- Inclusion of environmental studies (Climate Change and Sustainable policy) in Suez Canal University curricula in undergraduate and postgraduate studies.
- Organizing Sustainable Development & Climate change outreach programs for neighboring communities all over Suez Canal Region.
- Participation in regional partnership for sustainable development (some of SCU staff members are Members in the Mediterranean network for sustainable development).
- Development of students awareness programs, competitions and projects (United Nation, 2016)

THE CLIMASP CASE DESCRIPTION

Developing Climasp minor went through many stages that will be covered in the following subheadings:

1- Stakeholders'' survey

At the first stage of Climasp, it was required to meet as many stakeholders as possible to get their input and recommendations related to the minor and the type of knowledge and skills required for the marketplace.

At this point the stakeholders' survey was administered with twenty three persons representing:

- University students
- University staff members
- Ministry of environmental affairs
- Ministry of education
- Ministry of industry
- Local municipals
- Private sector

University students are considered a good source of information when it comes to stakeholders; they are the ones who will choose to study for the minor and commit to the required workload. Climasp staff members interviewed 120 students from three faculties (Education, Agriculture, Arts and humanities).

One unique result of interviewing university students is that 83% of the sample confirmed that climate change is happening while 17% didn't believe it is happening. Another alarming

result, 89% of those who want to know more about climate change never heard about it in the university!

These initial results give indication that projects such as Climasp are needed at the university level to raise students' awareness of this urgent issue.

After collecting data from the interviews with various stakeholders, the collected data were analysed to reach consensus regarding the recommended knowledge and skills related to climate change and the best ways to practice the suggested skills. The main topics and skills were then shared with the staff members in SCU to guide the process of infusing climate change in their courses.

2- Mapping the courses for the minor

Mapping the courses for the minor was the main scope of the first regional workshop that was held in Amman, Jordan (October 2014).

Insert pic 9

Each university came up with a suggested list of different courses from varied faculties that covers climate change from three main areas of concentrations:

- Climate change, environment and society
- Climate change, science and technology
- Climate change economics and public policy

Suez Canal University Climasp team till the academic year 2016-2017 involves seven faculties; namely:

1- faculty of education (two staff members)
2- faculty of engineering (two staff members)
3- faculty of agriculture (three staff members)
4- faculty of science (one staff member)
5- faculty of arts& humanities (three staff members)
6- faculty of vet medicine (one staff member)
7- faculty of tourism (two staff members)

SCU Climasp team who participate in revising the courses and teaching them till 2016 consists of fourteen staff members and new members are showing interest in joining the process.

The Climate Change and Sustainability Policy (CLIMASP) minor at the Suez Canal University in Egypt is an interdisciplinary programme. Students from different study areas choosing the CLIMASP minor as a complement of their major opens to them new opportunities for further studies and career paths.

The CLIMASP minor consists of three core courses, elective courses (twelve in each concentration) and the required capstone course.

The courses included in the CLIMASP minor are an integral part of the participating disciplines curricula. It is, thus, an advantage for students seeking a meaningful and

rewarding complement to their main field of study. Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma ranges from 45-60 ECTS.

The CLIMASP minor programme is administrated by the "Euro-Arab Center for Interdisciplinary Studies" which is part of the SCU's Center for community service. The program promotes five key learning processes and outcomes:

6. Increase creativity, critical thinking, communication, and collaboration. In addition, students will be prepared to grasp the skills of connectivity, critical consciousness, critical reflection, cross/inter-cultural competence, co-responsibility and constructing knowledge. All these skills are being highly recognized as the skills that CLIMASP students should be prepared for tackling the complexity of climate change and sustainability policy.
7. The increased complexity of the climate change and sustainability policy challenges drives us in preparing our students to become inquirers, problem solvers, critical and creative thinkers. The CLIMASP minor provides our students with improved strategies to help them deal with these very complex situations. Problem-based learning (PBL) is one such strategy that is employed throughout the CLIMASP curriculum and teaching methods.
8. Applying a values-based and PBL approach, the CLIMASP minor prepares students to comprehend and further explore the intersections of science, ethics, values, climate change and sustainability policy.
9. Transformative learning in a climate change context involves climate risk negotiation, identification of vulnerabilities, and both proactive and reactive adaptation. The CLIMASP minor prepares students to learn how to transformative adapt to the climate change vulnerabilities by seeking out relationships that potentially will help them deconstruct their frames of reference, habits of mind, and unsustainable practices.
10. The CLIMASP curriculum blends classroom learning with experiential, constructivist and transformative practices, incorporating critical self-reflection, argumentation, community service, civic engagement and practicum placements. It adopts a critical pedagogy of sustainability that involves inter- and trans-disciplinary engagement with students and community members in an effort to involve students in the process of sustainable thinking and action. In that way, it helps students experience the synergies of the 3Hs- head (cognition), heart (ethics and sentiment) and hand (praxis).

3- The process of peer review

After mapping the courses from different faculties from Suez Canal University, staff members started the process of developing the course description and the course modules based on a tool provided by professor Makrakis.

Suez Canal University was responsible for reviewing the courses provided by Jerash University, (JU). The results of the peer review process were presented in the first regional workshop that was held in Amman (24-27 October, 2014).

In total JU provided thirty courses; five courses in the concentration of climate change and society, twelve courses in the concentration of climate change and economy& policy, and thirteen courses in the concentration of climate change and science& technology.

Some general remarks were provided based on the rubrics of the peer reviewing process;

1- Most of the reviewed courses did not state basic information about the course name, number, instructor, lecture timing, place and contact info of the instructor.
2- Some courses didn't use measurable action verbs in the objectives of the course.
3- Some courses didn't elaborate on teaching methodologies used while teaching the course.
4- Sometimes the alignment between the course objectives and the assessment methods is not clear.
5- In most cases the interdisciplinary approach is not clearly stated.
6- Activities for students as agents of change are not adequately covered.
7- The relation between courses' activities and the local community is not stressed.

Some suggestions for enhancement were provided;

1- Rubrics should be provided to align course objectives, teaching methodologies, assessment techniques and students activities.
2- Add more courses to the Social concentration of climate change.
3- Values related to climate change should be integrated in the reoriented courses in a more comprehensive way.
4- Civic engagement should be reflected in teaching methodologies (community-based learning, service-based learning, and project-based learning).

Courses from Suez Canal University were provided in two languages; the courses in English were reviewed by Leuphana University of Lüneburg in Germany (22 courses) and the courses in Arabic were reviewed by Port Said University (PSU), Egypt (10 courses).

During the first regional workshop held in Amman, SCU received feedback and suggestions for enhancement.

4- Developing the minor study plan

After mapping and revising the courses, they were categorized by concentration area, twelve courses in each concentration, in addition to three core courses and two capstone courses.

The total numbers of offered courses is 41 courses, from which students can choose what equals 50 ECTS.

In addition to the courses, students enrolled in the minor will take free trainings that develop their abilities to enhance employability:

- How to write a CV
- How to conduct a successful interview
- How to write a motivation letter
- Time management skills
- Effective communication
- How to develop a good presentation

5- Pilot phase

In the pilot phase of implementing the minor study plan, students were asked about their prior knowledge of climate change and sustainability. Students were to provide the number of courses they studied and covered climate change and sustainability.

The following chart shows their responses.

Insert chart1

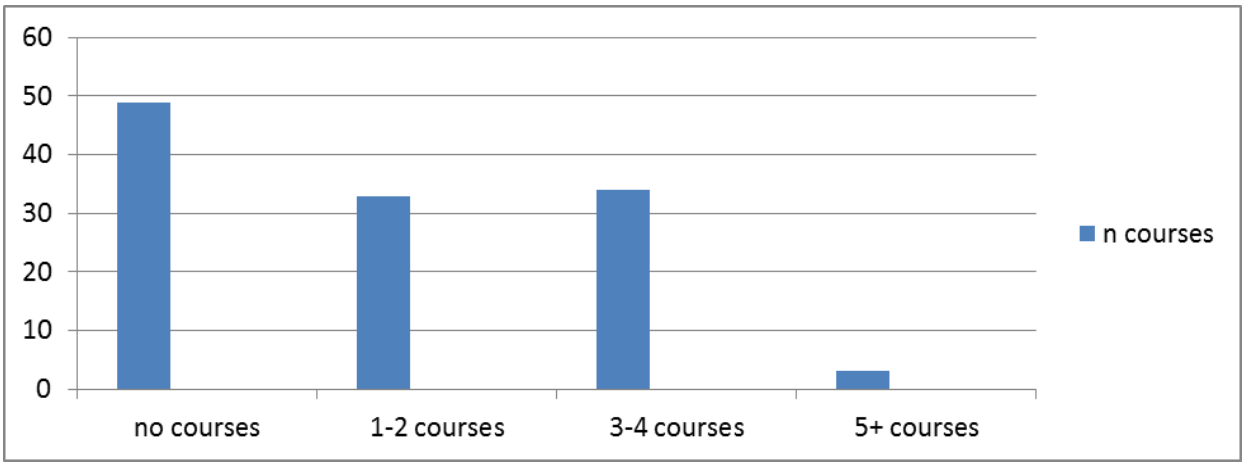


Chart 1, students' reported n of courses covered climate change and sustainability

Qualitative analysis is also used to evaluate the pilot phase. In depth interviews were carried out with students from the faculty of education& faculty of arts and humanities, in addition to three focus group discussions with students from the faculties of Education, Agriculture, and Arts& humanities.

General remarks on the implementation of the pilot phase

- Students reported gain of knowledge in climate change and sustainability.
- Some Students favored the interdisciplinary approach while others perceived it as extra effort and burden.
- Students who scored high in the questionnaire items stated that most of the abilities and skills they have is attributed to their work experience not the university curricula.
- Students are still confused and uncertain of the outcome of the minor in terms of employability.

6- External review

After revising the courses based on the feedback received from the peer reviewers, courses were sent to the external evaluator from Dublin City University.

SCU received suggestions to enhance the course content. Each staff member revised the content of his/her course and performed the suggested enhancements.

The final stage of revising the courses is done by the University of Padua in Italy. SCU staff members met the external evaluator during the second regional workshop held in Cyprus (4-8 May 2016), where they discussed the required changes and fields of improvements.

7- Implementation phase

The implementation phase started in the second semester of the academic year 2015-2016, *172 students* filled in applications to join the minor.

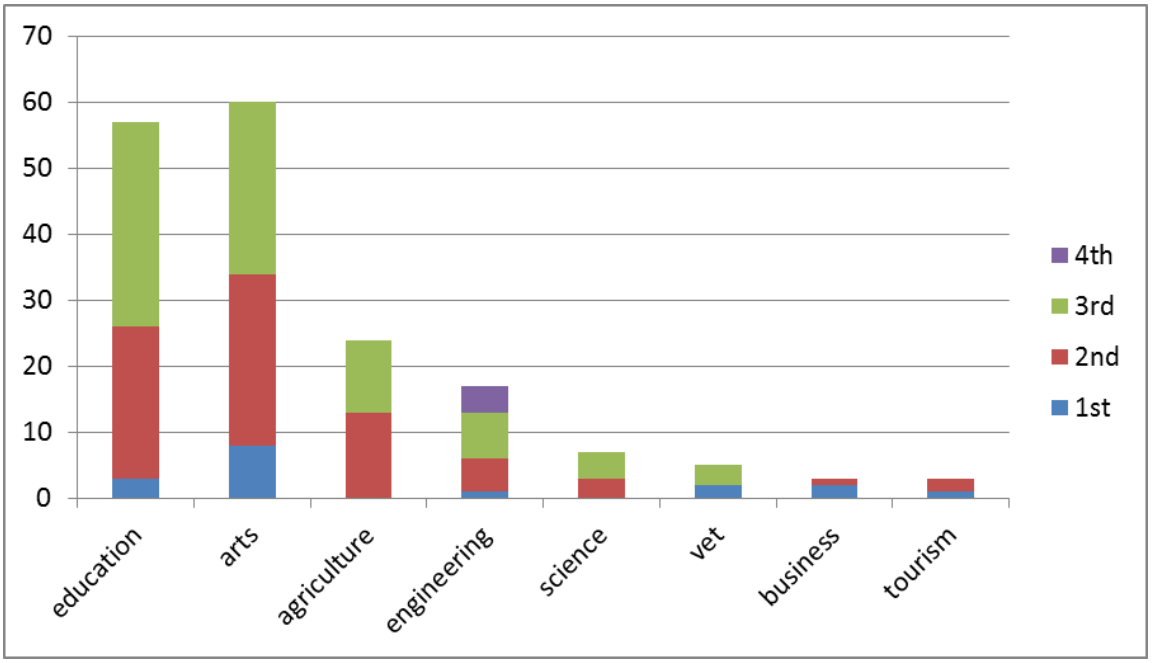


Chart 2, Numbers of students who filled in applications to join the minor studying

A good indicator of active students' commitment to the minor is the number of students who enrolled in courses not in their study program in the faculty. From the students who registered for the minor, seventeen enrolled and committed to the course readings in English (offered by the faculty of education) and three students enrolled in biology course (offered by the faculty of agriculture).

Table 1, Courses offered in SCU during spring semester 2016 (classified by concentration)

Concentration area	faculty	Course title	Number of students
CC, environment& society	Education Arts& humanities Engineering	Readings in English Environmental sociology Urban studies& humanities	47 120 14
CC, science & technology	Agriculture Engineering Engineering	biology Architecture design (studio-6) Environmental control in architecture	13 9 14
CC, economics& public policy	Vet medicine Agriculture Tourism& hotel management	Protected areas & climate change Production of horticulture crops Tourism planning	41 18 23

Challenges faced during the CLIMASP project

There were a number of challenges such as:

- Changing administration like some deans of the faculties involved in Climasp as well as the vice president of post graduate studies and research.
- Not many students were committed to filling in the questionnaires before and after implementing the courses; as it required time and more effort which was a burden to them.
- Few students were able to decide on the number of hours they can take each semester to be able to finish courses equal to 50 ECTS before graduation.
- Level 4 students were more interested in joining the study program of the minor than level 1, 2 and three. This is due to their understanding of the importance of completing such an interesting qualification and how it could help them when they are applying for future jobs. This is a problem as final year students will not be able to finish the 50 ECTS in one year!
- Students find it difficult to finish all the requirements of modified modules as more tasks and assignments were requested from them.
- Staff was requested to spend more of their time explaining detailed information and answering students questions
- The Euro-Arab pass is not yet understood by both students and staff members.
- Busy schedules of many faculties made it difficult for the students to commit.
- There is a need of additional training materials for enhancing the knowledge and skills in implementing and assessing the CLIMASP minor program.
- Many students are not skilled in using computers and some of them are not connected to the internet, and thus fail to catch up with their classmates especially when the assignments require searching the web.
- Time management is a difficult task; the students rarely have the time to take the courses due to their various everyday commitments.
- Students need to find the motivation to follow the new educational trends and also properly equip themselves for future challenges in their education and careers.

Solutions

- Many meetings were arranged with the new persons in administration posts to keep them updated with the projects' activities.
- Many events were planned and implemented to disseminate the knowledge about the minor and the benefits of its certificate.
- Students were encouraged to fill the questionnaire by approaching them individually and explaining more about the qualification. It needed more efforts and time from the project staff until it is all filled.
- Students were grouped and more information was provided about how to fill the questionnaire and what is expected from them in each module. In addition, key elements of the questionnaire were highlighted.
- It is suggested for students in the final year of study who wish to study for the minor (certificate) to join summer semester to be able to finish the required courses.
- Project staff has provided much support to students in order to help them finish all the requirements of each module within the deadline.
- Project staff had to set more office hours so they can be more available to respond to students' questions.
- A regular schedule planner would be a significant help to students who couldn't keep up with the study plan, as they could even set reminders for their courses and assignments.
- Providing trainings in computer skills, and English language would be great help to the students to be able to benefit from all the data and open source readings via the world web.

Exploitation and Dissemination

Workshops and fairs

To disseminate the new minor, members of Climasp Carried out workshops in different faculties to spread the word about Climasp and the minor in climate change, posters and brochures of the project were given to the attendants.

Insert pic 17& 18 here

The following table demonstrates the numbers of students, staff members and the dates of different events.

Faculty	Date	N of students	N of staff members
Education	Jan 2015	43	17
Arts& humanities	Jan 2015	60	4
Science	Jan 2015	17	4

Agriculture	Feb 2015	24	3
Vet medicine	March 2015	14	2
Engineering	March 2015	17	7
Tourism & hotel management	April 2015	21	4
Euro-Arab Center	December 2015	21	9

Using social media

A facebook page was created for the Climasp minor where students can register and choose their study plan. The page is also useful in sharing important learning material and monitoring students' progress in the required assignments.

Over three hundred students like the page and the total reach of posts by the page is 200 in average.

Insert pic 13 here

Conferences and projects

On 25th October 2015 the young researchers' conference was held under the title

(Prospects of green growth), Dr Nehal Lotfy SCU coordinator gave an orientation session about Climasp project and the interdisciplinary minor structure.

Flyers were distributed to the audience who were around 60 students and 20 staff members from different faculties in SCU.

Insert pic1 here

Students in the faculty of science who were enrolled in a Climasp course published a scientific paper and designed a device to deal with CO2 emission. This device make use of factories' exhaust gases (mainly CO2) and produce electricity and some useful product e.g. oxygen and fire extinguisher. The proposed project (packing the factory fumes into beneficial products) won the best student research in the first scientific forum 2015/2016, Faculty of Science, Suez Canal University.

It also won the second prize in the 10th Egyptian universities Youth week 11-17 September, 2015. It was exhibited in the 2nd Cairo International Exhibition of Innovation, Nov 24-25, 2015.

Insert pic 2 here

Students gave a presentation in the 4th African Congress For Scientific Research, Technology, Innovation & Entrepreneurship, Nov 23, 2015.

Insert pic 3 here

Another research project submitted by students from the faculty of science focused on water Balance in Nasser lakes: sustainability polices. It was Submitted to the Young Researchers' Conference in Suez Canal University.

Students from the faculty of agriculture enrolled in Climasp minor came up with an innovative idea to develop a machine to harvest sesame. The project entitled: "Control of Sesame Pests through Mechanization and Use of Compost"

The project consists of two phases:

- The first phase is a simple threshing machine instead of manual threshing operation, which in turn reduces wastage and increases the product quality and reduces mixing with dust, gravel and pests.
- The second phase is using compost as a mean of sesame pest control

The students presented the research project at the 2nd African Congress for Youth in Science and Technology Innovation and Entrepreneurship, 22 -25 November, 2015, Cairo – Egypt.

The team consists of three students: two females and one male student, for them it was the first time to attend an international conference and give a presentation, so it was a very rewarding experience for all of Climasp team in SCU.

Another project related to the scope of Climasp is "Early Warning System application in Suez Canal Governorates to Assess and Mitigate the Environmental Hazards Induced by Climate Change" that is coordinated by one of Climasp team members in SCU, Prof. Dr. Atef Mohamed Kamel who participated in disseminating Climasp in every available opportuinity (UNESCO, Paris).

Students' fairs and projects

Service learning approach was used while teaching the course (teacher of preschool child)

Students were asked to come up with practical ideas to teach the **earth charter** to the preschool child.

Students had the opportunity of going to the local community schools once a week for 12 weeks in the semester.

They planned and implemented their ideas and initiatives that were evaluated as a part of the course.

Insert pic 4 here

One group of students from the faculty of education planned and carried out a student-driven campaign for sorting the trash and making use of plastic wastes. Some of the ideas displayed in the fair that was held in the annual environmental week in SCU, uses of plastic containers, usage of paper waste, and training children to adapt sustainable behaviors.

Insert pic 5 and 6 here

Another group from the faculty of arts and humanities, who studied the course civilization of ancient Egyptians, developed Marquette of the ancients Egyptians building systems and how they adapted to the changing weather conditions in different seasons.

Insert pic 7 here

Another campaign was about heat exhaustion, hyperthermia, it aimed at raising the awareness of the university students of the symptoms and warning signs in addition to treatment and prevention.

Students from the faculty of veterinary medicine made a great effort whole studying the Climasp courses offered in their faculty and provided presentations related to climate change and sustainability.

Insert pic 20, 21&22 here

Examples of students best practices in some of SCU faculties

- **The faculty of agriculture**

Several courses in horticultural science are taught at Department of Horticulture. Those courses provided targeted students with knowledge, skills and attitude of agriculture and sustainability particularly in horticultural area. Throughout the course, the students were introduced to concepts and principles of sustainable agriculture and the methods to apply such concepts in farmer fields. Environmental issues associated with horticultural crops production are discussed during the courses.

- Substantial evidence indicate that fieldwork, properly conceived, adequately planned, well taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom (Dillon et al., 2007). Educational trips stimulate learning beyond what textbooks can provide to the learning environment. Outdoor trips to different places of interest and related to the field of study such as experimental farms, fields, orchards, nurseries, parks, public gardens, and greenhouse facilities were the best practices in those courses.
- Significant development could be observed after infusing field trips in horticultural courses. The student questionnaires significantly showed improvement in student attitude toward sustainability. Student feedback during and after trips showed a significant amount of success of field trips as educational tool. Student response to exams showed relationship between field trips and student knowledge, skills gained throughout the field trips.
- Positive impact on students can be realized. The field trips reinforced what has been instructed in the classroom. The trips gave students the chance to build closer bounds with their classmates and instructor. One of the success factors in our activity is the relatively small number of students involved in the field trips. This gave some strength to the practice since it reduced the costs related to field trips in terms of transportation and preparation. In

addition, short period trips (few hours) were another success factors rather than long period trips (days).

-
- **The faculty of engineering**

The Architecture curriculum is structured to expose students to the comprehensive theoretical, historical, technological, professional and social issues that play a role in the design of the built environment. Architectural education is therefore rich, varied and by definition interdisciplinary.

The vision of Department of Architecture and Urban Planning in Suez Canal University is: "leading the Development Wave in Suez Canal and Sinai Regions, throughout using the Integrated Design Approach in both the architecture and planning sides, able to achieve competitiveness on local, regional and national levels, and seeking for sustainability in both the architecture and urban planning".

Insert pic 19 here

Therefore, participating in CLIMASP was one of the department strategies towards the development of architectural education to achieve sustainability in architecture and urban planning through the graduation of architects are fully aware of the issue of climate change and how to mitigate and to adapt with its effects by following sustainability policy.

Faculty of Engineering participated in the project by the Department of Architecture five architectural courses from a total of 41 courses from the different faculties of the Suez Canal University, in addition to the preparation of the capstone course description "Sustainable Communities".

Insert pic 15 and pic 16 here

The faculty of tourism

Discussion on the CLIMASP minor in the Faculty of Tourism and Hotel Management has been done internally within the faculty and among faculty members and students and externally in the Social Research Centre in the American University in Cairo (AUC).

In the Faculty of Tourism and Hotels Management, three modules have been modified in order to include teaching materials related to Climate Change. These modules are: Marketing Research (level 2), Tourism Planning (level 3) and Information Technology (IT) and Tourism (level 3). All three modules are taught within the department of Tourism studies which has an average of 55 enrolled students.

Insert pic 11 showing Dr Islam Elgammal, faculty of tourism and Hotel Management during the third national workshop in Aswan.

Students have enjoyed the integrated parts of the climate change, particularly when it came to group work as it helped them understand more and relate different pieces of knowledge to the outside world.

IT and Tourism module learning outcomes related to Climate Change attracted the attention of level 3 students:

- Understand the role of online sustainability communication on destination sustainability development.

- Identify the characteristics of good smart phones application to support sustainable tourism.

However, they needed much help and support from the lecturer to explain techniques related to online sustainability communication and smart phones application to support sustainable tourism. Consequently, three workshops were organized and a number of seminars. In addition, students found it useful to contact other students in the faculty of Information and Computer science to help them understanding issues related to smart phones applications generally.

By the end of module, students were able to evaluate top tourism destinations website in relation to their sustainability communication and provide a critical analysis of each website. Such critical analysis within collaborative learning environment was then reflected upon and linked to Climate Change which had a great impact on students critical thinking (Gokhale, 1995) and reflective practices (Loughran, 2002)

Achievements

- Provide more hands-on experiences
- Help you shape your future path
- Enrich major study programs
- Responsive to societal needs
- Integrated program on climate change and sustainability policy, enabling students to acquire a Euro-Arab pass supplement diploma
- Species has yet become extinct exclusively because of climate change; many migratory and non-migratory species are expected to become extinct in the near future.
- Project on waste treatment unit to produce organic fertilizers and compost

CONCLUSION

Climasp experience in SCU resulted in many changes, some were direct, and others were indirect. Some were expected and others were unexpected.

As for the direct impacts of Climasp experience in SCU:

- Better collaboration with other partner universities in the MENA region.

- Introducing the interdisciplinary approach among different faculties in SCU.
- Raising students' awareness of climate change and sustainability in varied contexts.
- Better collaboration among staff members from SCU in different faculties, bonding ties were made during the three years of working together, facing the challenges and helping each other's to overcome them.
- Involving different stakeholders in the process of reorienting the courses and infusing climate change in the courses.
- Better covering the topic of climate change and sustainability in SCU courses in different faculties.
- Involving the career center in SCU and Education For Employment (EFE) in enhancing students' employability skills.

The indirect results of Climasp experience in SCU:

- Using new methodologies in teaching to enhance education for sustainable development; like using project based learning and community based learning.
- Infusing concepts related to climate change and sustainable development that were not mentioned in the project's objectives, like using the earth charter to inspire learning in the course (teacher of preschool child).
- SCU is now seeking and finalizing more student mobility agreements to provide opportunities for SCU students to outreach the world and learn new experiences.
- Students are showing interest in some programs like GIS.
- Students are more motivated, not only in Climasp activities but in other activities like the 10th week of youth that was hosted by SCU in July, 2015.
- The peer effect was one of the major results of applying Climasp experience, one active student would inspire four or five of his colleagues to join the study program and become an inspiration to others, it was like forming critical mass.
- The outcomes from implementing the stakeholders' survey helped in reorienting the courses which assisted in turn in bridging the gap between theory and practice in the studies of climate change.

The expected outcomes of Climasp experience:

- Enhanced knowledge of climate change and sustainability among SCU Climasp students which is proven by qualitative and quantitative data.
- Forty one courses were reoriented, and climate change was infused as both knowledge and skills.
- Establishing the Euro-Arab center for interdisciplinary studies in climate change and sustainability policy.
- Hosting dissemination activities in Climasp center and participating in conferences to spread the word about the minor and encourage students to join it.
- Forming better connections with the community through students' campaigns and university fairs.

The unexpected outcomes of Climasp experience:

- A group of Climasp students from different faculties in SCU formed a committee called (Our Heritage), its main aim is to locate the important places in the local community and assess its status and provide protection where needed and raise people's awareness of its importance. This committee is now supervised by SCU and

Ismailia governorate and they have made several events among which celebrating the innovations in the French former diplomat Ferdinand de Lesseps who planned for the Suez Canal that officially began in 1854.

- Colleagues from AlAzhar University attended the Climasp session in the second conference for young researchers, and they wanted to duplicate Climasp in their university. Arrangements are being made for the required agreements between the two universities as well as arrangements with the project's main coordinator for accrediting the certificate.
- Students who registered for Climasp certificate are showing increasing interest in other programs, especially abroad, they search for scholarships, fellowships and internships.
- Women empowerment was one of the unexpected outcomes from Climasp, as female students were given the chance to present their work and innovations in international conferences (like the 2nd African Congress for Youth in Science and Technology Innovation and Entrepreneurship, 22 -25 November, 2015, Cairo – Egypt). For the first time, those female students left their home city to got to Cairo and give a presentation in front of big audience!
- Enhanced personal skills, many students (especially those from the faculty of arts and humanities) didn't have email address and had very poor skills in surfing the internet and reading in English. They had to enhance these skills to be able to keep up with the assignments and other required readings.

REFERENCES

- El-Deghaidy, H. (2012), "Education for Sustainable Development: Experiences from Action Research with Science Teachers", Discourse and Communication for Sustainable Education, Vol. 3 No. 1, pp. 23–40.
- - Gokhale, A. (1995) Collaborative Learning Enhances Critical Thinking
- Journal of Technology Education, 7 (1).
- International Association of Universities (2014) Higher Education for sustainable development, available from: http://www.iau-hesd.net/en/actions/1991/reorient-university-curricula-address-sustainability-rucas.html Accessed on 05-09-2016
- Khalil, N.L. (2015), The effectiveness of interdisciplinary approach in reorienting courses towards sustainability on students' knowledge, attitudes, and achievement, published by the social research centre, the American University in Cairo.
- Khalil, N.L. (2012), "Reorienting an Educational Psychology Course to Address Sustainability: A Case Study", *Discourse and Communication for Sustainable Education*, Vol. 3 No. 1, pp. 109–120.
- Loughran, J. (2002) Effective Reflective Practice In Search of Meaning in Learning about Teaching, Journal of Teacher Education, 53 (1): 33-43
- Tempus EduCamp (2013) Education for sustainable development beyond the campus, Tempus project, available from: http://schools.aucegypt.edu/Sustainability/CSD/Documents/Education/Brochure3%20ENG%20fin%204x.pdf Accessed on 22-08-2016
- United Nation (2016) Partnerships for SDGs: Suez Canal University, available from: https://sustainabledevelopment.un.org/partnership/partners/?id=10782 , Accessed on 30-08-2016

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Appendix 1

Tables of dissemination activities from different faculties

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner		**Suez Canal University, Faculty of Engineering, Dr. Mervat Abdel Aziz**			
No	**Event***	**Date**	**Place**	**Target****	**Outcome**
1	Dissemination Meeting	March 29th 2015	Faculty of Engineering	- Students(60) - Staff members of the faculty(20)	- Define of CLIMASP Pr - Discussed the planning mapping of the minor in cli ch - Total attendants 80 S stud
2	Architectural Exhibition	May 17th 2015	Faculty of engineering Sustainable Design studio 6	Architectural Exhibition for students projects **Sustainable Hospital**	- Faculty of engineering stud visited the Architec Exhib - Increase knowledge of CLIM Project and the co
3	The official opening	December 1st 2015	Euro Arab centre for interdisciplinary studies in climate change	explain the minor structure and the offered courses	Meeting with a numb students of the university different disciplines and ex the courses that will be taug the center and how the reg
4	Architectural Exhibition	May 10th 2016	Faculty of engineering Sustainable Design studio 6	Architectural Exhibition for students projects **Sustainable Village**	- Faculty of engineering stud visited the Architec Exhib - Increase knowledge of CLIM Project and the cou - see ph https://www.facebook.com/Cli change-and-sustainability-p climasp-166005544426
5	1st Conference for Students Researches and projects concerns with Sustainable Development	May 10th 2016	Faculty of engineering	- Faculty students from all departments attended the conference and visited the Architectural Exhibition. - Dean and vice dean attending the exhibition	Director of Euro Arab centr interdisciplinary stud climate change is distrib certificates of appreciati students participating CLIM Pr

6	Suez Canal University website, and media centre	May 10th – 11th 2016	https://www.facebook.com/Climate-change-and-sustainability-policy-climasp-1660055444265853/		

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner		Khalid El-Sayed Abd El-Hamed Suez Canal University, Egypt			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
	The First st Young Researchers Conference	6-7 March 2013,	Suez Canal University, Ismailia, Egypt	Undergraduates, Postgraduates, Young Researchers	Two poster were presented covering CC mitigation and adaptation, Biodiversity 1 and 2)
1	The Second nd Young Researchers Conference (Prospect for Green Growth (Water Treatment- Renewable Energy- Green Technology)	(24-25 October, 2015)	Suez Canal University, Ismailia, Egypt	Undergraduates, Postgraduates, Young Researchers	A poster was presented covering CC Biodiversity, Sustainable production (3)
2	The Fourth th African Congress for Scientific Research, Technology, Innovation and Entrepreneurship	22 -25 November 2015-	Cairo -Egypt	Young African Researchers	Two SCU student's projects were presented (4 and 5)
3	Open Day and Opening Ceremony Euro-Arab Center for Interdisciplinary Studies in Climate Change	22/12/2015	Suez Canal University, Ismailia Egypt	Undergraduates,	Concepts of CC policy, Sustainable development were introduced to audience
4	Fourth Environmental	27- 31 March 2016.	Suez Canal University, Ismailia	Undergraduates,	Concepts of Environmental

	Awareness Week		Egypt	Postgraduates, Faculty and Staff members Public Citizens	awareness and management were introduced to audience
3	Seminar on (Climate Change and its effect on Agriculture)	2016-03-31	Suez Canal University, Ismailia Egypt	Undergraduate and Postgraduate students	Concepts of Mitigation and adaptation, Biodiversity, Sustainable production were introduced to audience
4	The Third rd Young Researchers Conference(Quality, Excellence and Sustainability)	(7-8 May 2016)	Suez Canal University, Ismailia, Egypt	Undergraduates, Postgraduates, Young Researchers	Four posters and two oral presentations were presented covering CC Mitigation and adaptation, Biodiversity, Sustainable production and water resources. (6,7,8,9,10,11)
5	Graduation Research Projects with Title "The effect of cucumber grafting on two different rootstocks"	May 2014	Suez Canal University, Ismailia Egypt	Horticulture Department Senior Year Student (Ahmed Ibrahim Hafez Ibrahim)	The research project covered CC concepts of Mitigation and adaptation, Biodiversity (12)
	Seminar on (Intellectual Property Protection)	2015	Suez Canal University, Ismailia Egypt	Faculty and Staff members	concepts of CC Legislation, regulations, Technology and innovation, ethics were introduced to audience
	Student Field Trip	April 2016	Experimental Farm, Tissue	senior year students of	Concepts of CC Mitigation and

			Culture Lab	plant production department	adaptation, Biodiversity, Sustainable production and water resources. Were practically introduced to students
	Seminar on (Journey to the World of Genetics)	Fall semester 2013	Department of Horticulture - Suez Canal University, Ismailia Egypt	Undergraduate and Postgraduate students	concepts of Biodiversity, Natural resources management were introduced to audience
	Training workshop on (Fundamentals of Tissue Culture)	15- 18 June 2013	Department of Horticulture, Suez Canal University.	Undergraduate, Postgraduate students and professional workers	concepts of Biodiversity, Natural resources management were introduced to trainees
	Training workshop on (Fundamentals of Tissue Culture)	20- 22 March 2014	Department of Horticulture, Suez Canal University.	Undergraduate, Postgraduate students and professional workers	concepts of Biodiversity, Natural resources management were introduced to trainees

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner	**Prof. Dr Atef Kamel SCU**				
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Student Field Visit to Ashtum El Gamil Protected area	25/10/2015	Port Said	Student Dissemination	To assess the current status of the protected areas and the impact of Climate change *SLR, Drought, others.
2	Review Article	10/1/2016	SCU, Faculty of Veterinary Medicine	Student assignment	To highlight on the Impacts of climate change on Biodiversity
3	Review Article	3/2/2016	SCU, Faculty of Veterinary Medicine	Students assignment	To highlight on on Biodiversity, Climate change and Sustainability.

4	Presentation	1/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Protected Areas & Biosphere Reserves and Climate Change: Role & Challenges
5	Presentation	7/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Biodiversity Conservation & Climate Change Impacts and Sustainability
6	Student Field visit to African Safari Park	19/3/2016	Cairo-Alexandria Desert Road	Student dissemination	To know how the wild animals accommodate to desert environment and drought
7	Regional African Research and innovation Conference with cooperation African Union	24-26/4 /2016	National Research Center, Doki, Egypt	Instructor dissemination	To highlight on the Climate Change & Sustainable Development in AFRICA
8	The African Mistrial Conference on the Environmernt-6th Special session	16-19/4/2016	Dussit Hotel, Cairo	Instructor (Expert) Dissemination	1. Implementation of the 2030 Agenda for sustainable development and SDGs in Africa 2. The African Adaptation Initiative 3. African Strategy on combating illegal trade in wild fauna and flora
9	Egyptian Third National Communication (UNFCCC)	March 2016	EEAA	Instructor contribution (Expert) Dissemination	

CLIMASP DISSEMINATION ACTIVITIES					
Name of CLIMASP Partner		**SCU, faculty of tourism, Islam Elgammal,**			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
	CLIMPAS	Wednesday 30th of Dec	Faculty of Tourism and Hotel	Faculty staff members	No. of attendees : 15 Staff were aware of the

1	introductory meeting	2015	Management		idea of the project and some were motivated to adjust their teaching materials to cope with the project aims and objectives. Mailing list was saved
2	CLIMPAS 1st student workshop	Thursday the 14th of Jan 2016	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 29 Students understood the value of joining the project and raised questions that will be answered in the second workshop. Mailing list was saved
3	CLIMPAS 2st student workshop	Thursday the 14th of Jan 2016	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 21 10 students showed interest in registering their names within the project. Mailing list was saved
4	CLIMPAS 3st student workshop	Wednesday the 3rd of Feb.	Faculty of Tourism and Hotel Management	Postgraduate students	No. of attendees : 13 Students showed interest in joining the project so perhaps we can consider postgraduate students registration in future opportunities if possible . Mailing list was saved
5	CLIMPAS 4th student Workshop	Wednesday the 9th of March	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 26 Project posters and brochures were distributed among attendees. A PPT about the project was delivered. Half of the attendees were fourth year student and

					therefore there was no chance for them to join the project which is a challenge. Mailing list was saved
6	CLIMPAS Seminar	Monday the 4th of April 2016	Social Research Centre, American University Cairo (AUC)	Staff member of SCU UNI, Bani Sweef UNI, Menofia Uni and SRC	No. of attendees : 32 PPT was delivered and brochures were distributed. Staff was very much interested to join future projects and to consider the idea of climate change within their teaching. Mailing list was saved.

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner		**SCU, faculty of humanities and arts, Sahar Hassany**			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
	Meeting was held with the students to define the objectives of the project and what should be studied at the Center for Climate Change It was also presented a special lecture about climate change revolved around the concept of climate change and global warming and the impact of climate change on some sectors, such as health, tourism and agriculture sector and the impact of those changes on some groups, especially women and children,	11-2016	College lecture hall	Students of the Department of Sociology	Students interested in the project and his idea and it was agreed with the students that they educate clients of institutions of civil society to contribute in solving the problem of climate change in the period for which the students training in these institutions, because the training of civil society organizations from within the activities for students of the Department of Sociology

	Sociology relationship to the environment and environmental issues related to the culture of the community members, as well as the family, school, university, the media, religious institutions, the role of the environmental socialization process				
	Was held focus groups to discuss topics that the students collect information about them, such as addressing environmental problems in Egypt, health and economic impacts of air pollution for the residents of some areas in Egypt, such as Helwan area and Shira Khaimah	4-2016	College lecture hall	Students of the Department of Sociology	For example, students clarify the following in Shubra Al Khaimah area: - Major industries in the region such as: intensive metals, ceramics, and Chinese, and plastic. - Air specifications Shubra Al Khaimah area - Sulfur dioxide sources in Shubra Al Khaimah. Identify some of the sources of pollution such as pollution with chlorine gas and the first carbon dioxide and butane gas, and pictures of this pollution and Nothirath on the environment and human

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner	**Prof Mohamed Tawfic, SCU**				
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Workshop, Organized by Ministry of Environment, African Union, Centre of Environment	29th May	Radison Blu Hotel, Cairo.	Raising awareness of journalists covering environmental news in major Egyptian newspapers	Introducing climate change and its impact on water availability, and related issues

	and Development of the Arab Region and Europe				
2	Workshop Organized by Ministry of Environment, African Union, Centre of Environment and Development of the Arab Region and Europe	April, 15th	Intercontinental Hotel	Senior staff, Technical Research Institutes,	Introducing major aspects of climate change and its impact on land degradation
3	Seminar	April, 2016	Agriculture Botany Dept. Suez Canal University	Staff members and students	Introducing climate change scenarios and possible risks
	Seminar	April, 2016	Department of soil science, Suez Canal University	Staff members and students	Introducing climate change scenarios and possible risks
	Seminar	March, 2016	Department of Plant Protection, Suez Canal University	Staff members and students	Introducing climate change scenarios and possible risks

CLIMASP DISSEMINATION ACTIVITIES

Name of CLIMASP Partner		**Faculty of veterinary medicine, prof. Atef Kamel**			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Student Field Visit to Ashtum El Gamil Protected area	25/10/2015	Port Said	Student Dissemination	To assess the current status of the protected areas and the impact of Climate change *SLR, Drought, others.
2	Review Article	10/1/2016	SCU, Faculty of	Student	To highlight on the

			Veterinary Medicine	assignment	Impacts of climate change on Biodiversity
3	Review Article	3/2/2016	SCU, Faculty of Veterinary Medicine	Students assignment	To highlight on on Biodiversity, Climate change and Sustainability.
4	Presentation	1/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Protected Areas & Biosphere Reserves and Climate Change: Role & Challenges
5	Presentation	7/3/2016	SCU, Faculty of Veterinary Medicine	Student Group presentation	Biodiversity Conservation & Climate Change Impacts and Sustainability
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9	Egyptian Third National Communication (UNFCCC)	March 2016	EEAA	Instructor contribution (Expert) Dissemination	

Appendix 2

Insert pics 12, 14 showing the flyers and posters used in dissemination

Insert pic 13 showing the facebook page developed and used in dissemination and in contacting students who registered in the minor.

Appendix 3

Examples of courses offered in Climasp minor

Course name: Reading in English, offered by the faculty of education, taught by Dr. Nehal Lotfy

Week	Date	Topics,	Reading, Assignments and Deadlines
1		How to skim a text. How to scan a text.	Echo anxiety
2		What is SD, ESD	1- http://www.iisd.org/sd/ 2http://www.myenglishpages.com/site_php_files/reading_sustainable_development.php 3http://www2.ed.gov/programs/readingfirst/support/readlores.pdf
3,4		Anger management techniques peace education	http://www.angermanagementgroups.com/Skills.html peace education in unicef, (1999) susan foundation
5,6		Eco anxiety	- http://www.psychologytoday.com/blog/design-your-path/201103/eco-anxiety-and-the-symptoms-going-green
7		Happiness	**http://www.un.org/apps/news/story.asp?NewsID=44430&Cr=sustainable+development&Cr1**

			=#
8,9		Conflict management	-http://nature.berkeley.edu/ucce50/ag-labor/7labor/13.htm
10,11		Climate change, climate resilience	
12-13-14		Scientific reading, how to read an abstract and skim for results	

Appendix 4

Summary of some of the offered courses in climasp

1. Architectural Design Studio 6- ARCH 304

This course was applied two times during the CLIMASP project period after developed and the design projects were:

* 2nd semester 2015:"Sustainable Hospital in Ismalia – 600 beds" – 17 student

* 2nd semester 2016: "Sustainable Rural Village"- New Ismailia" – 9 students

After the completion of this course students are able to collect, analyze data, formulate architectural design solutions and produce a sustainable architectural project.

2. Urban Renewal of Residential Areas - UPL 403- Elective Course

This course was applied 2015 during the CLIMASP project period. The main assignment and project was "Studying a residential area in Ismailia facing urban problems and applying of sustainable principles of the proposed urban renewal projects" After the completion of this course students could describe the different types of the residential areas and clarify the interrelationship between housing and social, economic factors and the impact of climate change. They could select appropriate urban renewal program of residential areas depending on the circumstances of each region and implementation mechanisms and apply principles of sustainability on the urban renewal projects.

3. Environmental Control in Architecture - ARCH 306- Elective course

The course activities included four individual assignments for each student and one main research in groups, each group (2-3 students) choose a heritage building in a particular climatic region. The groups studied the architectural elements of the building and demonstrate the work

theories of these different treatments and they analyzed the building in terms of materials, construction, function and its suitability for the environment. After the completion of this course students can analyse of climatic and environmental factors affecting the architectural design in the different climatic regions especially the hot region and apply principles of sustainability on the architectural design.

4. Urban Studies and Humanities - ARCH 207- Elective Course

The course activities included four individual assignments for each student and one main research in groups, each group (3-5 students) choose an urban space (public or residential) in Ismailia city or any other city in the Suez Canal Region. They studied the physical characteristics of the urban space, the human activities, the social relations and interactions and the social role of the people in the chosen urban space,

they designed questionnaire that distributed in the site and analyzed the effect of climate change in both urban space & human activities and applying the sustainable principles on the proposed urban spaces in Ismailia.

5. Building Codes and Legislation - ARCH 405- Elective Course

The course activities included six assignments. The main research was in groups, each group (3-5 students). They prepared an action plan for sustainable management of a sustainable urban development project, (sustainable site – water efficiency – sustainable materials & resources – socio- cultural quality).

11. Agriculture Zoology, Faculty of Agriculture, Department of plant protection

Zoology is the scientific study of animal. Zoology is the study of animals, their behaviour, their physiology and evolution, as well as their interactions with each other and with their environment. Zoologists also study how animals evolved and the impact of environmental change on their survival. They search for ways to manage wildlife populations, and to conserve rare and endangered species, such as takahe and tuatara. They study costs and benefits of conservation and ways to enhance species survival. Zoology is the branch of biology that includes the study of animals and animal life, including, but not limited to, the study of the structure, physiology and classification of animals.

12. Economics of Sustainable Development, Faculty of Commerce Department of economic

As a graduate course, students are expected to have a good background in micro and macroeconomics and the basic principles of econometrics. Students will be asked to summarize, present, and criticize some of the materials covered in class. At the end of this course, students are expected to have developed a keen interest in the area of sustainable development, as well as a set of analytical tools that can be applied in other fields of economics .The main language of this course will be "Arabic" but English will be used as needed.

13. Physical Geology, Faculty of Science

This course will further your understanding of, and ongoing curiosity about the Earth: what it's made of, its landforms, and the dynamic processes that have created and repeatedly changed the landscape (and ocean basins) through time. We will be exposed to the breadth of geology and its connections with the other major sciences, including chemistry, physics, meteorology, astronomy, and biology. As a resident of Earth, we can experience, observe, read about, and/or use much of what will be covered in course, regardless of what career paths we might take. At this time, we are fortunate to be witnesses to revolutionary changes in our understanding of the Earth's processes.

14. Horticultural Crops Breeding, Faculty of Agriculture, Department of Horticulture

The course is designed to Horticultural department senior year students to provide knowledge of the science and practice of horticultural crops (vegetables, fruits,

ornamentals and medicinal plants) breeding, that include the reproduction types, selection of parents for hybridization working with hybrid generation and breeding methods of some horticultural crops in order to solve problems associated with the field production.

The plant origin, taxonomy and cytology are among the topics of focus in that course. Throughout the course, the students will be introduced to concepts and principles of sustainable agriculture and the methods to breed new plant varieties that can fit with such concepts. Environmental issues associated with horticultural crops breeding are discussed during the course.

15. Information Technology and Information Systems for Sustainable, faculty of Tourism

This module provides students with an overview on the integration between Information Technology applications, Information Systems, tourism and sustainability. First, a thorough background on role, importance, functions and applications of Information Technology (IT) and Information Systems (IS) in tourism will be covered. Also, this module will discuss the new tourism mechanism and the new players in the online tourism market that were initiated by innovations of IT (e.g. Expedia.com which is owned by Microsoft). The new characteristics of tourists as information producer change the way in which tourism businesses should do their work.

16. Occupational psychology, Faculty of Education, Department of Educational psychology

This course applies behavioral science knowledge to professional organizations. The goal of this course is to understand how businesses can be designed so that both the efficiency and the quality of the employee life are improved. Topics will include the history of the industrial/ organizational psychology, job analysis, psychological assessments, personal decisions, training and development, organizational change, teamwork, motivation, leadership, work stress and health.

17. Marketing Research, faculty of tourism and hotel management

This module provides knowledge on the qualitative and quantitative methodologies used in market research, which provides a foundation to understand markets and consumers. A variety of qualitative and quantitative data collection and data analysis methods for descriptive, causal, and exploratory research designs will be discussed and compared, alongside the utilisation of these techniques in market research. The research design process (problem identification, proposal writing) will also be taught.

18. Teacher of preschool child, Faculty of Education, Department of Educational psychology

When this course was considered to be reoriented to include some insights about climate change and sustainability, the main gain was the head start we should have starting at early age. Children are also influential when it comes to their homes and families. If a child adapts a good behavior, or believes in a cause, it is likely that the child will influence his parents, siblings, close family and friends to adapt the same cause or at least be aware of it.

The course added the earth charter as a good source of ideas to present to the preschool children through their teachers.

As a part of their assessment, students are required to plan and implement a project with preschool children inspired by the earth charter's values, some of the values to be fostered; responsibility, compassion, respect, justice, cooperation, etc.

19. Pollution of Water Resource, faculty of Agriculture

Industrial growth and development is beyond doubt, the major driver of economic progress and societal prosperity. Industry has always been the nuclei that communities and civic activities cascaded around, allowing all other activities to develop and cherish. Industry is also one of the major causes for environmental degradation, resources depletions and pollution. Environmental pollution is a daunting challenge casting its adverse influence on human prosperity and livelihood. Water pollution is one of the most serious types of pollution since pollutants of other spheres, including air and soil would normally end up in water. Within this course, an introductory part would deal with water and water bodies as one of the main ecosystem services, and major drivers of changes that affect this service. . This part would also entail an overview of global environmental changes, with special reference to climate change, acid rain.

20. Research methodologies, faculty of education, educational psychology dept.

The main purpose of the Research Methodologies course is to introduce students to quantitative and qualitative methods for conducting meaningful inquiry and research. They will gain an overview of research intent and design, methodology and technique, format and presentation, and data management and analysis informed by commonly used statistical methods. The course will develop each student's ability to use this knowledge to become more effective as researchers.

The course will provide an overview of the important concepts of research design, data collection, statistical and interpretative analysis, and final report presentation. This course focuses on the ability to use research in studying of climate change, causes, consequences, mitigation, adaptation, and building resilience of vulnerable groups.

Developing and Implementing the CLIMASP Minor in the Faculty of Tourism and Hotels Management, Suez Canal University

Authors

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INTRODUCTION

CLIMASP is a European Commission TEMPUS funded project entitled “Development of an Interdisciplinary Programme in Climate Change and Sustainability Policy” that is being designed and implemented across 10 universities in Egypt, Jordan and Lebanon. The CLIMASP project is coordinated by the University of Crete, Greece through its UNESCO Chair ICT in Education for Sustainable Development. The objective of the current case study is to highlight the experience of implementing the CLIMPAS guidelines within the Faculty of Tourism and Hotels Management, Suez Canal University.

UNIVERSITY BACKGROUND

Suez Canal University has been organizing several seminars and projects related to sustainability issues and conserving the environment. In addition, SCU has been involved in various sustainability funded projects; the following are examples of what has been achieved through SCU:

- 2013 Education for Sustainable development Tempus project (Tempus EduCamp, 2013)

- 2014 Actions towards sustainability for this university: Reorient University Curricula to Address Sustainability (RUCAS) (International Association of Universities, 2014)

- 2014 Environmental seminar on sustainable development at the Faculty of Engineering.

- 2016 Third Young Researchers Conference (YRC2016): Quality, Excellence and Sustainability)

Suez Canal University is also a partner in the United Nation Sustainable Development goals (SDGs) and it aims at the environmental conservation for sustainable urban and rural development

Its ultimate aim is to enhance and conserve ecosystems and habitats in a sustainable base through the following: Inclusion of environmental studies (Climate Change and Sustainable policy) in Suez Canal University curricula in undergraduate and postgraduate studies. -Organizing Sustainable Development & Climate change outreach programs for neighboring communities all over Suez Canal Region. -Participation in regional partnership for sustainable development (Member in the Mediterranean network for sustainable development). -Development of students awareness programs, competitions and projects (United Nation, 2016)

THE CLIMASP CASE DESCRIPTION

In the Faculty of Tourism and Hotels Management, three modules have been modified in order to include teaching materials related to Climate Change. These modules are: Marketing Research (level 2), Tourism Planning (level 3) and Information Technology (IT) and Tourism (level 3). All three modules are taught within the department of Tourism studies which has an average of 55 enrolled students.

Students have enjoyed the integrated parts of the climate change, particularly when it came to group work as it helped them understand more and relate different pieces of knowledge to the outside world.

IT and Tourism module learning outcomes related to Climate Change attracted the attention of level 3 students:

* Understand the role of online sustainability communication on destination sustainability development

* Identify the characteristics of good smart phones application to support sustainable tourism

However, they needed much help and support from the lecturer to explain techniques related to online sustainability communication and smart phones application to support sustainable tourism. Consequently, three workshops were organized and a number of seminars. In addition, students found it useful to contact other students in the faculty of Information and Computer science to help them understanding issues related to smart phones applications generally.

Achievements

By the end of module, students were able to evaluate top tourism destinations website in relation to their sustainability communication and provide a critical analysis of each website. Such critical analysis within collaborative learning environment was then reflected upon and linked to Climate Change which had a great impact on students critical thinking (Gokhale, 1995) and reflective practices (Loughran, 2002)

Challenges faced during the CLIMASP project

There were a number of challenges such as:

- Not many students were interested in filling the first questionnaire,
- Few students were able to provide information about the number of hours they study and module plan.
- Level 4 students were more interested in joining the Diploma than level 1, 2 and three. This is due to their mutual understanding of the importance of completing such an interesting qualification and how it could help them when they are applying for future jobs.
- Students find it difficult to finish all the requirements of modified modules as more tasks and assignments were requested from them.
- Staff was requested to spend more of their time explaining detailed information and answering students questions

Solutions

- Students were encouraged to fill the questionnaire by approaching them individually and explaining more about the qualification. It needed more efforts and time from the project staff until it is all filled.
- Students were grouped and more information was provided about how to fill the questionnaire and what is expected from them in each module. In addition, key elements of the questionnaire were highlighted.
- The qualification is not appropriate for level 4 students and therefore nothing could have been done to overcome such challenge. Project staff is suggesting discussing such challenge within the project next meeting and finding a solution for it.
- Project staff has provided much support to students in order to help them finish all the requirements of each module within the deadline.
- Project staff had to set more office hours so they can be more available to respond to students' questions.

Discussion on the CLIMASP minor in the Faculty of Tourism and Hotel Management has been done internally within the faculty and among faculty members and students and externally in the Social Research Centre in the American University Cairo (AUC) as highlighted in the following table:

CLIMASP DISSEMINATION ACTIVITIES					
Name of CLIMASP Partner					
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	CLIMPAS introductory meeting	Wednesday 30th of Dec 2015	Faculty of Tourism and Hotel Management	Faculty staff members	No. of attendees : 15 Staff was aware of the idea of the project and some were motivated to adjust their teaching materials to cope with the project aims and objectives. Mailing list was saved
2	CLIMPAS 1st student workshop	Thursday the 14th of Jan 2016	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 29 Students understood the value of joining the project and raised questions that will be answered in the second workshop. Mailing list was saved
3	CLIMPAS 2st student workshop	Thursday the 14th of Jan 2016	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 21 10 students showed interest in registering their

					names within the project. Mailing list was saved
4	CLIMPAS 3st student workshop	Wednesday the 3rd of Feb.	Faculty of Tourism and Hotel Management	Postgraduate students	No. of attendees : 13 Students showed interest in joining the project so perhaps we can consider postgraduate students registration in future opportunities if possible . Mailing list was saved
5	CLIMPAS 4th student Workshop	Wednesday the 9th of March	Faculty of Tourism and Hotel Management	Undergraduate students	No. of attendees : 26 Project posters and brochures were distributed among attendees. A PPT about the project was delivered. Half of the attendees were fourth year student and therefore there was no chance for them to join the project which is a challenge. Mailing list was saved
6	CLIMPAS Seminar	Monday the 4th of April 2016	Social Research Centre, American University Cairo (AUC)	Staff member of SCU UNI, Bani Sweef UNI, Menofia Uni and SRC	No. of attendees : 32 PPT was delivered and brochures were distributed. Staff was very much interested to join future projects and to consider the

					idea of climate change within their teaching. Mailing list was saved.

The EuroArab pass diploma has been well managed by the SCU centre and the ICT lab which impacted positively on the university as more students are motivated to enroll in SCU so they get the chance to register in the Diploma. This is due to the dissemination plan that was done by the project staff.

Future dissemination is also planned in order to exploit the results of implementing the CLIMPAS minor and encourage more students to register within the project. This could have a great impact on the acquired knowledge gained by registered students and hence this could help the community to flourish and enhance by fresh graduates.

CONCLUSION

Indeed, students within the Faculty of Tourism and Hotel Management have benefited much from studying the modified modules. It helped them to progress and develop a number of skills, such as, working in groups, working under stress, related knowledge and theory to practice, connect different pieces of information, thinking critically and being a good reflective practionners.

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REFERENCES

- Gokhale, A. (1995) Collaborative Learning Enhances Critical Thinking Journal of Technology Education, 7 (1).

- International Association of Universities (2014) Higher Education for sustainable development, available from: http://www.iau-hesd.net/en/actions/1991/reorient-university-curricula-address-sustainability-rucas.html Accessed on 05-09-2016

- Loughran, J. (2002) Effective Reflective Practice In Search of Meaning in Learning about Teaching, Journal of Teacher Education, 53 (1): 33-43

- Tempus EduCamp (2013) Education for sustainable development beyond the campus, Tempus project, available from: http://schools.aucegypt.edu/Sustainability/CSD/Documents/Education/Brochure3%20ENG%20fin%204x.pdf Accessed on 22-08-2016

- United Nation (2016) Partnerships for SDGs: Suez Canal University, available from: https://sustainabledevelopment.un.org/partnership/partners/?id=10782 , Accessed on 30-08-2016



CLIMASP Minor at the American University of Madaba

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1- INTRODUCTION:

Climate change is one of the most pressing issues affecting all regions in the world and especially the Middle East and Mediterranean region. Climate change is a serious and an irreversible threat to human societies and the planet which requires the collaboration among the people from different nations to recognize and to respond in order to promote the awareness and the need to reduce global greenhouse gas emission. It is a common concern of civilization, and when stakeholders make decisions, they should address the respect and promote their obligations to human rights health, the rights of indigenous peoples, local communities, global and local environmental issues, specific needs and concerns of developing countries and the empowerment of mitigations and litigations in saving our environment. Public should be educated about the urgent need to address the pledges in terms of global annual emissions of greenhouse gases in holding the global average temperature to well below 2 °C above pre-industrial levels. We should recognize the urgent need to enhance the provision of education, finance, and the technology support by developed country countries, to enable enhanced the applications of environmental policies to sustain the benefits of aspiring major reductions in the cost of future mitigation and adaptation efforts. We must promote the universal access to sustainable energy in developing countries, through the enhanced deployment of renewable energy, Upholding and promoting regional and international cooperation to mobilize stronger and more ambitious

climate action by **NGO's** and non **NGO's** stakeholders, including civil society, private sectors, educational institutions, financial institutions, local communities and indigenous peoples.

Higher education plays an important, unique and crucial role in making a more sustainable society. The Climate Change and Sustainability Policy (**CLIMASP**) program at the American University of Madaba (**AUM**) was initiated in collaboration with other renowned European and Middle Eastern universities to promote and to develop interdisciplinary program (minor) on climate change and sustainability policy. The program is funded by a European Commission and led by the University of Crete, Greece. At **AUM,** we came to recognize that climate change and related subjects should shift from a strict disciplinary orientation focused on natural sciences to an inter-disciplinary topic including science, educational, economic and sociological orientation. The evolved CLIMASP initiative is designed to develop, implement and assess interdisciplinary programs for undergraduate students of various disciplines (e.g. as integrated minors) that aspire to meet the needs of climate change education and sustainability policy. **AUM** objective is to transform current unsustainable practices that prevent interdisciplinary collaboration and to promote sustainable leadership in the partners' countries, universities and its graduates. **AUM** vision is to promote interdisciplinary and multi- stakeholder driven curricula responsive to societal needs and to inclusively include undergraduate interdisciplinary, and to integrate program on climate change and sustainability policy, enabling students to acquire a Europass supplement diploma.

AUM is located in an agricultural region where drought and mis-management are threatening the continuance of farming practices. Awareness and poverty, lack of planning, and unsustainable exploitation of resources, are all problems which have to be addressed in Jordan. Jordan is currently hosting over a million Syrian refugees, increasing pressure on limited resources; Jordan is one of the poorest countries of the world in water recourses. All of these challenges require a new generation of qualified, well-educated and responsive people who will act as decision makers and individuals working together to identify and solve problems. The CLIMASP program at AUM is an opportunity to address the pressing problems of climate change and unsustainable use of natural resources in Jordan and the Middle East. In addition to the global perspective, we will also focus on the local / regional perspective. As a newly – founded university, this program may have a great impact on the general direction of curricula and course development in the future.

It is perhaps ironic that AUM itself is indirectly and unwillingly encouraging some urban development in the surrounding agricultural lands, thus causing further destruction of fertile land which is very limited in Jordan. This is because some land owners make use of rising land prices and the lack of regulations in Jordan governing the protection of land which has agricultural and natural value' i.e. people are generally not aware of the true value and benefits of land and limited natural resources, in addition to ethical issues regarding responsibilities towards society. AUM, nevertheless, will use this project as opportunity to develop courses in order to address the

causes and consequences, and possible solutions of climate change combined with unsustainable use of resources. The interdisciplinary approach will help students from various faculties to exchange their ideas and learn from each other and see things from different perspectives. Ethics, social responsibility and citizenship are among the themes which we will focus on in the revised courses and special activities and projects are being planned to make students more involved and interested.

The CLIMASP project is acknowledged by many faculty members at AUM to be an opportunity to develop some of their skills in terms of curricular developments by exercising the processes of reviewing and revisions, based on the feedback of peer reviewers and various stakeholders. The evaluation process which has been further developed due to the CLIMASP project includes the encouragement of discussions among colleagues and peers and this process makes faculty consider the relevance of their courses and the effectiveness of the methods being used. The interdisciplinary approach was used as an opportunity for learning from others and considering matters from another perspective.

2- UNIVERSITY BACKGROUND:

Image 1. AUM Location Map.

History and Overview:

The American University of Madaba (**AUM**) is a private non-for-profit university incorporated in Jordan and the State of New Hampshire, USA, and is currently working on the application for accreditation by the New England Association of Schools and Colleges. It is a newly established university located on a 100 acre (33 hectare) stand-alone campus approximately 5km from the city of Madaba, a historic region in the country of Jordan.

The history of the American University of Madaba (AUM) began with a decision by the Latin Patriarch of Jerusalem to establish a university in Madaba, Jordan. He envisioned this new university as "a stepping stone for personal and community advancement" and as a place "where ethics, values and moral integrity are pursued at the same time as knowledge and scientific skills are acquired." These concepts led to the adoption of the AUM motto – Sapientia et Scientia (Wisdom and Science).

A license to establish a new university was granted by the Higher Education Council of Jordan in 2005 and the cornerstone of the university was blessed by HH Pope Benedict XVI in 2009. In his blessing the pope confirmed the role of AUM as "a place of understanding and dialogue". He added that students, while assimilating their own culture, "will be led to a deeper knowledge of human culture achievements, will be enriched by other viewpoints, and [will be] formed in comprehension, tolerance and peace."

Curriculum development, faculty and staff hiring, and construction had proceeded sufficiently that students could enter for the school year 2011/2012. In recognition of the highly successful beginning of the university, HM King Abdullah II completed the preliminary phase of AUM's history by formally inaugurating the university on 30 May 2013.

The university began offering classes to its first-year students, all freshmen, and then realized tremendous growth (tripling in size) the second year. The growth rate continued through the third year of operation.

AUM currently offers bachelor's degrees in the following Faculties (colleges): Engineering, Science, Health Sciences, Information Technology, Art and Design, Business and Finance, Languages and Communication.

Faculty members have been recruited from throughout the Middle East, Europe and North America. Approximately two-thirds of the faculty members have degrees from US and European universities and classroom instruction is exclusively in English.

AUM is a traditional American-style four-year university located on a stand-alone campus approximately 5 km from the city of Madaba, a historic region in the country of Jordan. On the campus 11 buildings are currently in operation. Construction for phase two is expected to begin in 2016 and phase three about a year after the completion of phase two.

AUM is a private, non-profit university that draws upon religious, Jordanian, and American values, cultures and education systems to promote, ethical responsibility, social cohesion, mutual respect, hospitality, democracy, and peace.

The university is committed to devote adequate resources and energies that create a supportive and productive community serving the citizens of Jordan and, where appropriate, extending to the region and the world. The city of Madaba, with a population of approximately 80,000, is the eighth largest city in Jordan. Madaba sits in the midst of a major agricultural area and is just 40 minutes (along divided highways) from Amman, the capital of Jordan. Madaba is also about 15 minutes (by divided highway) from the Queen Alia International Airport.

Madaba is surrounded by rural areas and is of historical and economic importance due to the presence of numerous archeological and natural sites attractive for tourists (see www.visitmadaba.org). The cultural heritage of Madaba is especially rich. This area was inhabited since the stone ages and many archeological findings ranging from simple dolmens to byzantine churches with elaborate mosaic floors are evidence of ancient history and thriving societies. Mount Nebo, where Moses stood to behold Palestine is only a few minutes from Madaba and is one of the major tourist attractions. Near the base of Mount Nebo is the northern shore of the Dead Sea where there are several modern resorts. The famous hot springs at Ma'in is also located nearby.

Roman and Byzantine ruins abound within and near the city of Madaba. Of special interest is the mosaic map showing the location of Christian communities in the 5th century when the map was created. Several other mosaics are scattered in museums and churches throughout the city, thus giving Madaba the name of "Mosaic City". About 30 minutes' drive south of Madaba is the world heritage site of Umm ar Rasas, a Roman and Byzantine city now in ruins. The largest and, some say, the most beautiful and important mosaics in the Holy Land can be found there.

Structure:

The management structure of AUM is typical for any other university in Jordan and includes

- The Board of Trustees
- University Council: chair of this council is the president, it includes all deans and a representative faculty member from each faculty
- The Deans' Council, chair of this council is the University President, members are the faculty Deans. The Dean's council is the most important assembly when it comes to academic issues.
- The Faculty Councils, chair of this council is the Dean and members are heads of departments and representatives from each department elected by department council
- The Department Councils: all faculty members of the department are members; chair is head of the department.

Some numbers about AUM:

- Number of Faculties/Schools = 7 (Engineering, Science, Health Sciences, Information Technology, Business and Finance, Art and Design. Languages and Communication)
- The number of students of AUM in its 5th year (2015/2016) is around 1900 students. Planned capacity after all building phases completed c. 5500 students.
- Number of Faculty staff c. 200, around half are faculty members

Planning and Policy

AUM seeks to have broad participation from all stakeholders in the planning process and the creation of policies. Therefore, a system of evaluation and approval of strategic plans, policies and other matters of general application is being developed that solicits comments from the broad university community, as appropriate for each plan or policy.

Plans and policies are generally written by a committee under the supervision of the Office of the President or of one of the governing councils. After preliminary approval by the supervising body, the plan or policy is submitted to stakeholders for comments. Plans and policies of general applicability, such as the Vision and Mission, are submitted by email or letter to the staff and faculty for review. After a reasonable period, the formulating committee reviews the submitted comments, revises the plan or policy as appropriate and then submits to the governing body or council(s) for approval.

After final approval, plans are kept by the Office of the President and policies are given to Quality Assurance for permanent archiving. A system of policy numbering and date notation ensures that all policies are correctly filed and available for retrieval. A hard copy and electronic copy are made and stored in addition to the normal backup of files done by the university's IT department.

When the policy has public interest and application, such as the Vision and Mission or comments to be included in the student handbook, the Quality Assurance office submits the most current version of the policy to the Webmaster for inclusion on the website.

Planning

AUM believes that strategic planning is critical for the welfare of the university. The Strategic Plan discusses areas for improvement and attempts to chart key strategic directions in areas that can produce the best long-term results for AUM. The purpose of the plan, once approved by the Board of Trustees, the AUM community and stakeholders is to function as guidelines, recommendations, and directions for those entrusted with its implementation. Having a strategic plan for AUM is an integral part of the accreditation process.

A Strategic Plan was developed during the formation period of the university and served as the basis of the incorporation submittal to the Ministry of Higher Education in Jordan and the State of New Hampshire in the United States. After gaining incorporation in both Jordan and the U.S. and as part of the process to prepare for U.S. accreditation, a new strategy directing the university beyond the startup period was needed. Therefore, a Strategy Committee was formed under the Office of the President that included members of the President's staff and faculty, a member of the Board of Trustees and the Director of the Advancement Office. Hence, the committee represented all three key components of direction and support of the university – Office of the President, Owner, and Board of Trustees.

The Strategy Outline developed by the Strategy Committee is a set of goals that, if achieved, will allow the University to realize its Vision and Mission. This Strategy is the basis around which the fully comprehensive Strategic Plan was designed. The full Strategic Plan includes the details of implementation and is now being developed.

The information stated in the Strategy Outline was based on interviews with several key persons of the AUM community. The revised draft of the Strategy Outline was presented to the Office of the President for review, discussion, and revision. The revised version, after approval, was presented to the Deans Council for approval/revision and then to the University Council for approval/revision. The Strategy Outline was ultimately presented to the Board of Trustees. The approved Strategy Outline was then posted on the AUM website. A separate working group was then given the task of creating a full Strategic Plan. This Plan was reviewed by the owner, Office of the President, Deans Council, University Council, and Board of Trustees.

The Strategy Outline, developed over several months, has proven to be highly valuable in directing the course of the university. Major reorganizational changes were made based on the Strategy Outline resulting in stronger planning and control and a closer focus on accreditation and the systems needed to maintain the accreditation standards. Another benefit of the Strategy Outline was a unification of the direction of research toward community involvement and local problem solving. Other changes made based on the Strategy Outline include a strengthening of international ties and creation of an international office, adding courses of study, and increasing the number of cultural and academic events sponsored by AUM.

AUM Vision, Mission and Values

The American University of Madaba (AUM) believes that its vision and mission can best be achieved by being a private, Catholic-founded, not-for-profit university incorporated in both Jordan and the United States.

Vision:

AUM will be an internationally renowned university for its holistic education and its dedication to use wisdom and science to build a better world.

Mission:

- **AUM** ensures academic excellence through highly competent faculty, staff, and students supported by state-of-the-art sustainable facilities, strategic research and job-relevant study programs.
- **AUM** devotes its energies to the development of Jordan and the region.

- **AUM** builds on its international partnerships to enrich student experiences, to expand faculty capabilities and to broaden resources.
- **AUM** prepares leaders educated in the values of ethical conduct, human understanding, astuteness, integrity and peace who are dedicated to benefitting society and resolving local and global problems.

Values:

AUM commits itself to these fundamental Values:

1. Unique Community – To draw from different religious, Jordanian and American values, cultures, and education systems to promote ethical responsibility, social cohesion, mutual respect, hospitality, democracy and peace.
2. Holistic Education – To advance intellectual development and career opportunities, cultivate an appreciation for beauty and goodness, and provide for the physical, moral, emotional, social and cultural development of students.
3. Truth and Knowledge – To honor the pursuit of truth in all its manifestations by any ethical method, especially through the integration of knowledge across disciplines, and the imaginative and creative exploration of new ideas with the understanding that faith and reason are compatible.
4. Collaboration – To collaborate with international institutions to extend educational opportunity, enhance knowledge exchange, and enrich intellectual discourse, quality of education, and research.
5. Civic Engagement – To devote adequate resources and energies that create a supportive and productive community serving the citizens of Jordan and, where appropriate, extending to the region and the world.
6. Sustainability – To intelligently apply the best scientific and ethical principles for the care and sustainability of God's creations.
7. Diversity – To ensure a diverse community by welcoming faculty, staff, and students from different backgrounds, races, genders, and religions, thereby promoting world understanding and tolerance.
8. Good Governance – To maintain a responsible, transparent, well-managed and progressive governing system that complies with and benefits from all legal and regulatory requirements including Jordanian and American accreditation standards.
9. Equity and Merit – To practice ethical judgment on the basis of equity, merit and moral principles to create just and healthy relationships at AUM and wherever its influence may reach.
10. Quality Campus – To maintain an inspiring, encouraging and rewarding campus as the basis for steady and enlightened progress.

Incorporation and Accreditation

Incorporation

AUM was incorporated in Jordan by the Ministry of Higher Education and Scientific Research on 27 December 2005. This approval gave **AUM** the authority to operate as a private, non-profit university in Jordan.

AUM received New Hampshire Higher Education Commission (**HEC**) approval for incorporation in the state of New Hampshire, United States. By filing **HEC** approved Articles of Agreement with the New Hampshire Secretary, **AUM** became incorporated in the state of New Hampshire.

Following incorporation, **AUM** sought and received institutional degree granting authority from the New Hampshire Legislature and Governor, subject to New Hampshire Higher Education Commission approval of individual degree programs, which **AUM** has received. The following is the legislative act that gave **AUM** institutional degree granting authority:

Image 2. NEASC Accreditation

3- SETTING THE CONTEXT

The American University of Madaba was concerned about environmentally friendly conventional energy reliance during planning and construction of the campus buildings. **AUM** planned since its inception to use renewable energy resources and decided to use the geothermal and solar energy resources as supplement to conventional resources. The green campus concept also includes thermal isolation of buildings, and landscaping of the built areas to be environmentally friendly without wasting space for streets and parking lots, thus the built area is free of car traffic. A small waste water plant also exists and the treated water is to be used locally for irrigation of ornamental trees. All of this was carried out with the help of external engineers rather than the involvement of faculty members, but currently the faculty of engineering is carrying out small pilot projects for using solar energy.

Planting more trees on campus is underway, and using a mix of rain water and treated waste water for irrigation makes this sustainable and avoids the waste of other water sources. The planting of native and drought – tolerant trees is also being sought after. The CLIMASP project is increasing the cooperative and interdisciplinary work among faculty members and other staff which was previously missing. Faculty members who are involved in the CLIMASP project are now developing joint concepts for student projects to involve them in the development of the green campus.

The university welcomed the adoption of **CLIMASP** program and offered much needed support to foster the program. The administrative departments such as IT, registration, finance in addition

to the president's office did collaborate and helped in finding the appropriate methodology to adopt a new integrated minor program within the system to **AUM** students from different faculties without additional costs, and the establishment of a unit of interdisciplinary studies.

THE CLIMASP CASE DESCRIPTION

4- Achievements

A- Design phase

- Initial steps and establishing a design team

  Soon after the kick-off meeting held in Athens in February 2014, the AUM institutional CLIMASP coordinator contacted key persons at AUM. This institutional preparation included a presentation for the president and faculty deans and key administrative persons. Parallel to this faculty members were contacted and a design team including faculty members from 4 different faculties was established. This design team was then reduced to three because the coordinator of the faculty of engineering had too many commitments at his faculty and had no time to continue in this project. We were not able to recruit another person from that faculty so we continued without real participation of the faculty of engineering. The design team included faculty members from the faculties of Science, Health Sciences, and Business and Finance. We organized meetings to discuss the structure and design of the CLIMASP program at each faculty and which courses are most suitable. Each faculty coordinator mapped courses and prepared a list to be presented during internal meetings and then in the first national CLIMASP workshop held at the University of Jordan in March 2014.

- Stakeholder's engagement

  The national workshop in March 2014 included a meeting with stakeholders. Later, a selected number of AUM academic staff was engaged in the CLIMASP stakeholder's survey (WP2) which was carried out by filling a template, by academic staff at AUM, ministries, NGOs and professionals working in the private sector. This survey was finalized by summer 2014 as preparation for including the stakeholders' feedback in course revisions.

- Choosing the courses

Academic staff members initially mapped 20 undergraduate courses from the faculties of Health Sciences, Science, Business and Finance and other faculties; these increased to over

25 in the following months. Relevance, faculty interest and commitment were the most criteria when choosing the courses. The design for the minor program was set through after meetings and variable workshops, using the findings of the stakeholder's survey.

The program was planned to be multidisciplinary choosing courses from different departments and including a capstone course for practical part. The faculties who joined were faculty of Health Sciences (Nutrition & Dietetics), Faculty of Science (department Biology and Biotechnology), and Faculty of Business Administration (department of Risk Management). The Climate change and sustainability approaches that were reached through the stakeholder's survey were embedded in the selected courses in order to be used for implementation of CLIMASP.

The following tables include the final list of 24 revised courses including 3 capstone courses. A few more courses from the Marketing department were also revised; however, due to lack of coordination and effective communication inside the faculty of business and finance, these courses are not listed here as the participation of this department in CLIMASP is still pending.

The CLIMASP "minor" courses consists of core courses, elective courses and the required capstone course in three concentration areas: (1) Climate Change, Environment and Society; (2) Climate Change, Economics and Public Policy; and (3) Climate Change, Science and Technology. Each of the core and elective courses is equivalent to 6 ECTS and the capstone course of 10 ECTS.

I. CORE COURCES (All three are mandatory courses)

CLIMASP Orientations	Course ID	Course title	CH	Department	Faculty
Climate Change, Environment and Society	900171	Science and Society	3	Basic Sciences & Humanities	Science
Climate Change, Economics and Public Policy	900115	Social Ethics	3	-	Languages and Communication
Climate Change, Science and Technology	900170	Energy and the Environment	3	Basic Sciences & Humanities	Science

II. CAPSTONE COURSE (one mandatory course according to student's major)

Course ID	Course title	CH	Department	Faculty
505492	Graduation Project	5	Risk management	Business and Finance
303461	Internship in Food Science	5	Nutrition & Dietetics	Health Sciences
201473	Research project	5	Biology&Biotechnology	Science

III. ELECTIVE COURSES (<u>at least</u> 1 course from each area, and 6 courses or 18 CH in total)

CONCENTRATION AREA 1: Climate Change, Environment and Society				
Course ID	**Course title**	**CH**	**Department**	**Faculty**
900112	Civic Education	3	B.Sciences&Humanities	Science
303465	Special Topics in Food Sciences	3	Nutrition & Dietetics	Health Science

CONCENTRATION AREA 2: Climate Change, Economics and Public Policy				
Course ID	**Course title**	**CH**	**Department**	**Faculty**
900150	Introduction to Economics	3	-	Business & Finance
505101	Principles of Risk management	3	Risk management	Business & Finance
505321	Corporate Environmental management	3	Risk management	Business & Finance
505322	Project Risk Management	3	Risk Management	Business & Finance
505332	Disaster and Emergency Management	3	Risk management	Business & Finance
505431	Applications of Risk Management	3	Risk Management	Business & Finance

CONCENTRATION AREA 3: Climate Change, Science and Technology				
Course ID	**Course title**	**CH**	**Department**	**Faculty**
900116	Bio ethics	3	B.Sciences&Humanities	Science
201323	Applied Plant Biology	3	Biology&Biotechnology	Science
304231/201331	(Basic) Microbiology	3	Med. Labs, Biology & Biotechnology	Health Sciences/Science
201415,201416	Ecology, Ecology lab	4	Biology&Biotechnology	Science
201417	Applied Ecology	3	Biology&Biotechnology	Science
201472	Selected Topics in Environmental Biology	3	Biology&Biotechnology	Science
303240	Food Science	3	Nutrition & Dietetics	Health Sciences

303341	Food Hygiene	3	Nutrition & Dietetics	Health Sciences
303455	Nutrition Education	3	Nutrition & Dietetics	Health Sciences
303441	Food Systems Management	3	Nutrition & Dietetics	Health Sciences

* 3 Credit hours are equivalent to 5 ECTS

B- CLIMASP development phase

- Course Revisions: The interdisciplinary CLIMASP courses chosen have gone through a process of revising that aimed to embed sustainability into content and teaching methods. The toolkit was distributed to faculty members and a few meetings were held to explain the methodology of course revision. This started in summer of 2014 during and **after the second national workshop held in June 2014 at the Hashemite University and the American University of Madaba,** but at AUM the process of revision for some courses continued into 2015. The delay in some course revisions was due to changes in the staff involved in CLIMASP.

  Courses were first revised by their lecturers accordingly, then they were reviewed internally and also sent for external review. The peer reviewer's comments were taken into consideration for correcting the courses thoroughly. The reviewing process took several months.

  The design and structure of modules was also discussed thoroughly during the **1st regional workshop held at AUM and Jordan University during October 2014**. All partner universities presented their cases and AUM received very helpful feedback from peers from other university partners regarding the structure of the CLIMASP program and the best choice of core courses at AUM.

  The capstone courses are based on an internship and/or research project, or graduation project that provides a strong mechanism for integrating academic coursework with practical experience. Voluntary work is also encouraged as part of the capstone course. The capstone courses for CLIMASP students have not been implemented yet because these are usually offered to 4th year students (most CLIMASP students are currently 2nd – 3rd year students) and we expect further development of these capstone courses in the coming year.

  After completion of the final courses revision the program was ready for pilot phase.

- Establishing the ICT lab and unit for interdisciplinary studies at AUM

The ICT lab was equipped and functional by early 2015. It was already used during the pilot phase for some CLIMASP courses. The

The strategic plan for the unit for interdisciplinary studies including the ICT lab was prepared by

the CLIMASP coordinator at AUM by late 2014. The original plan was to call it a center. However, the president and deans' council suggested the activation and actual establishment of centers which were endorsed by the Board of Trustees as priority. Thus the Deans' council accepted finally to establish a unit or department of interdisciplinary studies at AUM which will work as part of the Center for Training and Consultation. This Center was previously endorsed and many of its objectives are similar to the "Center of interdisciplinary studies", thus duplication is to be avoided and synergies strengthened by adding the "unit of inter-disciplinary studies" to this center which is currently neing established. The unit will be responsible for many activities related to and arising from the CLMASP project including the issuing of the CLIMSAP diploma / Euro-Arab pass. The unit will have its own steering committee (see attached details about unit). The regulations of "Center for Training and Consultation" are currently being revised by a special committee.

C- Pilot Phase

For a smooth transition from disciplinary to interdisciplinary curricula, a piloting stage started in the spring (second) academic semester 2014–2015 on a small number of CLIMASP courses. Piloting creates the opportunity to demonstrate what interdisciplinary learning and teaching looks like throughout the semester and allows faculty, students and evaluators to observe processes, methods and practices. Based on the pilot assessment, proper interventions to enhance content and methods are to be applied to CLIMASP course modules.

Pilot phase was implemented on the courses that were taught during that time, where the students were introduced to the idea of climate change within the course, and they filled survey about their expectation from the course. And after the course also they were asked to express their impression. Pre-test and post-test surveys were carried out with students during the piloting phase to test reliability and validity of learning models as well as to examine possible changes during the implementation process. The analyses show that the instruments are reliable, although improvement and enrichment is still necessary. There were some increased changes experienced by students at the end of the piloting courses.
After finishing the pilot phase the findings and problems were discussed during meetings and workshops, and based on that the program can be developed.

5- Challenges:

A- Establishing the minor: Minors are not allowed at Jordanian universities according to Jordanian accreditation regulations.
B- Developing the center for interdisciplinary studies – this was mentioned above
C- institutionalizing the CLIMASP program and diploma at AUM
D- Lack of communication in some faculties and at university level during the design and development phases. Not all members of the initial design team were able / willing to

communicate and motivate others in their departments / faculties. They did not present the project appropriately / by any means at their department councils; ironically two members of the design team did not continue when they realized the project needed their efforts in designing and development. Thus we missed the opportunity to engage the Faculty of Engineering (e.g. Department of Civil Engineering), and the Department of Marketing (Faculty of Business and Finance) as part of the program. In addition, some Deans were either absent during the presentation or did not inform their colleagues about the CLIMASP project after the project was presented in early 2014.

E- Engagement of staff with the program and motivating them to get involved in climate change and sustainability program. This appears to be a common problem at AUM which has various causes, e.g. lack of incetives which were not not yet fullfilled due to finanical limitations at AUM, having other commitments thus little time remains for deeloping intitatives, and the changes of faculty members.

F- The setback in developing a modern and effective system for academic evaluation and review at AUM. CLIMASP should be seen as opportunity and driver of such positive change. However, the university management which has been changing its leading persons too frequently, failed to focus on academic development.

G- Difficulty in approaching practical methods for integrating sustainability thinking and problem-based learning into undergraduate curricula. This has been discussed at one of the workshops where an AUM faculty member expressed his worries that faculty members in Jordan are generally not aware of the true meaning of problem-based and student-based learning. There appears to be a lack of motivation toward changing traditional courses and teaching system. Moreover, students also are not always responsive and accustomed to this type of education, and this problem may have its roots in the educational systems at schools, and may also be caused by course activities which are not very appealing.

H- How to make CLIMASP sustainable at AUM and how to increase the impacts of CLIMASP on university, and the local community

6- Solutions

The following solutions are recommended and they are discussed and listed in the same order as the challenges (see previous section).

A- CLIMASP is being established at AUM as an "integrated minor", i.e. not seperated from the major. The courses being taken are part of the major and university requirements the students would anyway have to take as mandatory or elective courses.

B- the unit of interdisciplinary unit is being established as part of the center of training and consultation. The CLIMASP AUM coordinator happens to be in the Deans' council and the activation of the endorsed center has been recommended and decided upon. The Deans' council also recommends including the unit for interdisciplinary studies into the

center. This is a big step towards institutionalizing the CLIMASP program at AUM. The CLIMASP coordinator at AUM has still to follow up the establishment at all levels.

C- This goes hand in hand with the previous point – see B. Once the steering committee of the unit becomes official, it will be able to issue diplomas. We also have to work together with the registration department who must acknowledge the role of the unit in issuing the CLIMSP diplomas.

D- The current design team is more active and committed than the initial design team; yet we have to engage our colleagues and follow up the implementation in each academic department implementing CLIMASP. Activities may include bi-annual meetings with faculty members teaching the revised courses.

Our goal is to have the departments of Civil Engineering (Faculty of Engineering) and the Department of Architecture (Faculty of Art and Design). The latter have mapped a few courses and are willing to revise them in the near future. We will continue to disseminate the program and present it again intenrally, and we are planning a launching event of the ICT lab along with the Unit for Interdisciplinary studies at the end of this year, using what is left from the "indirect costs".

E- Some problems cannot be solved at the program level alone, as they are related to common problems at the university level, and the culture as a whole. We hope that the institutionalizing process and developing the regulations for incentives at AUM will proceed and CLIMASP can be used as tool for developing an academic evaluation and revision system, and improve the capacity for problem-based education.

F- see B.

G- Problem-based learning and using methodologies which are more effective than the traditional teaching system is a big challenge in all universities of Jordan. Some students appear to have well – developed research skills while others have been taught to learning contents by hard. There are public and private schools with different systems and the best schools (usually with IB –system) are expensive and unaffordable for most people in Jordan. The majority of students studying at Jordanian universities are accustomed to traditional content or knowledge – based learning. This makes the challenge of developing active student learning and problem-based learning still bigger. Moreover, we have to develop our capacities as educators and mentors. We have to establish activities which are more appealing and make students more engaged and interested. In some of the basic science courses this is still a bigger challenge. CLIMASP can be used again as tool to foster this type of education at AUM. Some of the academic staff from different faculties are now planning joint activities, practical and voluntary work, combined with student projects in each course. The engagement of the student will be evaluated using the various standard criteria derived from Bloom's taxonomy. Further activities are being

planned by AUM to organize student – led workshops combined with field work in the Madaba region about sustainability climate change and ecosystem services.

H- How to make CLMASP sustainable at AUM – through institutionalizing and further developing the CLIMASP program, and the Unit for Interdisciplinary Studies as part a permanent department in the Center for Training and Consultation (see above). Continued dissemination and activities involving the local community and other stakeholders.

7- Exploitation and Dissemination

As mentioned in the previous section, CLIMASP can be used as a tool for academic and educational development at AUM. This is due to the experience gained in reviewing and revising courses in terms of designing syllabi, course contents (e.g. what the student will learn, relevance, competencies, ethics, etc…), and clarifying the learning outcomes to be evaluated. The objectives and planned activities of the Unit for Interdisciplinary Studies as well as its basic management structure can be found in more detail in the attached files. In general the unit will play a role in (a) compiling the information about CLIMASP students, and produce a file presenting their achievements, and issuing the Euro-Arab Pass Diploma. The CLIMASP faculty coordinators will be part of the unit's steering committee and responsible for this activity. (b) The unit and the ICT lab provide the infra structure for some of the CLIMASP course activities and training. Soon after the ICT lab was ready, few CLIMASP courses were being taken in the ICT lab to make use of the equipment and the access to the web and special software. One course even included video conferences with a similar course in the US, where students were able to communicate with each other about energy and environment issues. We aspire that the ICT lab and unit will play an important role in future capacity building and training of academic staff e.g. on how to evaluate and revise and design curricula, evaluate students, etc…, according to international standards / standards required by the US accreditation associations. (c) the unit is to be used for consultation and provide any information or advice required. (d) the unit will foster cooperation and communication with scholars all over the world.
Generally, CLIMASP is being used / can be used to solve some of the academic challenges faced by AUM, and joint student activities are being planned by various academic staff involved in CLIMASP (see previous section).

The following is the feedback of one faculty member teaching a CLMASP – revised course (Civic Education) *Earth charter comes to correspond with AUM mission and vision. CLIMASP is a very vital program because of its wide range of the awareness raising topics. It provided the working team with up to date topics and ways of thinking and work that positively impacted the course outcomes. Civic education class was highly improved by implementing CLIMASP especially ICT classes we collaborate in With Gannon University.*

Soon after the Kick-off meeting in Athens, an internal meeting with key persons at AUM including the president, vice president, Deans and administrative persons ((e.g. heads of financial and IT departments) was held to present the CLIMASP project. This was in 27th February 2013. This was followed in the next weeks by several internal meetings with a number of faculty members working at the faculties of Science, Health Sciences, Business and Engineering, to present this project and initiate the design phase. The involvement of external stakeholders in 2014 was a chance to present CLIMASP project during personal meetings. The CLIMASP - AUM webpage (www.aum.edu.jo/CLIMASP), which is considered in the AUM case the most effective dissemination tool so far for CLIMASP, was launched in summer of 2015. This webpage includes details regarding the program being offered by three academic departments/three faculties and also an online registration page for the students to register in the CLIMASP program. Social media: AUM facebook page published the launching of the AUM - CLIMASP webpage. AUM website and social media published news about CLIMASP meetings partly held at AUM campus, i.e. the 2nd national workshop and the 1st regional workshop. Flyers were printed at AUM in October 2015, and distributed to students in their 1st-2nd years. The CLIMASP program was also presented during the orientation day for new students; however, and as recommended by Prof. Makrakis, we noticed that 1st year / 1st semester students were not yet ready/willing to register in such programs.

We are now in the process of designing and printing further dissemination material i.e. posters and brochures to be ready by Summer/Fall 2016. The posters will be presented in various parts and events of AUM, we are also planning to continue dissemination using social and other media. Moreover, we will soon print a number of booklets for CLIMASP students and for dissemination as well. A number of academic staff are compiling material and case studies which will be printed and bound for their CLIMASP students.

8- Conclusion:

This case study describes AUM, its achievements and challenges regarding the implementation of CLIMASP. The implementation of the program has already started after a pilot phase in which some courses were given in revised form for the first time. The student evaluation during the pilot phase indicated some positive results although statistical analysis was not possible or appropriate.

AUM has fulfilled all requirements of the project from the design phase up to the implementation phase. More than 15 academic staff and a few administrative staff were directly involved although not all staff and departments continued in the project. During the first year of implementation 30-40 students registered in CLIMASP from three departments in three different faculties. The management issue is being resolved and it is expected that the Unit for

Interdisciplinary Studies will be established soon as part of the Center for Training and Consultation. Dissemination and student materials are currently being designed and printed.

It is difficult to evaluate all the impacts of CLIMASP so far on AUM. CLIMASP, the center/unit and ICT lab are definitely playing a role in raising the capacity of faculty members, raising attention and awareness about climate change and sustainability, enhancing the focus on social responsibility and civic awareness, and providing new opportunities and ideas for interdisciplinary courses and joint activities among academic staff and students of different disciplines. CLIMASP can be used as tool for further academic development of AUM, especially when it comes to developing a system for (self-) evaluation and curricula and course revision, and developing non-traditional teaching methods. CLIMASP is expected to provide students with competencies which will increase their chances in starting their careers CLIMASP will hopefully contribute to the establishment of a new generation of scholars and professionals which will be able to face the challenges of climate change and depletion of natural resources.

REFERENCES

1- Makrakis, V. and Kostoulas-Makrakis, N., (2014), Interdisciplinary Problem-Based Sustainability Education: The Case of the CLIMASP-Tempus Minor.

2- Makrakis, V., & Kostoulas–Makrakis, N. (2014). An instructional-learning model applying problem-based learning enabled by ICTs. In A. Anastasiadis et al. (Eds.), Proceedings of the 9th panhellenic conference on ICTs in education (pp. 921–933), October 5–7, 2014, University of Crete.

3. Makrakis, V., & Kostoulas–Makrakis, N. (2015). A strategic framework for developing interdisciplinary minors on climate change and sustainability policy: The CLIMASP-Tempus example. In W. Leal Filho et al. (Eds.), Integrating sustainability thinking in science and engineering curricula (pp. 103–114). Switzerland: Springer

1- Paulo, D., Filho L., (2016) Walter (Eds.).Challenges in Higher Education for Sustainability

Development of an Interdisciplinary Programme in Climate Change and Sustainability Policy (CLIMASP)

Jerash University Case Study



Developing and Implementing the CLIMASP Minor in Jerash University

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EXCUTIVE SUMMARY;

Climate Change and Sustainability Programme (CLIMASP) is a European Commission TEMPUS funded project. The main aim of the project, as its name suggests, is to develop an Interdisciplinary programme in climate change and sustainability policy among 10 universities in Egypt, Jordan and Lebanon participated in the project. This case study introduces a clear picture about developing and implementing CLIMASP Project in Jerash University. To respond effectively to climate change and simultaneously meet sustainable development goals, radical transformations are needed. Climate change education is one of the most important solutions. Climate change education offers many opportunities and benefits for learners, educators, institutions and for wider society. Climate Change and Sustainable Policy (CLIMASP) program is a pioneer in this area.

Jerash University was founded in 1993, located about 5 km from Jerash city with eleven faculties, more than 20 departments, almost 5000 students and more than 200 staff members. At the early beginning of CLIMASP project design in our university establishing relevance of CLIMASP with real life was very important factor to be considered since CLIMASP minor in Jerash University aimed to help students understand, address, mitigate, and adapt to the impacts of climate change, to encourage the changes in attitudes and behaviours needed to put our world on a more sustainable development path.

Based on the fact that climate conditions are very critical to Jerash city, prior to the initiation of CLIMASP project Jerash University focused on climate related issues. A university elective course was environment and climate related course. Jerash University designed a well constructed strategic action plan which is to assure the correct and productive contribution of Jerash University in CLIMASP project.

In Jerash University, CLIMASP Project went through five distinct stages; design, development, piloting, implementing and evaluation stages. During the design stage, the institutional design team and staff to be involved were identified, barriers and drivers to multiple-stakeholders' involvement were analyzed and mapped. During the development stage, syllabi and modules of CLIMASP courses as well as CLIMASP minor structure were developed. In the piloting stage a transition from disciplinary to interdisciplinary curricula on small number of CLIMASP courses was accomplished. In the implementation stage CLIMASP Project was implemented and Interventions to enhance content and methods were made. During the evaluation and revision stage, which covers the whole period of the project, the evaluation tools were applied before, during, and after project implementation.

Achievements during the whole three years period of the project included the identification of barriers and drivers to multiple-stakeholders' involvement were mapped and identified, adoption of CLIMASP competences, development, validation and accreditation of CLIMASP syllabi and modules, establishment of The Euro-Arab Centre for Interdisciplinary Studies and The Information and Communication Technologies (ICT) Lab. The results of these achievements are that CLIMASP Program integrated into existing academic disciplines in our institution.

At the end of the first two semesters since CLIMASP implementation in Jerash University students who were involved in CLIMASP were asked to submit a small assignment about their participation in CLIMASP project. The following conclusions could be derived;

1. CLIMASP equip students with a fundamental understanding of the issue of climate change from diverse perspectives.
2. CLIMASP provide a comprehensive understanding of climate change which is essential to a growing number of careers.
3. CLIMASP provide students with the opportunity to evaluate the social, political, economic, and ethical dimensions of climate change.
4. CLIMASP creates opportunities for students to study, develop, and implement solutions to climate change through internships and other applied coursework.
5. CLIMASP support faculty who incorporate climate change and sustainability issues in their courses.
6. CLIMASP encourage interdisciplinary team-learning approach.

1. INTRODUCTION

CLIMASP is a European Commission TEMPUS funded project entitled "Development of an Interdisciplinary Programme in Climate Change and Sustainability Policy". CLIMASP was designed and implemented across 10 universities in Egypt, Jordan and Lebanon. The CLIMASP project is coordinated by the University of Crete, Greece through its UNESCO Chair ICT in Education for Sustainable Development. Jerash University is a partner in this programme.

The CLIMASP minor in Jerash University aimed to help students understand, address, mitigate, and adapt to the impacts of climate change, to encourage the changes in attitudes and behaviors needed to put our world on a more sustainable development path and to build a new generation of climate change-aware citizens. Helping students to deal with climate change issue is mainly achieved by providing the interested undergraduate students in our university with the possibility to acquire knowledge of climate change issues and their impacts and help them to share in planning to mitigate the consequences of climate change. The main area in helping students to understand and acquire knowledge of climate change issues is to integrate these issues into the

present educational materials through developing interdisciplinary CLIMASP courses and modules in the involved departments. This will provide undergraduate students from different majors the flexibility to select courses to enhance their interests in climate change and to enrich their major field of study with professional skills in climate change. The interdisciplinary CLIMASP courses include core courses, elective courses and required capstone courses in three main concentration areas, namely: Climate Change-Environment and Society, Climate Change-Economics and Public Policy and Climate Change-Science and Technology.

At the early beginning of CLIMASP project design in our university establishing relevance was very important factor to be considered. One major factor that contributes to poor motivation is inability of students to see the relevance of what they are learning to their future careers. Relevance is a critical factor in maintaining student interest and motivation. The element of establishing relevance is one of the most important aspects of the teaching and learning environment which motivate or de-motivate students study. Relevance can bring theory to life, and provide the motivation necessary to inspire deep and sustained learning in higher education. By establishing real-world relevance, students are provided with an important opportunity to relate any course subject matter to the world around them.

In Jerash University through CLIMASP minor we are trying to help students, as other higher education institutes involved in CLIMASP project, to be able to demonstrate their understanding of the basic concepts related to climate change adaptation, to develop core adaptation planning competencies and skills to deal with climate change issues, to connect climate change issues with other critical issues such as poverty, social exclusion, gender equity, food and water security, migration, and human rights, to demonstrate familiarity with systems-based approaches to climate change adaptation, to integrate diverse bodies of scientific knowledge in climate change and sustainability policy, to recognize, explain and connect the basic principles, concepts, theories, pertaining to the global climate change debate and to develop appropriate problem solving and service learning strategies for climate change adaptation and mitigation.

2. UNIVERSITY BACKGROUND

Jerash University was founded in 1993, located about 5 km from Jerash city center and is considered as the first private University established north of Jordan. It is located 40km north of Amman, Capital of Jordan. Jerash University Consists of eleven faculties providing over 30 undergraduate and 8 postgraduate programs, all accredit by the Ministry of Higher Education in Jordan. Jerash University is a member of the International Association of Universities, Federation of the Universities of the Islamic Word, Union Arab Universities and Association of Arab Private Institutions of Higher Education.

Jerash University ensures to provide high quality education, and is keen to conduct an outstanding level of scientific research in basic and applied sciences. Jerash University is a national university contributing in the development of the community by delivering specialists and highly qualified graduates able to compete and meet the growing needs of the labor market.

At the present time there are eleven faculties in the university with almost 5000 students and more than 200 staff members. The university faculties include; Faculty of Information Technology, Faculty of Literature, Faculty of Nursing, Faculty of Engineering, Faculty of Science, Faculty of Economics and Administrative Science, Faculty of Educational Sciences, Faculty of Shari'a (Islamic Studies), Faculty of Agriculture, Faculty of Law and Faculty of Pharmacy.

The **mission** of the university is to improve its capabilities to achieve excellence in teaching, scientific research and community service.
The **message** of the university is to be supportive to national academic institutions to achieve an effective role in the development of society and therefore to :provide teaching and learning of distinct, produce innovative research contributing to the development of knowledge, provide studies and consulting for national public and private institutions to promote sustainable development for all, provide a stimulating academic environment, achievement of local, regional and global partnerships to promote effective educational, economic and cultural development.
All of the above is based on core values such as quality and excellence, academic freedom, equal opportunities, leadership and teamwork, transparency and accountability, lifelong learning and meditation.

3. PRIOR TO CLIMASP PROJET INITIATION

Jerash city is an ancient historical city located in the Northern part of the country. Climate conditions are very critical for this city. Based on this fact and prior to the initiation of CLIMASP project Jerash University focused on climate related issues. One of the elective university courses was environment and climate related course (Environmental Science). Now two climate and environment related courses are among the university elective courses, they are; Environmental Science & Agriculture and Climate Change & Sustainable Policy. More than 400 students from all faculties of the university registered for these two courses each semester. In addition, many courses related to climate issues are included as obligatory courses in the study plan of many departments in the university such as Environment Science course in the Biology Department, Environmental Law in Law Department, Environment Economics in Agricultural Economics and Extension Department.

The university established with cooperation of the government Metrological Department a simple metrological station to follow up the weather conditions in the university as well as in the city.

4. CLIMASP PROJET

4.1: Rational;

Climate change is a complex global problem because it is intertwined with many other issues, such as economic development. It is necessary to understand how both the mitigation and adaptation to climate change are connected to issues such as eradication of poverty, increased well-being and welfare, air quality improvement, technology innovation, and food and water availability. To respond effectively to climate change and simultaneously meet sustainable development goals, radical transformations are needed. Climate change education is one of the most important solutions. Climate change education offers many opportunities and benefits for learners, educators, institutions and for wider society. Climate Change and Sustainable Policy (CLIMASP) program is a pioneer in this area. The main objective of this program is to integrate and implement the CLIMASP program as an integral part to existing undergraduate academic degrees in disciplines such as education sciences, applied sciences, technical sciences,

economics/business sciences, and social sciences. CLIMASP project is a step in the correct direction as it is targeting the issue of climate change and sustainability policy, and trying to transform current unsustainable practices with respect to interdisciplinary collaboration and promote interdisciplinary climate change curricula in the partners' countries universities.

4.2: Planning Overview

By providing strategic directions, Jerash University constructed CLIMASP project Strategic Action Plan that outlines the major priorities regarding climate change and sustainable policy and the university-level outcomes against which our performance will be measured in this area. This strategic action plan is designed to assure the correct and productive contribution of Jerash University in the project.

Consistent with the university's vision, mission, and core values, this document is organized around five broad priorities with specific objectives in each priority. In total, we have identified thirty one specific measures related to these priorities and objectives and a number of activities related to achievement of the objectives. Indicators upon our success in attaining priorities and objectives were assessed. From this university-level outline, administrative divisions, colleges, departments and specialized units are encouraged to develop more detailed courses of action in unit plans that, collectively, will constitute the university's strategic plan in the area of climate change and sustainable policy.

4.3: CLIMASP Vision, Mission and Core Values in Jerash University;

Developing a minor in Climate Change and Sustainability Policy will provide students with the necessary knowledge, skills and attributes to tackle the challenges of climate change and turn them able to act as agents of change and give them the opportunity to pursue a second area of interest. The CLIMASP minor development project in Jerash University is based upon the following vision, mission and core values.

VISION

To be the centre of choice for innovative climate change and sustainable policy education, research and training as well as a sustainable centre committed to excellence at the service of its students, scholars and the wider community in the area of climate change and sustainable policy

MISSION

Building human capacity is necessary to address the unique climate change adaptation needs and sustainable policy of vulnerable communities through teaching, action-oriented research, development of innovative technologies and community participation.

CORE VALUES

- **Commitment to**;
  - Sustainability and to acting in an environmentally friendly way
  - Innovation and excellence
  - Doing good for the whole

- **Climate-challenge driven**
- **Integrity**; Honesty, trust and openness to our stakeholders through commitment to delivering results and taking responsibility for our actions.
- **Equity and Fairness;** Embrace diversity, gender equity, impartiality and non-discrimination in all our activities.
- **Professionalism;** At all times we act with due care and process, providing quality service and interventions, being reliable and responsible as we strive for excellence while taking pride in all that we do and say.
- **Collaboration and team spirit;** Internal and external collaboration by supporting one another, respecting one another's view and making our work environment fun and enjoyable. We strive to ensure our teams have areas that are celebrated by all.
- **Creativity and Innovativeness**; we respect individuality, knowledge, skills, ideas and capabilities that each individual brings to the team towards developing our work.

Definition of planning terms;

1. **Priorities** are broad, inspirational outcomes that we seek to achieve as we fulfill our mission.
2. **Objectives** are more specific, measurable outcomes that contribute to the attainment of priorities.
3. **Activities** are the overall approaches used to achieve priorities and objectives.
4. **Indicators** represent the measures upon which our success in attaining priorities and objectives will be assessed.

KEY PRIORITIES (Figure 1: Strategy Map; Annex 1)

1. Increase Access and Opportunity;

This key priority is very important one. It ensures project access and attainment remains to be enough and equal. Given the growing need for an educated work force, increasing opportunity will be critical to promoting social mobility for future generations in the area of climate change and sustainable policy.

2. Provide resources to perform education and creative activities related to climate change and sustainability policy;

   Providing different kinds of resources needed for this project will end in performing quality education and creative activities related to climate change and sustainability policy. This will

lead to incorporating climate change and sustainable development values and practices into core activities of teaching and research, institutional management and operational systems involved with the project.

3. Piloting stage of the project;

For a smooth transition from disciplinary to interdisciplinary curricula, a piloting stage should start on a small number of CLIMASP courses. Piloting creates the opportunity to demonstrate what interdisciplinary learning and teaching looks like throughout the semester and allows faculty, students and evaluators to observe processes, methods and practices.

4. Project Implementation;

Based on the pilot assessment, proper interventions to enhance content and methods will be applied to all the CLIMASP course modules.

5. Project Evaluation;

Evaluation is being integrated into the CLIMASP program before, during and after implementation in the following way: Evaluation before project implementation includes the activities performed in the design and development stages of capturing stakeholders' expectations, competences needed as well as validating/accrediting the course modules. Internal and external assessment can provide data that demonstrates how the CLIMASP interdisciplinary courses can foster the objectives set.

4.4: Stages of CLIMASP Project (Annex 1*;* Figures 2);

In Jerash University, CLIMASP Project went through five distinct stages based on a well formulated action plan (Annex 1, figure 3), these include;

1. Design stage (December 2013 – June 2014); The tasks during this stage include but not limited to;
    a. Selection of the institutional design team & Identification of staff to be involved.
    b. Mapping and analyzing barriers and drivers to multiple-stakeholders' involvement.
    c. Participating in two national training workshops.
2. Development stage (July 2014 – June 2015); The tasks during this stage include but not limited to;
    a. Development of syllabi and modules of CLIMASP courses. (Course mapping).
    b. Participating in the 1st regional training workshop.
    c. Development of CLIMASP minor structure.
3. Piloting stage (July 2015 – December 2015); this stage is a transition stage from disciplinary to interdisciplinary curricula. It was conducted on a small number of CLIMASP courses.
4. Implementing stage (January 2016 – June 2016); the tasks during this stage include CLIMASP Project implementation and make Interventions to enhance content and methods.

5. Evaluation and Revision stage (Whole period of the project); the tasks during this stage are conducted before, during, and after project implementation.

4.4.1: Design stage;

Task 1; CLIMASP design team Identification;

The first task during this stage was to identify Jerash University CLIMASP design team. Most of staff members in all the related departments were directly involved. The design team was identified as follows (Table 1);

Table 1; CLIMASP design team/ Jerash University

DESIGN TEAM/ JERASH UNIVERSITY			
No.	NAME	SPECIALIZATION	DISCIPLINE
1.	Dr. Ali AL-Sharafat	Agricultural Economics & Agribusiness	Business/Economics Sciences
2.	Dr. Mohammad Brake	Biotechnology	Applied Sciences
3.	Dr. Yousef Jaraideh	Methods of Teaching English	Educational Sciences
4.	Dr. Abdullah Albadarneh	English Literature	Social Sciences
5.	Dr. Mysaa Ata	Animal Production	Applied Sciences

Task 2; Mapping and analyzing barriers and drivers to multiple-stakeholders' involvement;

A stakeholders' survey was conducted. The survey aimed at providing the opportunity of understanding climate change and sustainable policy concepts by various stakeholders and to promote their engagement in the project. This will result, in a way or another, in improving environment related to better understanding and dealing with climate change and sustainability policy issues. Mapping and analyzing barriers and drivers to multiple-stakeholders' involvement, identifying CLIMASP Project competencies, and how to improve stakeholders inputs to the program are the issues to be considered in conducting and analyzing the stakeholders' survey. The purpose of stakeholder involvement in the project is to help identify the most important outcomes to the project and to set out an understanding of those outcomes that has been informed by stakeholders. **The surveyed stakeholders were;**

- ✓ University: students, staff, administrators;
- ✓ Government agencies: Jerash governorate, Higher education institutions accreditation committee, Jerash Agriculture Directorate, Civil Defence Directorate, Royal Environment Protection Administration, Jerash Tourism Directorate, and Directorate of Education.
- ✓ Associations: Farmers Union, Agricultural Engineers Association.
- ✓ Civic society: Handicap International, Charitable Organization.

The main barriers derived from stakeholders' survey for stakeholders' involvement in CLIMASP Project are as follows;

1. Low level of awareness about climate change and sustainable policies
2. Lack of knowledge of scientific aspects of climate change and sustainable policies
3. Lack in realizing the vulnerability of socio-economic and natural systems to climate change and sustainable policies
4. Lack in realizing that climate change is already a reality and poses threats and dangers to the survival of human communities
5. Slow response from government regarding climate change sequence
6. Involving stakeholders without taking their advice may raise an expectation that hasn't been met, which can lead to distrust and hamper morale
7. No sufficient time to engage enough stakeholders

The main drivers derived from stakeholders' survey for stakeholders' involvement in CLIMASP Project are as follows;

1. Importance of stakeholder involvement: we understand why stakeholder involvement is important. We understand why active stakeholder involvement is important and what the impact to the project will be if we don't have it.
2. Support from the stakeholders themselves: some of the stakeholders would love to be actively involved with the project, and many more could likely be easily convinced that they should be involved.
3. Potential beneficiaries may be wildly supportive of an effort, seeing it as an opportunity or the pathway to a better life…
4. Involving stakeholders can build trust
5. Involving stakeholders can increase transparency and lead to better decision making

The results of stakeholders' survey were very useful in addressing the followings during the process of courses revision;

- ✓ The latest scientific, technical, and socio-economic information relevant for the understanding of human induced climate change
- ✓ The potential impacts and options for mitigation and adaptation to climate change
- ✓ The link between the scientific information provided by expert sources and the policy-makers
- ✓ The capacity building process related to climate change and sustainability policy aspects
- ✓ The tools that could be used for promoting climate change and sustainability policy awareness at the national level

The following guidelines for strengthening stakeholders' inputs to the project could be adopted;

1. Treating them with respect
2. Providing whatever information, training, mentoring, and/or other support they need to stay involved

3. Finding tasks for them to do that catch their interest and use their talents regarding project issues
4. Engaging them in decision-making
5. Employing them, if possible, in the conception, planning, implementation, and evaluation of the project
6. Helping them learn how to gain and exercise influence by working together and developing their personal, critical thinking, and skills related to the project
7. Building trust with them
8. Sharing them the responsibility for decisions or actions
9. Enhancing communication and coordination with them

4.4.2: Development stage;

Task 1; Development of syllabi and modules of CLIMASP courses.

Regarding this stage Jerash University accomplished the following tasks;

1. Revision of the university courses catalogue; 1311 courses were revised in 11 faculties (26 Departments).
2. According to course revision, the best suitable faculties, disciplines, and faculty members to be involved in the project were selected.
3. Four faculties (Arts, Education, Agriculture, Economics & Administrative Sciences) were chosen to be involved directly in the program. The other faculties will be included in later stage.
4. Three faculties were chosen to be involved in the piloting stage in CLIMASP program implementation (Agriculture, Economics & Administrative Sciences and Arts).
5. One department from each of the three selected faculties was chosen to be included in the piloting (7/2015 -12/2015);
    - Department of Food Science & Nutrition.
    - Department of Accounting.
    - Department of English Language & Literature.
6. A complete review was conducted for each course syllabi and module in the selected disciplines in line with the project objectives; Out of 1311 courses, 97 potential courses were selected to be involved in CLIMASP minor. The potential courses were selected according to the three concentration areas; Climate Change, Environment and Society; Climate Change, Economics and Public Policy; Climate Change, Sciences and Technology.
7. Out of the 97 potential courses, syllabi and modules for 30 courses were developed and sent for peer-reviewing. Development of syllabi and modules accomplished with the help of the inter-university team in the various faculties to integrate the climate change and sustainability theme.
8. The peer-reviewed courses were modified according to the comments from the peer-reviewers (Suez Canal University) before implementing the piloting stage. 28 courses were peer-reviewed by SCU (Table 2).
9. 19 courses out of these 30 were selected from the University Compulsory and Elective courses. The remaining courses were selected from student plan.
10. Two new important courses for CLIMASP program were added to the elective courses of the university to be core courses (3 CH OR 5 CTIS each); they are; 1) Climate Change & Sustainable Policy. 2) Environmental Science. (These two courses are available for all students in the university)
11. Enough resources (Text books, websites…) about climate change and sustainable policy were provided in the university library.

Table 2; Courses Developed for CLIMASP Minor according to key areas;

No.	Climate Change, Environment, and Society	Climate Change, Economy, and Policy	Climate Change, Science, and Technology
1.	Climate change and sustainability policy	Graduation project	Animal environment
2.	Environmental science	Environmental law	Biodiversity
3.	Community nutrition 1	Pollution and Ind. safety	General biology
4.	Community nutrition 2	Economic fruit crops	Scientific translation
5.	Knowledge management	Fiscal and monetary policies	Practical agriculture
6.	Communication skills in English	introduction to economics	Environmental engineering
7.	Health education	Managerial economics	Special topics in medical physics
8.		Economic development	Environmental chemistry
9.		Environmental economics	General chemistry
10.		Economic plants	General physics
11.		Principles of statistics	
Total	7 Courses	11 Courses	10 Courses
Total	28 courses		

Task 2; Development of CLIMASP minor structure;

According to the first national workshop outcomes (19th – 20th March 2014, The University of Jordan, Amman, Jordan), three models of CLIMASP minor structure were suggested;

1. Model No. 1; all students' share two core courses, and the remaining courses are picked from the student's study plan.
2. Model No. 2; the courses are almost the same for all students.
3. Model No. 3; 8 – 12 courses are to be picked from the student's study plan, 3 – 5 courses from the university elective courses and 5 – 7 courses from the department courses.

* Model No. 1 was adopted in the structure of CLIMASP program in our university (Table 3);

Table 3; CLIMASP Minor student study plan

JERASH UNIVERSITY				
College…….			Department: ……	
			1. Compulsory Courses (6 CH, 10 ECTS);	
No.	Course No.	Course Name	CH	ECTS
1.	603116	Climate Change & Sustainable Policy	3	5
2.	601115	Environmental science	3	5
3.	501101	Human Rights	3	5
Total Compulsory CH (ECTS);			9	15
2. Elective Courses (15 CH, 25 ECTS); from the elective courses in student's study plan;				
1.	102108	Communication Skills in English Language	3	5
2.	403105	Islamic Culture	3	5
3.	070112	Thinking and Creativity	3	5
4.	501108	Contemporary legal Issues	3	5
5.	206107	Introduction to Economics	3	5
6.	204322	Knowledge Management	3	5
7.	102108	Computer Skills	3	5
8.	According to student study plan	3 courses to be picked up from compulsory courses in the student study plan	9	15
9.				
10.				
11.				
Total Elective CH (ECTS);			15/30	25/50
3. Capstone (3 CH, 5 ECTS);			CH	ECTS
1.	Field Training, Graduation Project …		6	10
Total CH, ECTS in Plan;			30	50

Task 3; Peer-reviewing Process;

Four external evaluations were conducted for Jerash University Courses and Syllabi;

FIRST;

Conducted by Suez Canal University. The results were presented by Dr. Nehal L. Khalil, (SCU coordinator) in the 1st regional workshop of CLIMASP project: Amman 24-27 October 2014: (28 COURSES);

The Structure of CLIMASP minor and course modules of our university were revised by Suez Canal University. Dr. Nehal L Khalil, SCU coordinator presented the results of the peer-review and the reflections on the reviewed courses. The following concluding remarks were drawn;

- Most of the reviewed courses did NOT state basic information about the course name, number, instructor, a lecture timing, place, and contact info of the instructor.
- Some courses didn't use measurable action verbs in the objectives of the course.
- Some courses didn't elaborate on teaching methodologies used while teaching the course.
- Sometimes the alignment between the course objectives and the assessment methods is not clear.
- In most cases the interdisciplinary approach is not clearly stated.
- Activities for students as agents of change are not adequately covered.
- The relation between courses' activities and the local community is not stressed.

The following suggestions for enhancement were introduced;

- Rubrics should be provided to align course objectives, teaching methodologies, assessment techniques and students activities.
- Add more courses to the Social concentration of climate change.
- Values related to climate change should be integrated in the reoriented courses in a more comprehensive way.
- Civic engagement should be reflected in teaching methodologies (community-based learning, service-based learning, and project-based learning).

Our team deeply discussed these remarks and suggestions and modified the course syllabi and modules for CLIMASP minor according to these remarks and suggestions.

SECOND;

- Conducted by Dr. Khaleel AL-Said. 10 COURSES (In Arabic) were sent to Dr. Khaleel (September, 2015) to be evaluated and the results sent to Prof. Makrakis by Dr. Khaleel.

THIRD;

- Conducted by Dr. Carmel Mulcacy. 24 COURSES were sent to Dr. Carmel (September, 2015) to be evaluated. The results were encouraging and most of the needed corrections were made.

FOURTH;

- Conducted by Dr. Michele Biasutti. 3 COURSES were sent to be evaluated by Dr. Biasutti (13 February, 2016) and other 21 courses were sent to him (24 March, 2016). The needed corrections were made.

Task 4; Setting-up CLIMASP infrastructure;

A. Euro-Arab Interdisciplinary Studies and Climate Change Centre;

The centre provides opportunities for staffs and students to explore topics related to Climate Change. The centre will function as an essential site and mechanism through and across which facilitation of interdisciplinary work on Climate Change occurs. The mission, vision, and goals and objectives of the centre are formulated. The institutional structure and the strategic action plan for the centre accomplished.

Procedure;

1. A committee was formulated by the president of the university for the identification of equipments and materials needed for the lab and the center according to CLIMASP regulations (The Financial Manager, the Inventory Manager, the Dean of IT Faculty, the Computer centre Manager, and the Institutional Coordinator for CLIMASP Project). The same committee along with the design team and representatives of the faculties involved in the CLIMASP minor will be responsible for running the lab. As well as the center.
2. A list of the needed equipment and materials was made.
3. Five offers were made to purchase the equipment and materials. Three of these offers were accepted. One was selected (Most suitable).
4. Equipment; equipment purchased, installed, and recorded in the inventory of the university.

Mission of the Centre;

To promote climate change and sustainable policy issues through education taking into consideration the many intricacies of providing sufficient knowledge on these issues.

Vision of the Centre;

To be a national center of excellence in interdisciplinary teaching, research, and training on climate change and sustainable policy.

Goals of the Centre;

- Help students understand, address, mitigate, and adapt to the impacts of climate change.
- Encourage the changes in attitudes and behaviors needed to put our world on a more sustainable development path.
- Build a new generation of climate change-aware citizens.
- Expand knowledge base on climate change and sustainable policy.
- Create awareness on climate change and sustainable policy issues and challenges.
- Empower research and development institutions on climate change and sustainable policy.

Objectives of the centre;

1. Generate knowledge and technologies through multidisciplinary approaches in climate change and sustainable policy.
2. Create a platform for continuing discussion and consultation on climate change and sustainable policy issues and challenges in Jordan.
3. Mainstream climate change and sustainable policy in curricular programs at Jerash University.
4. Strengthen concerns and programs on climate change and sustainable policy with the participation of other stakeholders.

B. Information and Communication Technologies (ICT) Laboratory;

The Information and Communication Technologies (ICT) Lab. is integrated into the Euro-Arab Centre for Interdisciplinary Studies and Climate Change.

A plan for the Centre and ICT lab was made, providing location, space, size, design, etc;

- Location; IT College building, room no. 503, fifth floor.
- Area; around 60 m².
- Design; as shown in the photos.
- Equipment; equipment directly relevant to the objectives of the project were identified, purchased, and installed (Table 4) .
- Equipment (Photo 1 annex 1):

Table 4; Equipment of ICT LAB

No.	ITEM	DESCRIPTION	Q
1.	ActivBoard	Size; 105", Active; 95"	1
2.	Data Show	Ultra Short Throw projector Min 6000 hours 3LED/3000 Lumens	1
3.	Video conference equipment	Complete Video conference equipment + 42" TV	1
4.	Desktop Computer	Processor; 4 Generation Intel care i7 (6CASHE,302ghz), Memory; 8GM RAM DDR3 WITH 4DIMM, Graphics; Dedicated 4GB or (2GB & 2GB Share from memory), Hard Disk; 500 GB 17200, Expansion Parts; 8 USB (Front/Rear), Integrated sound card with speakers, Multimedia; Super DVD/R/W/Optical Mouse, Screen; 19-21" LED Monitor, Chipset; Intel All, WI-FI AND Bluetooth enabled.	20
5.	Printer	Network/duplex 4 in 1 Colour laser printer A4/A3, USB, Ethernet (10/100/1000), 5000 Min. monthly duty cycle, Network and Scanner enabled,	1
6.	Scanner	A4 Scanner	1
7.	Access Point	Wireless Access Point	1
8.	Network Switch & Cabling	RJ 45 Ports + Giga 10/100/1000, Cat 615cable one box	1

4.4.3: <u>Piloting stage</u>;

This stage, as stated earlier, is a transition stage from disciplinary to interdisciplinary curricula. It was conducted on a small number of CLIMASP courses. A pilot is simply a test or a trial. It is the validation that the project works as intended and that it is setup in a way that properly supports the goals. A pilot is the implementation of the project on a small controlled scale to allow for its full impact, benefits and weaknesses to be evaluated before full implementation. A properly conducted Pilot Phase sets the stage for a successful project launch. Success of the pilot phase can be defined as the smooth running of the pilot as planned.

Planning for the Pilot Phase;

To ensure success of the pilot phase a plan considering the following components was formulated (Faculties, Disciplines, CLIMASP courses & no. of students participating in this stage are presented in tables 5, 6 and 7);

1. The pilot's objectives.
2. The tools to be used.
3. Implementation details.
4. Logistics needed.
5. Timeframe.

6. Team members (profiles & responsibilities).
7. Pilot phase final report.

Table 5; Faculties & Disciplines participated in the pilot phase;

Faculty	Disciplines
Faculty of Agriculture	Food Science & Nutrition Plant Prod. & Protection
Faculty of Arts	English Language Translation
Faculty of Economics and Administrative Sciences	Accounting
Faculty of Education	Classroom Teacher Kindergarten
Faculty of Law	Law
Faculty of Science	Biology Math.

Table 6; No. of students participated in the pilot phase;

Faculty	Disciplines	No. of Students
Faculty of Agriculture	Food Science & Nutrition Plant Prod. & Protection	41 47
Faculty of Arts	English Language Translation	32 23
Faculty of Economics and Administrative Sciences	Accounting	110
Faculty of Education	Classroom Teacher Kindergarten	28 15
Faculty of Law	Law	29
Faculty of Science	Biology Math.	32 44
Total		401

Table 7; CLIMASP courses included in the pilot phase;

No.	Course Name	Faculty
1. 2.	Climate Change & Sustainable Policy Environmental Science & Agriculture	Faculty of Agriculture
3.	Communication Skills in English Language	Faculty of Arts
4. 5. 6.	Microeconomics Macroeconomics Introduction to Economics	Faculty of Economics and Administrative Sciences
7.	Thinking & Creativity	Faculty of Education

8.	Human Rights	Faculty of Law
9.	Basic Biology	Faculty of Science

Once the pilot's testing period has come to an end, the team wrote a detailed report with the collected findings. The report included the most relevant data gathered, as well as the results from the pre-test and the post-test tests and additional information obtained from other sources.

Results of the Pilot Phase;

Student perceptions of Interdisciplinary Teaching and Learning of CLIMASP courses at Jerash University were tested. In order to determine the students' perceptions of Interdisciplinary Teaching and Learning of CLIMASP project courses at Jerash University, a questionnaire was constructed by Dr. Vassilli Makrakis (Project coordinator/ University of Crete). The questionnaire, as a survey instrument, was used at the beginning and at the end of the pilot phase. The questionnaire contained dimensions related to students' previous courses and their previous learning experience or ability. In the first section of the questionnaire (variables 8 – 21) students were asked to rate each item in the questionnaire on a Likert-type scales ranging as follows: 1 = not at all, 2 = few times, 3 = often, and 4 = very often. In the second section of the questionnaire (variables 22 – 73) students were asked to rate each item in the questionnaire on a Likert-type scale ranging as follows: 4 = agree strongly, 3 = agree somewhat, 2 = disagree somewhat, and 1 = disagree strongly. In total, 326 students were interviewed in the pre-test survey. The same students also interviewed in the post-test survey. Nine CLIMASP courses from six faculties and ten disciplines were covered in the survey. Comparing students perceptions at the beginning of learning the interdisciplinary CLIMASP courses and at the end of the learning process, results showed that there is a significant difference in the level of students' perceptions towards interdisciplinary learning of the CLIMASP courses at Jerash University. Students' perceptions changed in a positive manner suggesting that their perceptions improved. The reason for this improvement is learning of the interdisciplinary CLIMASP courses.

4.4.4: <u>Implementing stage</u>;

The tasks during this stage include CLIMASP Project implementation and making Interventions to enhance content and methods. CLIMASP Project implementation in Jerash University started officially on October 1, 2015 (Fall Semester 2015/2016). Spring Semester (2015/2016) is the second semester of the project implementation phase. The total number of students participating in CLIMASP is presented in table 8 below. Tables 9 and 10 show CLIMASP Project courses by faculties, disciplines and concentration areas during Spring Semester 2015/2016 and CLIMASP Project Courses and No. of Students during Spring Semester 2015/2016 respectively. In addition to workshops and meeting held with the other local partners in the project, four workshops were organized in our institution for our design team and staff. In-depth training through these workshops on climate change and course development related issues was provided to the team.

Table 8; Total Number of Students Participating in CLIMASP

Faculty	Department	Number	%
Agriculture	Food Science & Nutrition	34	25.0
	Plant Production & Protection	29	21.3
Economics & Administrative Sciences	Accounting	23	16.9
Arts	English Literature	16	11.8
	Translation	9	6.60
Education	Classroom Teacher	11	8.10
	Kindergartens	14	10.3
Total		**136**	**100**

Table 9; CLIMASP Project Courses by faculties, disciplines and conc. areas (Spring Semester 2015/2016)

No	Course	Discipline	Faculty	Conc. Area
1.	Climate Change & Sustainable Policy	Ag. Econ. & Extension	Agriculture	CC, Environment and Society
2.	Environmental science & Agriculture	Plant Production		
3.	Human Rights	Civil Law	Law	
4.	Human Nutrition	Nutrition	Agriculture	
5.	Communication Skills in English Language	English Literature	Arts	
6.	Introduction to Economics	Accounting	Economics & Adm. Sciences	CC, Economy and Policy
7.	Knowledge Management			
8.	Contemporary legal Issues	Civil Law	Law	
9.	Fundamentals of Soil Science	Plant Production	Agriculture	CC, Science and technology
10.	Practical Agriculture (Plant Production)			
11.	Introduction to Computer & Internet	Computer Sciences	IT	
12.	General Biology	Biology	Sciences	

Table 10; CLIMASP Project Courses and No. of Students During Spring Semester 2015/2016

No.	Course	Number of Students	Concentration Area
1.	Climate Change & Sustainable Policy	12	CC, Environment and Society

2.	Environmental science & Agriculture	9	
3.	Human Rights	13	
4.	Human Nutrition	4	
5.	Communication Skills in English Language	11	
6.	Introduction to Economics	7	CC, Economy and Policy
7.	Knowledge Management	4	
8.	Contemporary legal Issues	9	
9.	Fundamentals of Soil Science	5	CC, Science and technology
10.	Introduction to Computer & Internet	8	
11.	Practical Agriculture (Plant Production)	6	
12.	General Biology	6	
Total		**94**	

4.4.5: Monitoring and Evaluation stage;

The coordination of the project is under the direction of Prof. Ahmad AL-Salymeh from The University of Jordan. The institutional management group of the project includes representatives (institutional coordinators) from different partner universities in Jordan (The University of Jordan, The Hashemite University, The American University of Madaba, and Jerash University). The institutional management group is responsible for methodological, organizational and financial management of the project.

Monitoring & Quality Assurance (MQA) is a systematic evaluation of the various aspects of a project to ensure that standards of quality are being met. MQA is essential to ensure that the intended project objectives can be achieved within the given time frame following the activities as planned to be carried out by project personnel.

Monitoring and Evaluation was being integrated into the CLIMASP program before and during and implementation and it will be integrated after implementation of the project in the following way:

Monitoring and Evaluation before project implementation includes the activities performed in the design and development stages of capturing stakeholders' expectations, competences needed, and aversions as well as validating/accrediting the course modules. At stages of design and development several instruments were used in the MQA process including:

1. Close monitoring from the project coordinator and the national coordinator noticed during the accomplished stages of the project. This was mainly through huge and frequent exchange of mails between Prof. Vassilios Makrakis (Project Cordinator) & Prof. Ahmad Salaymeh (National Coordinator), and between them and the institutional coordinators and staff.
2. Templates developed to be used in all tasks (e. g; identification of stakeholders, mapping stakeholder's knowledge, internal peer-reviewing template, and CLIMASP course syllabus & modules templates).
3. CLIMASP Toolkit used in revising mapped courses.
4. The Online Community of Practice (OCoP) which used for further work on the internal peer-reviewing before the external review.

5. Achievements;

During the whole three years period of the project the following achievement could be addressed;

1. Consortium agreement signed, Project management plan developed and Barriers and drivers to multiple-stakeholders' involvement were mapped and identified.
2. CLIMASP competences addressed based on results of stakeholders' survey and Guidelines for strengthening stakeholders' inputs to the project were adopted.
3. Jerash University participated actively in the 1st, 2nd, and 3rd CLIMASP national training workshops, the 1st and 2nd CLIMASP regional training workshops. The Online capacity building and support initiated.
4. CLIMASP courses syllabi and course modules revised and developed, validated and accredited. Faculties, disciplines, and faculty members to be involved in the project were selected.
5. The peer-reviewed courses modified according to the comments from the peer-reviewers. Development of syllabi and modules accomplished with the help of the inter-university team in the various faculties to integrate the climate change and sustainability theme.
6. The design team for CLIMASP project with the assistance of the other related persons in the university validates and accredits the interdisciplinary course syllabi and course modules of CLIMASP project. The dean's board approved all changes made on the involved courses.
7. The Euro-Arab Centre for Interdisciplinary Studies and Climate Change established and The Information and Communication Technologies (ICT) Lab is integrated into the Euro-Arab Centre for Interdisciplinary Studies and Climate Change. A plan for the Centre management and running was developed.
8. A pre-teaching survey was conducted on students in Climate Change & Sustainability Policy classes.
9. CLIMASP Program integrated into existing academic disciplines in our institution.

Outcomes According to missions;

1. Management; Plan, consortium agreement, biannual progress reports.
2. Development;
    a. Stakeholders' survey and guidelines for university-community partnerships.
    b. Interdisciplinary CLIMASP syllabi and modules.
    c. Integrative and interdisciplinary studies centres.
    d. Implementation and institutionalization of CLIMASP in the undergraduate degrees of various disciplines.
3. Exploitation; CLIMASP training workshops and resources.

4. Quality Plan; Quality control and monitoring plan as well as internal and external monitoring and quality control reports.
5. Dissemination;
    a. CLIMASP Euro-Arabpass.
    b. International network of CLIMASP studies.
    c. International conference and list of publications, achievements, and good practices.

6: Obstacles, Shortcomings and solutions;

In the project kick-off meeting, the representatives of our institution were absent; no further contributions were made during a period of three months from that event. This was a big shortcoming concerning our institution participation in the project. Besides our late involvement in the project activities, all the correspondence was made to the former contact person. Due to these circumstances the involvement of our institution in the project was a matter for concern. Another obstacle for the implementation of the project was the institutional requirements for the inclusion of the climate change concepts in the courses. A third obstacle was the approval of the Deans Board of the two new suggested courses with climate change & environment topics. The design team openly discussed these constraints with the related parties and made extraordinary efforts to overcome all of them. Now we are actively participating in the project.

Compared with the original project proposal and during the previous period of project implementation no changes or modifications took place. No modification of CLIMASP activities, budget, or eligibility period was required. The only changes which took place were the change of the contact person in our institution and change of legal representative. The new contact person is Dr. Ali AL-Sharafat who was replaced by the present contact person Dr. Mysa'a Ata. The former contact person of our institution was Dr. Ghaith Jaradat. The legal representative of our institution was the former university president Prof. Khaled Alomari and the new legal representative of our institution is the current university president Prof. Abderrazaq Bani Hani. An official letter signed by Prof. Abderrazaq Bani Hani concerning those changes sent to Tempus project office in Jordan and to Prof. Makrakis.

7: Dissemination and Sustainability;

The major focus is to ensure that the achieved project's outcomes of the project are widely disseminated to the appropriate target communities, at appropriate times, via appropriate methods. A multi-dimensional dissemination approach with different communication tools adapted to the respective target groups, stakeholders and partners involved was used to disseminate project concepts and results and attract interest and necessary feedback/involvement from them. The approach regularly reviewed on the basis of the project's evolution and of the acquired new knowledge that will allow adding new dissemination opportunities. Different actions were taken to reach the dissemination and sustainability goals. These mainly include;

1. Target groups identification: a list of the target groups, stakeholders involved for the dissemination activities were provided, along with an indication of the most appropriate partner(s) to approach them.

2. Project identity: in carrying out all dissemination tasks of the project, the project logo used in the documentation to be easily identifiable. All dissemination tools and activities referred to the name and identification code number of the project (Project No 543879-TEMPUS-1-2013-1-GR-TEMPUS-JPCR), to the project's website URL (http://www.climasp.eu) and the project portal on the university website (www.jpu.edu.jo/CLIMASP/en./), and to the graphic elements (logo) of the project (below).

3. Dissemination tools:
    a. Project Website: a website dedicated to the project has been released and is available on the following URL address: (http://www.climasp.eu).
    b. Project Portal: a portal dedicated to the project has been created and is available on the following URL address: (www.jpu.edu.jo).
    c. Technical papers, press releases and other dissemination channels: a number of demonstrations relating to the project were specified and published through these tools. A brochure about project aims, procedures, and construction was distributed among all interested parties (especially students). Means of posters and flyers were used.
    d. Fact Sheet: a fact sheet about the project was prepared and distributed among the university academic staff, the university administration, and students.
    e. Presentations: brief project presentation was prepared and published to all faculties and departments. The presentation was under the following headings:
        - project name & logo
        - project objectives
        - project participants & target groups
        - project expected achievements/impact
        - project coordinator and staff contact details
    f. Production of leaflets: leaflets with materials on the CLIMASP project were produced and distributed to the students and other related parties.
    g. Workshops and Events: many workshops and events related to the project were organised.
    h. **Sending e-mails:** sending e-mails adopted as a direct and easy method of communicating with any audience**.**
    i. *Social networking:* In year three of the project, our university will constitute a Facebook group and a tweeter/hashtag. Those are jointly managed and fed, although one person is in charge of monitoring it.

8. CONCLUSIONS;

This case study covered all stages and procedures followed in developing and implementing CLIMASP project in Jerash University. The project aim is to integrate interdisciplinary CLIMASP courses into existing undergraduate disciplines to provide undergraduate students from different majors the flexibility to select courses to enhance their interests in climate change. Most of the results of achieved activities during the past period are highly contributing to the objectives of the project. The project activities in our institution is organized and managed by women and men in almost equal proportions. Gender balance in the project is in line with equal opportunities given to women.

Due to Jerash University late involvement in the project, we missed the kick-off meeting in Athens at the beginning of the project. The project agreement officially was signed by the former president of our university on the 5th of June, 2014. The institutional design team and the involved staff as well as the contact person were identified. Stakeholders' survey was conducted. The stakeholders' survey aimed at providing the opportunity of understanding climate change and sustainable policy concepts by various stakeholders and to promote their engagement in the project. Mapping and analyzing barriers and drivers to multiple-stakeholders' involvement, identifying CLIMASP Project competencies, and how to improve stakeholders inputs to the program are the issues considered when conducting and analyzing the stakeholders' survey.

During the design phase of the project, aiming at achieving capacity building for CLIMASP curriculum development and implementation, our institution participated in the first CLIMASP national training workshop at The University of Jordan (19th and 20th March 2014), the second CLIMASP national training workshop at The Hashemite University and AUM (16th , 17 and 18th June 2014), and the 1st Regional CLIMASP Training Workshop which held in Jordan on 25-27 October 2014 at the American University of Madaba (AUM), Jerash University, and the University of Jordan. These participations aid in capacity building for CLIMASP curriculum development & implementation.

Development of CLIMASP courses was accomplished during the second stage of the project (July 2014 – January 2015). The Structure of CLIMASP minor and course modules of our university were revised through four external peer-reviewing processes. At the end of each process the needed corrections were made. The design team for CLIMASP project with the assistance of the other related persons in the university validates and accredits the interdisciplinary course syllabi and course modules of CLIMASP project. The dean's board approved all changes made on the involved courses. Based on a suggestion of the design team, two new courses were added to be an elective university courses; Climate Change & Sustainable Policy (0603116) and Environmental science & Agriculture (0603115). These two courses were included to be compulsory in CLIMASP study plans.

The Euro-Arab Centre for Interdisciplinary Studies and Climate Change established and The Information and Communication Technologies (ICT) Lab is integrated into the Euro-Arab Centre for Interdisciplinary Studies and Climate Change. A plan for the Centre and ICT lab was made, providing concrete location, space, size, design, etc…. The centre provides opportunities for staffs and students to explore topics related to Climate Change. The Centre will function as an essential site and mechanism through and across which facilitation of interdisciplinary work on Climate Change occurs. The mission, vision, and goals and objectives of the centre were formulated.

A multi-dimensional dissemination approach with different communication tools adapted to the respective target groups, stakeholders and partners involved was used to disseminate project concepts and results.

The overall conclusion to be derived is that the CLIMASP Program is integrated into existing academic disciplines in Jerash University.

At the end of the first two semesters since CLIMASP implementation students who were involved in CLIMASP were asked to submit a small assignment about their participation in CLIMASP indicating the way they were informed about CLIMASP minor. The following conclusions could be derived;

7. CLIMASP equip students with a fundamental understanding of the issue of climate change from diverse perspectives.
8. CLIMASP provide a comprehensive understanding of climate change which is essential to a growing number of careers.
9. CLIMASP provide students with the opportunity to evaluate the social, political, economic, and ethical dimensions of climate change.
10. CLIMASP creates opportunities for students to study, develop, and implement solutions to climate change through internships and other applied coursework.
11. CLIMASP support faculty who incorporate climate change and sustainability issues in their courses.
12. CLIMASP encourage interdisciplinary team-learning approach.

9. Acknowledgement

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10. References;

1. Davies. M., & Devlin, M. (2007). Interdisciplinary higher education: Implications for teaching and learning. Melbourne, Australia: The University of Melbourne, Centre for the Study of Higher Education. Retrieved from https://cshe.unimelb.edu.au/resources_teach/curriculum_design/docs/InterdisciplinaryHEd.pdf
2. Ertas, A., Maxwell, T., Rainey, V. P., & Tanik, M. M. (2003). Transformation of higher education: The transdisciplinary approach in engineering. IEEE Transactions on Education, 46(2), 289-295. doi:10.1109/TE.2002.808232
3. Holley, K. A. (2009). Interdisciplinary strategies as transformative change in higher education. Innovative Higher Education, 34(5), 331-344. doi:10.1007/s10755-009-9121-4
4. Klein, J. T. (1990) Interdisciplinarity: history, theory and practice. Detroit: Wayne State University Press.
5. Newell, W. H. (2009) 'Interdicisplinarity in undergraduate general education'. In R. Frodeman, J. T. Klein and C. Micham (Eds.) The Oxford handbook on interdisciplinarity. Oxford: Oxford University Press.

11. Annexes;

Annex 1*;* Figure 1;

CLIMASP Strategy Map

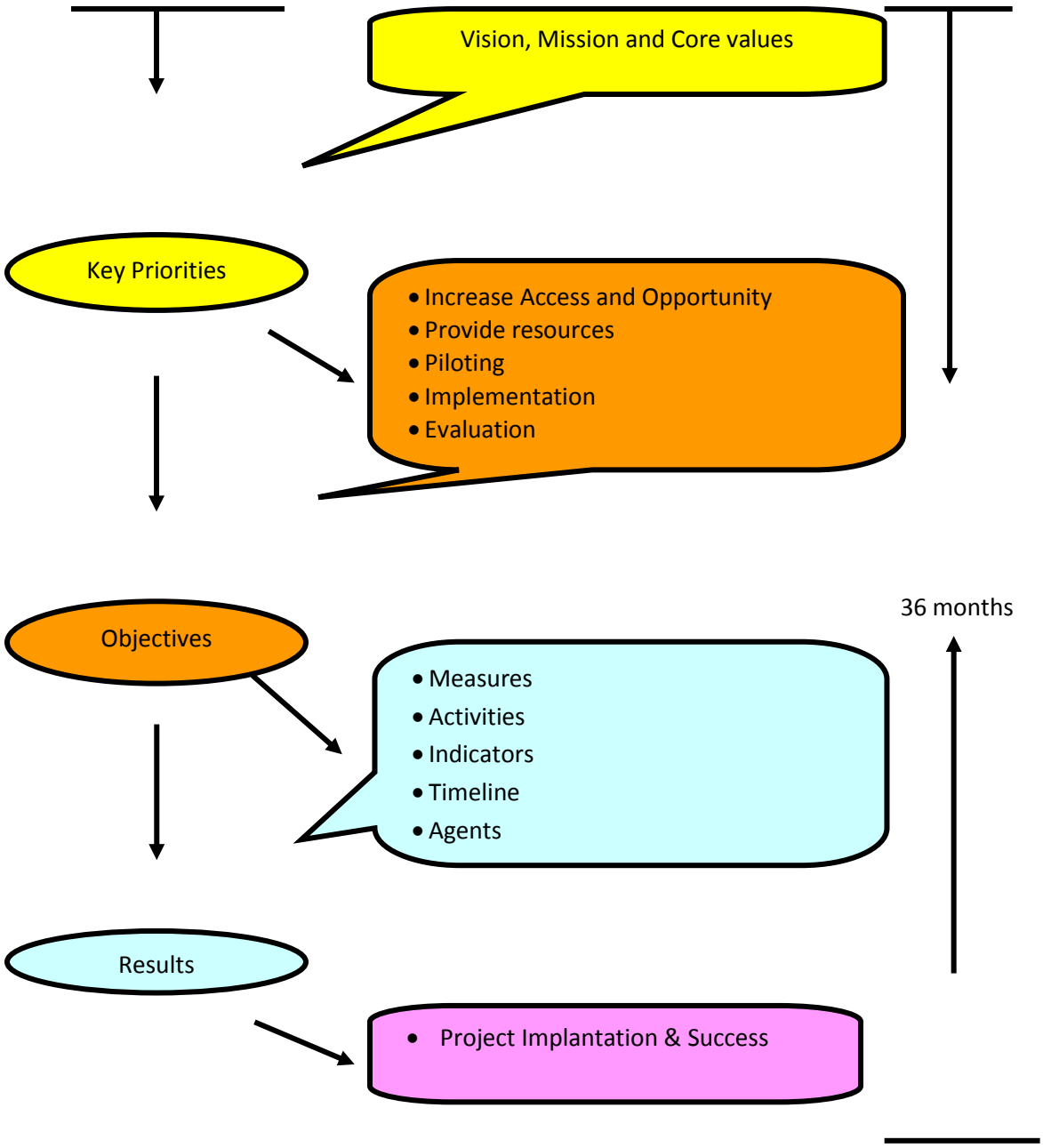


Figure1; CLIMASP Programme Strategy Map

Annex 1*;* Figure 2;

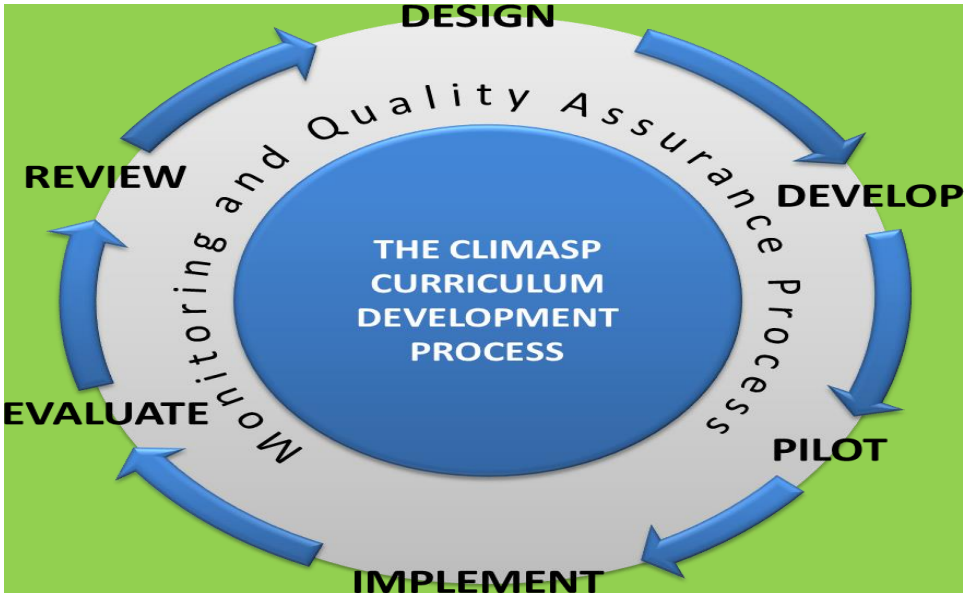


Figure 2; Stages of CLIMASP Project

Annex 1*;* Figure 3;

CLIMASP ACTION PLAN BY QUARTERS

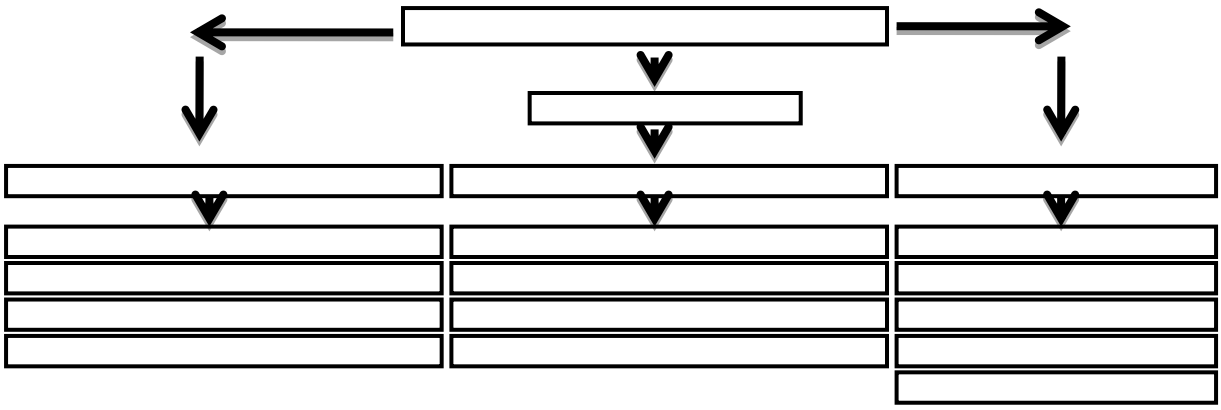
Priority Area	December 2013-June 2014	July 2014-June 2015	July 2015-December 2015	December 2016
• Increase Access and Opportunity				
• Provide resources				
• Piloting				
• Implementation				
• Evaluation				

Annex 1*;* Photo 1;



Photo 1; CLIMASP Project, ICT Lab. and Euro-Arab Centre for Interdisciplinary Studies and Climate Change

Annex 1*;* Figure 3;







Developing and Implementing the CLIMASP Minor at

The Hashemite University

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Faculty of Educational Sciences

Hashemite University

JORDAN



UNIVERSITY BACKGROUND

The Hashemite University is located on a total area of 8519 acres in the vicinity of Zarqa, Jordan on a strategic site parallel to the international highway that links Amman with Mafraq, at the crossroad that connects Saudi Arabia, Syria, and Iraq. The Royal Decree to establish the University was issued in 1991, and teaching started on September 1995. The University's vision is oriented toward achieving an academic pioneering position and excellence in university teaching and scientific research, at both the national and regional levels. As a youthful higher education institution, the Hashemite University's mission is preparing loyal men and women who are not only technically competent in their professional fields, but also life-long learners who have loyalty to their nation, and a sense of civic and moral responsibility and devotion to the fundamental values of human life. The University consists of about 16 faculties as follows: Deanship of Scientific Research, Faculty of Educational Sciences, Faculty of Art, Faculty of Science, Queen Rania Faculty of Tourism and Heritage, Prince Al-Hussein Bin Abdullah II Faculty of Information Technology, Faculty of Physical Education and Sport Science, Faculty of Allied Health Sciences, Faculty of Engineering, Faculty of Nursing, Faculty of Medicine, Faculty of Pharmaceutical Sciences, Faculty of Economics and Administrative Sciences, Queen Rania Faculty for Childhood, Faculty of Natural Resources and Environment, Faculty of Graduate Studies. The diverse groups of teaching staff are valued for their extensive knowledge and notable teaching abilities. The student enrolment ranges between 36-38 thousand students.

The Hashemite University Prior to the CLIMASP Project

At the Hashemite University, the courses that are relevant to Climate Change and Sustainability Development were offered mainly at the Faculty of Natural Resources and Environment. As for the Faculty of Educational Sciences, a new course entitled: "Education for Sustainable Development" was initiated two years ago for Pre-service Students. One or two courses that tackles sustainability were offered at the Faculty of Arts and the Faculty of Economics.

It is also worth mentioning that the Hashemite University recently constructed a 5-MW solar power plant (Solar Park) which is estimated to generate 20 percent of the campus's total

electricity needs. Add to that, the plant provides shade for students during the hot Summer Season in a semi-arid environment, which gives the campus its unique identity, and improves its aesthetic image.

THE CLIMASP PROJECT

The CLIMASP Interdisciplinary Project, funded through the European Commission Tempus Programme, adopts a multi/inter-disciplinary and systematic approach that aims to transform current unsustainable practices leading to climate change and promote interdisciplinary collaboration alongside with developing sustainable leadership in the partner countries' universities (Makrakis & Kostoulas-Makrakis, 2015). The wider CLIMASP objective is to transform current unsustainable practices that prevent interdisciplinary collaboration and promote sustainable leadership in the partners' countries universities and its graduates. The project aims at developing capacity-building programmes to train university teaching staff and key administrators for interdisciplinary collaboration and building partnership with local/national/and regional partners, and to provide interested undergraduate students the possibility to acquire knowledge of climate change issues and their effects. The main objective of developing a minor in Climate Change and Sustainability Policy is to offer undergraduate students the necessary knowledge, skills and attributes to tackle the challenges of climate change and turn them able to act as agents of change locally and globally. Choosing a minor combined with a major degree gives students the opportunity to pursue a second area of interest that can open significant career opportunities, besides building knowledge and skills in an area that fulfils their personal interests. After graduation, students will be provided a formal credential through transcript documentation (Euro-Arabpass) adapting the Europass diploma to certify that they have developed leadership in the field of climate change and sustainability policy. The CLIMASP project specific objectives are to:

- Develop capacity-building programmes to train university teaching staff and key administrators for interdisciplinary collaboration and building partnerships with local/regional and national partners.
- Involve university staff and other key stakeholders (e.g., students, professionals) in the development of an undergraduate interdisciplinary programme in CLIMAte change and Sustainability Policy (CLIMASP) in each partner country university.
- Integrate and implement the CLIMASP programme as an integral part to existing undergraduate academic degrees in disciplines such as education sciences, applied sciences, technical sciences, economics/business sciences, and social sciences; and
- Monitor, evaluate and review the CLIMASP programme in each partner country institution.

Rationale:

Climate change is seen as the most critical problem facing humanity worldwide, and one of the most pressing world issues affecting all mankind and natural environment in today's world. It is widely recognized that the earth is getting warmer and it will continue to do so in the future,

creating a wide range of impacts that include sea-level rise, extreme weather conditions, seasonal changes, droughts, and heat waves. Climate change has become a major challenge which need to be addressed at every level and in all sectors of society. The key question that is often posed is: how fast and how severe the impacts will be in the future and whether we can adopt policies for mitigating and adapting to these impacts?

Higher education institutions (HEIs) can play a unique in dealing with these issues and in building a more sustainable society. Accordingly, HEIs have an obligation to address to not only climate change crises, but also threats to sustainability on all fronts. Thus, it is essential that colleges and universities formally acknowledge these transcendent problems and reorient their programs and curricula to be relevant to the challenges all future graduates will face. The key questions are: How curricula will be changed to address climate change and sustainability issues? How can we empower disadvantaged groups to face climate change impacts? What are the solutions with climate change? Therefore, educators need to be ready to tackle the climate change challenges. This necessitate that they should be equipped with climate change and sustainability policy knowledge, skills and attributes to minimize threats and maximize opportunities for climate change adaptation. Addressing climate change and sustainability issues takes more than one discipline. Integrating knowledge from multiple disciplines is of great importance when dealing with climate change issues. Climate change education depends heavily on diverse interdisciplinary areas that range from science and technology to agriculture, transport, forestry, and disaster risk reduction. McCright, et al., (2013) promote interdisciplinary approach when dealing with climate change education. Likewise, Jaroszweski, Chapman and Petts (2010) emphasize the need to utilise an interdisciplinary approach when dealing with the impact of future climate change. The UNESCO report point out that global climate change is based on four thematic areas: scientific, educational, environmental, and ethical (UNESCO Climate Change Initiative, 2010).

In light of the climate change challenges the Middle East region is facing, there is a need to cultivate interdisciplinary expertise among educators and future leaders. Consequently, climate change requires educated individuals who are able to bridge the isolated academic fields in order to facilitate policy choices towards climate change risks (Makrakis and Kostoulas-Makrakis, 2014).

This requires that university teaching staff be exposed to the various interdisciplinary teaching strategies and incorporating them into their courses, such as Problem-based learning and Service learning. Add to that, the process of integrating climate change and sustainability into courses from a variety of academic fields such as education, economics, engineering, social sciences, applied sciences may take additional planning and can involve reshaping the approach to the course. There are also courses that provide more of a challenge to incorporating climate change and sustainability concepts and topics. Consequently, giving students the opportunity to encounter climate change and sustainability concepts across the whole study program or curriculum of a discipline is a powerful way of giving them the knowledge and skills they will need to tackle the challenges of climate change. This approach require teaching staff to collaborate across disciplines in order to enhance interdisciplinary climate change teaching.

CLIMASP Structure

The structure of the CLIMASP Minor interdisciplinary courses consists of core courses, elective courses, and the required capstone courses in the three concentration areas, namely:

1. Climate Change, Environment and Society
2. Climate Change, Economics and Public Policy
3. Climate Change, Science and Technology

The number of courses to be taken by the undergraduate could be weighted between 45-60 ECTS or 30-45 credit hours.

The major field of study that offer the CLIMASP minor program at the Hashemite University were selected based on certain criteria. Among the criteria are those of relevancy, staff interest, and commitment. The Faculties/Departments are listed as follows:

- Faculty of Educational Sciences

  (Department of Curriculum and Instruction)

- Faculty of Science

  (Department of Biology and Biotechnology)

- Faculty of Natural Resources and Environment

  (Department of Water Management & Environment)

  (Department of Land Management & Environment)

- Prince Al-Hussein Bin Abdullah Faculty of Information Technology

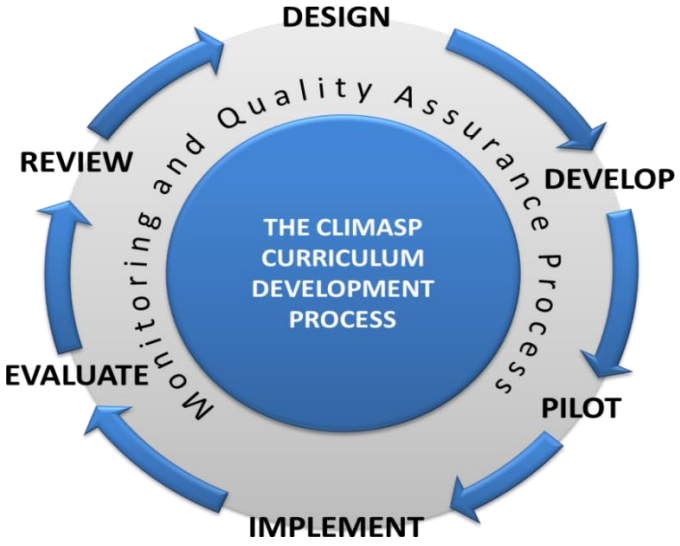
  (Department of Computer Science and Application)

- Faculty of Economics and Administrative Sciences

  (Department of Economics)

Development of the CLIMASP Curriculum

The curriculum development process for the interdisciplinary CLIMASP programme incorporated six stages: 1) design, 2) develop, 3) pilot, 4) implement, 5) evaluate and 6) review through a cyclical and interlined process. The conceptual and methodological framework applied throughout the process is depicted in Figure 1.



The Design Stage

One of the main objectives of the First CLIMASP National Workshop held on March 19-20, 2014 at the University of Jordan, Amman was to engage various stakeholders from different expertise, interests and perspectives and involve them in identifying the competencies needed to address the climate change programs. The stakeholders included Government officials who represented Ministries of Health, Environment, Water and Irrigation, Energy and Natural Resources, Climate Change Directorate, Jordan Valley Authority, Environmental Police Department, Faculty members from different universities, and representatives of several interest groups and organizations, civic societies and NGOs including the Royal Scientific Society and The National Center for Agricultural Research and Extension. The stakeholders were given the opportunity to become part of the design process in investigating the capabilities and conflicts of interests related to climate change and strengthening their contribution to the curriculum. In order to attain this purpose, the stakeholders were interviewed through utilizing a *Survey Reporting Template* based on a thorough literature review of studies on climate change with special reference to the MENA region. The survey template questions aimed at gathering information about the interdisciplinary perspectives of the impacts of climate change in Jordan, and the specific needs of the country's economy, governance, and education. The survey template included the main issues/problems and key training needs suggested by the interviewers to tackle the issue or problem, and asked to identify the competencies, barriers and drivers of their inputs. This process has led to the development of a list of competencies and guidelines for strengthening stakeholders' inputs in the CLIMASP curriculum development within the three thematic areas, namely: Climate Change adaptation, mitigation, and cross-cutting interventions.

Following that, the design team was established and assigned in setting up the mapping of the courses within each field of specialty. The university design group within each field of specialty was guided by the inter-university design team in identifying the existing courses and suggesting potential courses in various faculties to be included. Each design team was assigned to map out

the courses required for each field of specialty. Faculty staff from each department was assigned to develop the courses' syllabi and modules, infusing the stakeholders' inputs into the courses, and developing the pedagogical and structural principles that will guide the development of the courses. Table (1) lists the names of the design team assigned in setting up the mapping of the courses within each discipline as follows:

Table 1: CLIMASP Design Team at the Hashemite University

No.	Name of Faculty Staff	Field of Specialty	Faculty
1	**Dr. Lubna Tahtamouni**	**Biology and Biotechnology**	**Science**
2	**Dr. Ahmad Qablan**	**Curriculum and Instruction**	**Educational Sciences**
3	**Dr. Ibrahim Al-Oqily**	**Computer Science & Application**	**Information Technology**
4	**Dr. Usama Qalawi**	**Economics**	**Economics and Administrative Sciences**
5	**Dr. Jwan Ibbini**	**Land Management & Environment**	**Natural Resources and Environment**
6	**Dr. Salaheddin Jaber**	**Water Management & Environment**	**Natural Resources and Environment**

The Development Stage

Following the design of the CLIMASP Minor structure , every working group proceeded to develop 24 courses' syllabi and modules in the CLIMASP three concentration areas on the basis of stakeholders' inputs, taking into account developing the methodological approach in order to meet the objectives of the CLIMASP project. Accordingly, the syllabi and modules of 24 courses were developed. The courses' syllabi and modules were peer-reviewed by the CLIMASP project team in Aswan. The faculty staff had the chance to discuss their work during the Second National Workshop held on June 16-18, 2015. The structure of course mapping in all fields of specialty are shown in (Appendix A).

The Piloting Stage

The main aim of the pilot stage was to demonstrate the effective use of interdisciplinary learning and teaching, and allow faculty members, students as well as evaluators to observe and reflect on the teaching processes, methods and practices applied. This stage created the opportunity to demonstrate what interdisciplinary learning and teaching looks like throughout the semester. For a smooth transition from disciplinary to interdisciplinary curricula, the piloting

stage started on a small number of CLIMASP courses. The process took place during the summer and fall semesters of the academic year 2014-2015. Table 2 lists the Piloted courses.

Table 2: The Piloted Courses

No.	CLIMASP Course Piloted	Instructor	No. of students
1	Teaching Methods of Biology Concepts	Dr.Theodora De Baz	30
2	Computer Networks	Dr. Ibrahim Obeidat	18
3	Developmental Biology	Dr. Lubna Tahtamouni	20
4	Multimedia Programming	Dr. Ibrahim Al-Oqili	59
5	Economics Feasibility Studies	Dr. Ahmad Al-Waked	64
6	Teaching Methods of Chemistry and Geology Concepts	Dr. Ahmad Qablan	44
7	Education for Sustainable Development	Dr. Zeinab Abu Samak	24
8	Climate Change	Dr. Mahmoud Abu Laban	79
9	Environmental Spatial and Temporal Variability	Dr. Mahmoud Al-Qinna	62
10	Contemporary International Issues	Dr. Yahya Al-Ali	59

The piloted courses were taught during the second semester of the academic year 2014/2015. In order to investigate the perceptions of the HU students toward interdisciplinary teaching and learning the CLIMASP courses, a survey questionnaire of Likert-type scale was administered to the 459 students (112 males, and 347 females) at the beginning of the semester as pre-test and at the end of the semester, as a post-test. The results which revealed improvement in students' performance were discussed during the Third National Workshop held on August 4-6, 2015 in Jordan.

The Implementation Stage

The main aim of the Implementation stage carried during the second semester 2015/2016 was to demonstrate the effective use of interdisciplinary learning and teaching, and allow faculty members to observe and reflect on the teaching processes, methods and practices applied. About 15 courses were implemented.

To investigate the perceptions of the Hashemite University students toward interdisciplinary teaching and learning of the CLIMASP courses, a survey questionnaire of the Likert-type scale was administered at the beginning of the second semester of the academic year 2014/2015, as a Pre-Test. The same questionnaire was administered to the same students at the end of the

semester, as a Post-Test. The process was discussed during the Second Regional Workshop held in Nicosia, Cyprus on May 5-7, 2016.

The survey questionnaire applied is an innovative assessment instrument developed by Makrakis & Kostoulas-Makrakis (2015) based on experiential, constructivist and transformative approaches to sustainability education.

Assessment of a Revised Course during the Implementation Stage

In order to assess the effectiveness of the CLIMASP courses during the implementation phase, a research study was carried out during the second semester of the academic year 2015/2016. The aim was to find out what changes have occurred as a result of the revised course during the implementation phase.

The subjects of this study consisted of 44 (40 females & 4 males) pre-service teachers enrolled in their "*Education for Sustainable Development*" course at the Department of Curricula and Instruction at the Hashemite University, Jordan. Only 11 students have taken courses relevant to climate change and sustainable development. The assessment instrument consists of 65 items constructed of five scales as follows:

The CLIMASP Assessment Instrument applied consists of five parts:

Scale (1): Student Background Variable

Scale (2): 3 items that measure teacher-cantered teaching learning modes

11 items that measure student-centred teaching learning modes

Scale (3): 10 items that measure 10Cs Critical Skills and Understandings

Scale (4): 27 items that measure the six pillars of 21th century learning

Scale (5): 8 items that measure Interdisciplinary Skills

2 items that measure Reflective Behaviour

3 items that measure Interdisciplinary Perspectives

The validation of the measurement scales was established based on *Cronbach alpha* reliability test, and exhibited very high indices that ranged between 0.84- 0.96. (Makrakis, Kostoulus-Makrakis, 2015).

The CLIMASP Assessment Scales and Sub-scales instrument was administered as a pre-test to the student teachers at the beginning of the semester during the first meeting, and again as a post-teat at the end of the semester. Student teachers' responses were recorded and the mean scores for the instrument's scales and sub-scales were computed and compared. (See Table 1). The results revealed that the course implantation had a positive effect on instrument's scales and sub-scales. However, the highest mean score for change was related to the sub-scale: Recognizing Disciplinary Perspectives

Table 1

Pre- and Post-Test Means and Change Scores of CLIMASP Assessment Scales and Sub-Scales

CLIMASP ASSESSMENT SCALES		Pre-test Mean	Post-test Mean	Change
Teaching Learning Methods	Teacher-Centred		3.5985	0.3485
	Student-Centred	2.8554	3.0475	0.1921
10Cs / Critical Skills for the 21st Century		3.2477	3.4182	0.1705
Six Pillars of the 21st Century Learning		3.3685	3.5657	0.1975
Sub-Scales of Learning Pillars	1- Learning to Know	3.1250	3.4380	0.3130
	2- Learning to Be	3.2784	3.4318	0.1534
	3- Learning to Live Together Sustainably	3.4968	3.6591	0.1623
	4- Leaning to Do	3.4280	3.6364	0.2084
	5- Learning to Transform Oneself and Society	3.5606	3.7197	0.1597
	6- Learning to Give and share	3.3636	3.4773	0.1137
Interdisciplinary Problem-Based Learning		3.1486	3.4381	0.2825
Scale Dimensions	1- Interdisciplinary Skills	3.1477	3.4545	0.3068
	2- Reflective Behaviour	3.4773	3.4432	0.0397-
	3- Recognizing			

	Disciplinary Perspectives	**2.9318**	**3.4167**	**0.4842**

To determine whether there are significant differences between students teachers' ... before and after the course, data analysis was carried out by performing a t-test for paired-samples. No significant differences at the (α=0.05) level were detected , which indicates that no significant change in student-teachers' in Intrtdichiplionarro

occurred due to the course. (See Table 2). The data gathered from the pre- and post- tests administration was measured and analyzed through the use of paired-samples t-test by calculating the differences between the means. (See Table 2)

Table 2

t-test results for the differences in means between student teachers' pre- and post-tests
Pre-test and post-test comparisons of the interdisciplinary problem-based sustainability education scales

CLIMASP ASSESSMENT SCALES		**Pre-test Mean**	**Post-test Mean**	**df**	**t-value**	**Sig (2-tailed)**
Teaching Learning Methods	**Teacher-Centred**	**3.250**	**3.598**	**43**	**-4.153**	**0.000**
	Student-Centred	**2.855**	**3.0475**	**43**	**-2.167**	**0.360**
10Cs / Critical Skills for the 21st Century		**3.2477**	**3.565**	**43**	**-2.541**	**0.015**

Six Pillars of the 21st Century Learning	**3.368**	**3.565**	**43**	**-4.401**	**0.000**
Interdisciplinary Problem-Based Learning	**3.148**	**3.438**	**43**	**-4.658**	**0.000**

With respect to the scale measuring Teacher-centred learning method, the statistical analysis shows that the pre-test total Mean is 3.250 on a four-point scale and the average post-test total Mean 3.598, yielding no statistically significant difference with a t-value of -4.153, at $p< 0.000$. As for the Student-Centred learning and teaching methods, the statistical analysis shows that the pre-test total Means is 2.855 on a four-point scale and the average post-test total Mean 3.598, yielding a statistically significant difference with a t-value of -2.167, at $p< 0.360$. Regarding the scale measuring the 10Cs, the statistical analysis show that the pre-test total Mean is 3.247 on a four-point scale and the post-test total mean the total Mean 3.565, yielding no statistically significant difference with a t-value of -2.541, at $p< 0.015$. As for results of the six learning pillars, it has been revealed that the total pre-test Mean = 3.368 on the four point scale and the total post-test Mean = 3.56, yielding no statistically significant difference with a t-value of -4.401, at $p< 0.000$. Regarding the Interdisciplinary Problem-Based Learning scale, it was found that the total pre-test Mean = 3.148 on the four point scale and the total post-test Mean = 3.438, yielding no statistically significant difference with a t-value of -4.658, at $p< 0.000$.

In conclusion, the findings of this research revealed no change in students' performance as a result of the impact of the CLIMASP minor course. However, a statistically significant difference was revealed for the Student-centred learning and teaching methods, which makes it clear that the interdisciplinary approaches to teaching and learning in dealing with climate change education and sustainability issues were effective in enhancing student-centred learning and teaching methodology.

The Evaluation Stage

Evaluation was integrated into the CLIMASP program before, during and after the implementation of the courses. It took place during the validation of the courses, during the design, development, and implementation stages. Proper interventions during the each stage

helped enhance the CLIMASP courses' content and methodology. The courses' syllabi and modules were developed by the HU project team. The structure of CLIMASP minor syllabi and modules were initially revised by the CLIMASP team of Aswan University, Egypt, based on the developed peer-reviewing template. The results were presented by the Faculty Staff and during the First Regional Workshop held in Jordan. The reviewers offered their comments and suggestions. Later the course structure and courses were modified accordingly. Following that, the courses' syllabi and modules were submitted for the first external evaluation to Dr. Carmel Mulcahy of Dublin City University who provided the learning assessment comments and suggestions through utilizing the CLIMASP External Assessment Rubric for Interdisciplinary Learning. The second external evaluation was performed by Professor Michele Biasutti from the University of Padova, Italy who proposed the comments and suggestions needed to meet the challenges of climate change and sustainable development.

The Reviewing Stage

Proper interventions during the evaluation stage enhanced the content and methods applied to all the courses syllabi and modules. Both internal and external evaluation provided data to demonstrate how the CLIMASP interdisciplinary courses can foster the objectives set by the project. Add to that, the CLIMASP toolkit was very helpful in revising the mapped courses.

Strategic Plan for the Euro-Aran Centre for Interdisciplinary Studies

Mission Statement

The Euro-Arab Centre is the driver force for the institutionalization of the CLIMASP program at the Hashemite University and in promoting interdisciplinary teaching, learning and curricula. The Centre is also responsible for issuing the Euro-Arab Pass Diploma for the CLIMASP Diploma Certificate.

Vision Statement

The centre will continue to play a major role in disseminating the program at the Hashemite University, and in achieving the long term sustainability of the program. **Core Value Statements**

The core values that represent the Centre's priorities are as follows:

- **Respect for Equity, Diversity and Social Justice.**

  Valuing ethnic, cultural and individual differences, and strive to demonstrate cultural competence in all interactions.

- **Commitment to the Community**

Enhancing the quality of life, health, and well the being of the community members through creating opportunities to address the societal needs.

- **Quality Education**

  Providing the highest quality of teaching and learning that promotes personal growth of students through the integration of scholarly research and service.

- **Collegiality and Collaboration**

  Promoting the interchange of knowledge, skills, and resources among the diverse community of scholars, teaching staff of the CLIMASP partner institutions, and administrators. The aspiration is to build partnership with the local community members and organizations and a wide variety of stakeholders.

- **Interdisciplinary Education**

  Valuing interdisciplinary education, research, and practice activities that maximize students' understanding of the contributions of varied disciplines.

Strategic Goals

Goal 1: Providing resource materials necessary for developing and teaching the interdisciplinary courses with emphasis on climate change and sustainability policy.

Objective 1.1: Developing the core courses required for all specialties within the CLIMASP orientation themes:- Climate Change, Environment and Society; Climate Change, Economics and Public Policy; and Climate Change, Science and Technology**.**

Objective 1.2: Providing advice and capacity building in developing and revising the courses and programs, especially those related to sustainable development and climate change.

Objective 1.3: Help out students in exchange information and the use the available - resources for research.

Goal 2: Facilitate the communication and cooperation among the teaching faculty at the Hashemite University and scholars at other institutions.

Objective 2.1: Expanding the collaboration of the Hashemite University teaching faculty involved in the CLIMASP project through frequent local meetings.

Objective 2.2: Extending the collaboration of the CLIMASP faculty staff locally, regionally, and internationally.

Objective 2.3: Fostering connections between the Faculty staff and other environmental organizations both locally and internationally.

Objective 2.4: Providing reliable sources of information and advice for various stakeholders including policy-makers about issues related to sustainable development and climate change

Objective 2.5: Encouraging and initiating multidisciplinary dialogues necessary to the nurturance of new approaches to curriculum, pedagogy, research and outreach.

Goal 3: Enhance outreach efforts and service learning opportunities

Objective 3.1: Promoting students' community service and engagement in environmental work.

Objective 3.2: Encouraging students to engage in interdisciplinary projects and activities.

Objective 3.3: Connecting the program with associated professions through service learning.

Objective 3.4: Facilitating the link between the students and the stakeholders during the practical training.

Objective 3.5: Assisting students who are interested in pursuing a graduate degrees in applying to Higher Education Institutions in the European Commission.

Goal 4: Cultivating Excellence: The Euro-Arab Center for Interdisciplinary Studies and Climate Change.

Objective 4.1: Advocating best-practice techniques for interdisciplinary teaching and research.

Objective 4.2: The Centre brings faculty and students from across each faculty/departments together into contact with colleagues in EU, to explore issues of common intellectual concern, to advance collaborative research, and to foster interdisciplinary inquiry.

Objective 4.3: Euro Arab Center is assessed periodically towards achieving an inclusive and supportive climate change and sustainability themes**.**

Administrative Organization

The centre is supervised by a committee which include faculty members assigned by the university president, the university registrar, and an administrative staff for the organizing and maintaining the centre.

Location of the Centre

The centre is located is located on the ground floor of the Registration Building

Expected Activities at the Centre

- Student information centre about CLMASP minor.
- Student consultation about the minor and help with organizing the practical training for the students.
- Meeting room.
- Lecture hall.
- Study and research area.

Equipment Purchased for the ICT Lab

Q	DESCRIPTION	ITEM	No.
1	**105"Ceramic Interactive Whiteboard**	**ActivBoard**	**1.**
1	**Color Laser Printer Jet Pro M451nw**	**Printer**	**2.**
1	**Short Throw Projector**	**Data Show**	**3**
16	**Fujitsu ESPRIMO P521**	**Desktop Computers**	**4.**
1	**ARCGIS Desktop Teaching & Research Lab Pak (31 seats) and 3D Analyst Evaluation**	**GIS software**	**5.**
1	**A4 Scanner**	**Scanner**	**6**
10	**CO-FINANCED by the Hashemite University**	**Desktop Computers**	**7**

CLIMASP DISSEMINATION ACTIVITIES					
Name of CLIMASP Partner		**Hashemite University**			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Local Workshop	October 2016	Center for Interdisciplinary Studies on CLIMASP.	Students enrolled in the CLIMASP program (At least 15 students from each specialty)	Discussions, Advice, Clarifications, Responding to questions

2	National Conference on Climate Change and Sustainability Policy.	Second Semester Academic Year 2016-2017.	Hashemite University Campus	Representatives from both Public & Private sectors at the national, regional, and global countries.	The students will have the opportunity to present papers Knowledge of field through interacting with experts. Promotion of the Project and program
3	Collaboration with Environmental NGOs and Stakeholders		Field Studies	Students enrolled in the CLIMASP program in all specialties)	Facilitation of students' field-based research required for the Capstone courses in their study plan.
4	Graduation Ceremony	March, 2018???	Assembly Hall HU Campus	Euro-Arab Pass degree candidates.	Conferring of the certificates
5	Dissemination through Network and printing materials: Booklets, folders, and flyers, Flex posters at each department.				Dissemination of the Project
6	Keeping the CLIMASP "Community of Practice" Website active, even after the termination of the project.	Will continue upon the completion of the project formal activities		CLIMASP partners at the National, Regional and International Levels	Continuation of the collaboration between the Hashemite University and other Universities involved in the CLIMASP project.

7	Presenting a Research Paper about the project at the Hashemite University	August 2017	Annual Conference (Association for Teacher Education in Europe)	.	
8	Attended the 1rst Swedish International Conference on the Global Action Program on ESD and the 9th Meeting of INTEI at Uppsala University, Visby, Sweden.	August 21-24, 2016			Participating in the meeting discussions and sharing practices and experiences CLIMASP achieved so far at The Hashemite University

Achievements

During the three-years duration of the project, the following activities were achieved at the Hashemite University:

1. The Project consortium agreement signed.
2. CLIMASP competencies addressed based on the results of the stakeholders' survey and guidelines.
3. The Design team selected.
4. The courses mapped.
5. Faculty members to be involved in the CLIMASP Project were selected, two members representing each field of specialty.
6. The Hashemite University actively participated in the three National Training Workshops and the Two Regional Workshops were held.
7. The syllabi and modules of 24 courses were revised, developed, piloted, and implemented .
8. The Courses' syllabi and modules were modified based on the comments and suggestions of the peer-reviewers and both internal and external evaluators.
9. Booklets, Folders, and Flyers were printed to be distributed to the students.
10. The program was approved and validated by the planning committee at each Department and Faculty levels, after a thorough inspection and analysis of the courses' descriptions, syllabi and modules.
11. About 50 students registered in the program.
12. The Euro-Arab Centre for Climate Change and Interdisciplinary Studies was established, and the equipment for the ICT lab purchased.

Challenges

Despite the commitment of the CLIMASP project team at the Hashemite University to participate actively, there was always delay in submitting their work. This is due to their heavy loads, lack of incentives and other priorities. The institutional coordinator had to keep in contact with each team member and explain to him/her the required tasks.

During the project, some active and trained members of the CLIMASP team left the university and had to be replaced. Some resigned and others took sabbatical leaves. This has created some delay in accomplishing the task. The institutional coordinator had to replace them after offering them some training.

The Hashemite University is a state (government) university. The policy follows very rigid rules and regulations. The process of purchasing the equipment is very long and time consuming and has to pass through many administrative stations. In spite of that, we were able to start the purchase process early enough and equip the lab before project ends.

Conclusions

This case study describes the accomplishments regarding the implementation of the CLIMASP program at the Hashemite University, which began on the Second Semester of the academic year 2015/2016.

Twenty-four interdisciplinary courses were developed by the HU CLIMASP team. The design, team were involved in creating a conceptual interdisciplinary framework for the CLIMASP undergraduate program through mapping the courses. The courses were structured into core courses, capstone courses, and elective courses. The syllabi and modules of the courses were developed, reviewed and modified. The National and Regional created the opportunity for the project team to discus and determine whether the courses are potentially related to Climate Change and Sustainability Policy.

The strategy for the management of the project is based on co-sharing and self-reliance. The activities and major tasks related to the project were planned and discussed through frequent local management meetings of the institutional coordinators of the local universities. Staff members were encouraged to use the interactive tools available through the CLIMASP website and the online Community of Practice.

Finally, in order to secure the sustainability of the project at the university, efforts are make to keep implementing the undergraduate interdisciplinary minor program, even after the termination of the project. The Euro-Arab Center for Climate Change and Interdisciplinary Studies established on campus will help sustain the benefits of the project.

Acknowledgement

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content of the paper reflects the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

References

Jarozweski, D., Chapman, L., and Petts, J. (2010) Assessing the Potential Impact of Climate Change on Transportation: The need for an interdisciplinary approach. *Journal of Transport Geography 18*, 331-335.

Makrakis, V., and Kostoulas-Makrakis, N. (2015). A Strategic Framework for developing Interdisciplinary Minors on Climate Change and Sustainability Policy: The CLIMASP-Tempus example. In W. LEAL Filho et al. (Eds.). *Integrating Sustainability Thinking in Science and Engineering Curricula* (pp. 103-114). Switzerland: Springer.

Makrakis, V., and Kostoulas-Makrakis, N. (2015). Piloting the CLIMASP-Tempus interdisciplinary minor in climate change and sustainability policy: Outcomes achieved. Paper presented at the Third European Conference on Sustainability, Energy and the Environment, July 9-12, 2015, The Thistle Brighton, UK.

McCright, A. M.., O'Shea, B. W. Sweeder, R., R., Urquhart, G.R. and Zeleke, A. (2013). Promoting Interdisciplinarity through Climate Change Education, Perspectives, *Nature Climate Change, 3*, 713-716.

The UNESCO Climate Change Initiative. (2010). *Climate Change Education for Sustainable Development, UNESCO, Paris.*

APPENDIX A: The Structure of Course Mapping in all Specialties at the Hashemite University

Department: Curriculum and Instruction **Faculty of Educational Sciences**					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					

1	111303458	Climate Change and Global Warming	3	Natural Resources and Environment	
2	110201327	The Economics of Natural Resources and Environment	3	Economics and Administrative Sciences	
3	110201414	Jordan Economy	3	Economics and Administrative Sciences	
4	1203433	Environmental Sociology	3	Art	
5	107751	Contemporary International Issues	3	Art	
6	110302237	Teaching Methods of Biology Concepts	3	Educational Sciences	
7	110302238	Teaching Methods of Chemistry and Geology Concepts	3	Educational Sciences	
8	110302419	Education for Sustainable Development	3	Educational Sciences	
3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	303495	Practicum	3	Educational Sciences	
2	111202370	Environmental Volunteering	3	Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10 ECT= 50 ECTS					

Department: Water Management and Environment Faculty of Natural Resources and Environment					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					
1	111203424	Environmental Impact Assessment	3	Natural Resources and Environment	
2	111303458	Climate Change and Global Warming	3	Natural Resources and Environment	
3	111202411	Environmental Spatial and Temporal Variability	3	Natural Resources and Environment	
4	111203222	Environmental Legislation and Policy	3	Natural Resources and Environment	
5	1203481	Renewable Energy Resources	3	Natural Resources and Environment	
6	110104362	Developmental Biology	3	Science	
7	110108113	Biotechnology and Society	3	Science	
8	110302419	Education for Sustainable Development	3	Educational Sciences	
3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	111202475	Special Topics	3	Natural Resources and Environment/	

				Water Management and Environment	
2	111202370	Environmental Volunteering	3	Natural Resources and Environment/ Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10ECT= 50ECTS					

Department: Land Management and Environment **Faculty of Natural Resources and Environment**					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					
1	111203424	Environmental Impact Assessment	3	Natural Resources and Environment	
2	111303458	Climate Change and Global Warming	3	Natural Resources and Environment	
3	111202411	Environmental Spatial and Temporal Variability	3	Natural Resources and Environment	
4	111203222	Environmental Legislation and Policy	3	Natural Resources and Environment	
5	1203481	Renewable Energy Resources	3	Natural Resources and Environment	

6	110104362	Developmental Biology	3	Science	
7	110108113	Biotechnology and Society	3	Science	
8	110302419	Education for Sustainable Development	3	Educational Sciences	
3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	111202477	Research Project on Climate Change and Sustainability Policy	3	Natural Resources and Environment/ Land Management and Environment	
2	111202370	Environmental Volunteering	3	Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10ECT= 50 ECTS					

Department: BIOLOGY AND BIOTECHNOLOGY **Faculty of SCIENCE**					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					
1	110104362	Developmental Biology	3	Science	
2	110108113	Biotechnology and Society	3	Science	

3	110201327	The Economics of Natural Resources and Environment	3	Economics and Administrative Sciences	
4	110201414	Jordan Economy	3	Economics and Administrative Sciences	
5	1203433	Environmental Sociology	3	Art	
6	107751	Contemporary International Issues	3	Art	
7	110108115	Computer Ethics	3	Prince Al-Hussein Bin Abdullah II for information Technology	
8	110302419	Education for Sustainable Development	3	Educational Sciences	
3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	110104495	Special Topics	3	Biology & Biotechnology/ Science	
2	111202370	Environmental Volunteering	3	Natural Resources and Environment/ Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10 ECT= 50 ECTS					

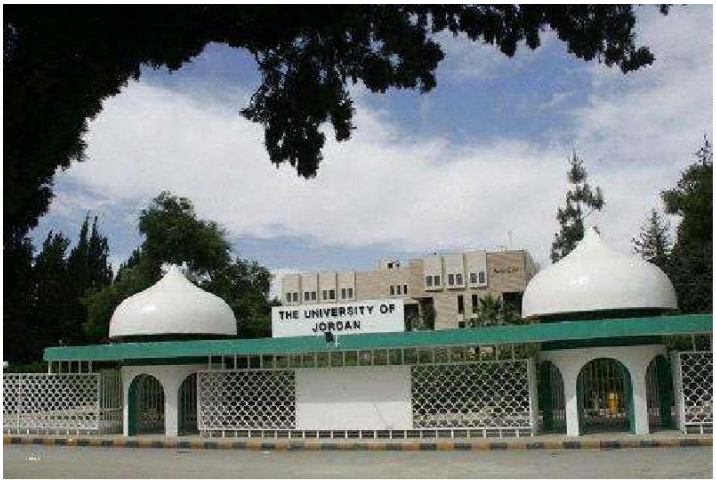
Department: Economics Faculty of Economics and Administrative Sciences					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					
1	111303458	Climate Change and Global Warming	3	Natural Resources and Environment	
2	110201412	Economics Feasibility Studies	3	Economics and Administrative Sciences	
3	110201327	The Economics of Natural Resources and Environment	3	Economics and Administrative Sciences	
4	110201414	Jordan Economy	3	Economics and Administrative Sciences	
5	110203209	Business Ethics	3	Economics and Administrative Sciences	
6	1203433	Environmental Sociology	3	Art	
7	107751	Contemporary International Issues	3	Art	
8	110302419	Education for Sustainable Development	3	Educational Sciences	

3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	1100201455	Research Project in Climate Change and Sustainability Policy	3	Economics and Administrative Sciences	
2	111202370	Environmental Volunteering	3	Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10ECT= 50 ECTS					

Department: Computer Science and Applications **Faculty of Prince Al-Hussein Bin Abdullah II for** **Information Technology**					
1- Core Courses: 9 Credit Hours =15 ECTS					
#	**Course No.**	**Course Name**	**CH's**	**Faculty**	
1	110108133	Environmental Awareness	3	Science	
2	111404120	Economics and Administration	3	Economics	
3	110108104	Energy and its Sources	3	Science	
2- Elective Courses: 15 Credit Hours = 25 ECTS (FIVE COURSES)					
1	111303458	Climate Change and Global Warming	3	Natural Resources and Environment	
2	110201327	The Economics of Natural Resources and Environment	3	Economics and Administrative Sciences	
3	1203433	Environmental Sociology	3	Arts	

4	107751	Contemporary International Issues	3	Arts	
5	111001214	Multimedia Programming	3	Prince Al-Hussein Bin Abdullah II for IT	
6	111001320	Computer Networks	3	Prince Al-Hussein Bin Abdullah II for IT	
7	110108115	Computer Ethics	3	Prince Al-Hussein Bin Abdullah II for IT	
8	110302419	Education for Sustainable Development	3	Educational Sciences	
3- Capstone Courses: 6 Credit Hours = 10 ECTS					
1	151001490	Practical Project 1 (Emphasis on Climate Change and Sustainability Policy)	1	Prince Al-Hussein Bin Abdullah II for IT Information Technology	
2	151001491	Practical Project 2 (Emphasis on Climate Change and Sustainability Policy)	2	Prince Al-Hussein Bin Abdullah II for Information Technology	
3	111202370	Environmental Volunteering	3	Land Management and Environment	
Sum of Credit Hours = 9+15+6=30, 15 ECT+25ECT+10ECT= 50 ECTS					

DEVELOPING AND IMPLEMENTING THE CLIMASP MINOR AT THE UNIVERSITY OF JORDAN: A CASE STUDY





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September, 2016

1.0 INTRODUCTION

CLIMASP is a European Commission TEMPUS funded project entitled "Development of an Interdisciplinary Programme in Climate Change and Sustainability Policy" that is being designed and implemented across 10 universities in Egypt, Jordan and Lebanon. The CLIMASP project is coordinated by the University of Crete, Greece through its UNESCO Chair ICT in Education for Sustainable Development (http://www.ictinesd.org/unescochair/climasp/).

Middle East is one of the most vulnerable regions to climate change and there is a need for awareness programs as well as academic program to produce professionals who will develop, lead, manage, teach and influence society's institutions of different disciplines.

The general objective of participating in the CLIMASP project is instill the awareness of climate change and sustainable development in the university students as a first step towards qualifying interested students to take part in the assessment and mitigation of climate change impacts on the Jordanian society and environment. Specific objectives include:

1) Developing capacity building activities to encourage university teaching and administrative staff for interdisciplinary collaboration and building partnerships with local/ national and regional partners,

2) Involve university faculty and other key stakeholders in the development of an undergraduate interdisciplinary program on climate change and sustainability policy issuing a recognized certificate by university administration in disciplines involving education sciences, applied and engineering sciences as well as economics/business sciences,

3) Establish a focal point to promote sustainability and interdisciplinary cooperation through the Euro Arab center and its ICT lab.

2.0 UNIVERSITY BACKGROUND

Provide background on your university, history, structure, faculties, number of students and staff, strategic planning, especially in relation to sustainable development, organizational culture, and any other issues that you feel are necessary to provide the reader with a comprehensive understanding of the background of the CLIMASP case study.

2.0. A

UJ History, Structure, and Faculties:

The University of Jordan is both a modern as well as old institution of Higher Education in Jordan. Established in 1962, the University has, since then, applied itself to the advancement of knowledge no less than to its dissemination. In its capacity as a comprehensive teaching, research and community-service institution, the University of Jordan enables its students to choose from a wide range of programs-more than 3500 different courses are offered by some 18 faculties.

Many current and former staff members head important academic, administrative, and political establishments in the Kingdom; many have served as ministers in a number of government cabinets, top advisers to the Jordanian leadership, members of Parliament, and presidents of Jordanian public and private universities. Among its more than 1086 faculty members are freelance writers in the national newspapers and magazines as well as consultants for the radio and TV. Stations, poets, novelists, short-

story writers, and literary critics. Many have also offered their services to some neighboring Arab and Muslim countries, and many teach or have taught at a number of prestigious universities all over the world. Most faculty members are active participants in conferences, workshops, and symposia abroad; and most take advantage of the various research and exchange awards. Given the global outlook, the progressive

Thinking and diverse background, these faculty members shoulder the responsibility of delivering a quality education to the 38,000 students who are pursuing a wide variety of undergraduate and graduate programs.

At the undergraduate level, students have the choice to select from among 63 different programs in the Arts, Business Administration, Science, Shari'a (Islamic Studies), Medicine, Nursing, Agriculture, Educational Sciences, Engineering and Technology, Law, Physical Education, Pharmacy, Dentistry, Humanities and Social Sciences, Rehabilitation Sciences, Information Technology and, most recently, Arts and Design. For those interested in graduate education, the University offers 30 doctoral programs, 81 Master's programs, 16 programs in Higher Specialization in Medicine, one program in Higher Specialization in Dentistry, 3 Professional Diploma Programs, and 6 interdisciplinary Master's programs across the wide spectrum of academic disciplines.
From an international perspective, the University offers 63 international programs at the undergraduate level, and 130 international programs at the graduate level and in all fields of specializations. All programs offered by the University combine traditional academic lecturing with the more liberal methodologies of instruction which are based on dialogue, research and creative thinking. Theoretical instruction is further assisted with interactive multimedia teaching techniques and computer-based instructional materials to support, and eventually discard, traditional teaching methodologies. Field work, practical training, and applied research are essential components of most of the programs offered by the University. For some time, UJ has been introducing and implementing the principles of Total Quality Management (TQM). With respect to Information Technologies, UJ is very well-positioned.

2.0. B
UJ Strategic Plan and its Relation to Sustainable Development:

UJ Vision
To manage society in order to make UJ one of globally ranked universities by 2018.

UJ Mission
To become a pioneer university amongst globally ranked ones by providing students with outstanding teaching and learning experience, adopting research programs; to produce theoretical and applied knowledge and spread it, contributing effectively to building lifelong learning culture and improving the quality of life at local, regional and global levels.

UJ Goals and Objectives Related to Sustainable Development:

1. Graduating outstanding students who can excel in public competitions, job markets and postgraduate programs, in light of pluralism and the change of environmental and technological requirements.
2. Excel in the academic and institutional side at both the undergraduate and postgraduate levels .
3. Promoting the spirit of loyalty and pride amongst faculty members, administrative staff, students and alumni.
4. Readiness for accountability by higher education officials for the provision of quality in its programs, services and procedures as well as its commitment to the laws and regulations.
5. Providing safe, healthy and stable environment that encourages UJ's administrative, faculty members and students to learn, create and excel.
6. Excelling in research production and postgraduate programs in a way that serves local, regional and global communities in addition to developing the educational process .
7. Perfectly invest available human and material resources in order to serve the educational process and achieve its vision and mission.
8. The development of the structure of UJ's programs, academic and administrative units to contribute to overcoming slack management, wasting of financial resources and increasing costs rather than achieving quality and development of its operations and outputs .
9. Strengthening ties with the local community, Arab and regional educational institutions and bodies.
10. Improving the effectiveness of faculty members at UJ to strengthen the learning process amongst students, boosting their personal, social, academic and technological abilities.

3.0 UNIVERSITY POLICIES AND PRACTICES PRIOR TO CLIMASP

According to the strategic plan of the University of Jordan there are many goals and objectives that are related to sustainability policy curricula and professional development. One of the main objectives is "Excelling in research production and postgraduate programs in a way that serves local, regional and global communities in addition to developing the educational process". In addition, the strategic plan focused on preparing the students to be ready to cope with "the change of environmental and technological requirements". To achieve these goals one of the UJ policies and practices is creating plan committees in each of its faculties. The duties of these committees include sustainable review of UJ study programs, develop, and reform many of the current implemented programs to meet the contemporary higher education institutions' needs. Consequently, CLIMASP project is an exceptional initiative that resonates to the UJ general policies and practices in promoting new "interdisciplinary cooperation" that strengthen the awareness of climate change and sustainable development among university students.

4.0 THE CLIMASP CASE EXPERIENCE AT THE UNIVERSITY OF JORDAN

4.1 Overview

The CLIMASP project experience stemmed from the interest showed by faculty members and passed through several stages:

- Pilot Stage, started in the academic semester 2014–2015.
- Implementation Stage started in the academic semester 2015-2016.

4.2 Achievements

By participating in the CLIMASP project, the following items are considered as achievements by the University of Jordan. The interested people including university students, faculty members, administrative staff and the local community will all share the project outcomes presented below.

4.2.1 Capacity Building of UJ Faculty and Staff

WP 2: Strengthening the Inputs of the Stakeholders
DEV 2.1 Barriers and drivers of stakeholders inputs
DEV 2.2 Stakeholders' survey for CLIMASP competences
DEV 2.3 Guidelines for strengthening stakeholders' inputs

WP 3: Capacity Building for CLIMASP Curriculum Development & Implementation
EXP 3.1 National training workshop at the design stage
EXP 3.2 National training workshop at the development stage
EXP 3.3 National training workshop at the implementation stage
EXP 3.4 1st & 2nd regional training workshops
EXP 3.5 Continuous online capacity building and support

The following are the main national and regional capacity building activities:

1. First national training workshop held at the University of Jordan, Amman, Jordan, March, 19-20, 2014.
2. Second national training workshop held at the Hashemite University, Zarqa, Jordan, June, 16-18, 2014.
3. First regional training workshop held at the American University Madaba, University Jerash and University of Jordan, Amman, Jordan, October, 25-27, 2014.
4. Third national training workshop held at the University of Jordan, Amman, Jordan, August, 4-6, 2015.
5. Second regional training workshop held at Fredrick University, Nicosia, Cyprus, May, 5-7, 2016.

Other activities include building local, national and regional/international cooperation among academics, educators and professionals as well as contributing to the project publications. Monitoring visits and other meetings provided further knowledge and expertise.

During these meetings, important issues such as interdisciplinary programs, climate change impacts awareness and related research projects, sharing academic and educational experience among participating institutions, stakeholders' engagement, integration ethics, values and sustainability in education, course mapping and curriculum development, teaching and learning approaches including problem-based learning, service capstone courses, peer review of course syllabi and modules, pilot stage outcomes, establishing infrastructure and running centers for interdisciplinary studies, awarding the program certificate and its privileges; in addition to administrative and financial issues.

4.2.2 Establishing Interdisciplinary Program

WP 4: Design and Development of CLIMASP Curriculum

DEV 4.1 Catalogue of CLIMASP courses to be revised and developed
DEV 4.2 CLIMASP course syllabi and course modules
DEV 4.3 Validation and accreditation of CLIMASP courses

Specific objectives include:

1. Building interdisciplinary and stakeholders' driven climate change curricula responsive to societal needs;
2. Develop an undergraduate interdisciplinary program on climate change and sustainability policy (CLIMASP);
3. Integrate, implement and assess the CLIMASP program as an integral part to existing undergraduate academic degrees; and
4. Contextualize the Euro Arab pass supplement diploma.

The Climate Change and Sustainability Policy (CLIMASP) minor at The University of Jordan is an interdisciplinary program funded by the European Commission Tempus under the coordination of the UNESCO Chair ICT in Education for Sustainable Development, University of Crete, Greece. Students from Faculty of Engineering & Technology, The school of Business, and Faculty of Educational Sciences choosing the CLIMASP minor as a complement of their major opens to them new opportunities for further studies and career paths.

Program Structure: The CLIMASP minor consists of core courses, elective courses and a required capstone course in three concentration areas: 1) Climate Change, Environment and Society; 2) Climate Change, Economics and Public Policy; and 3) Climate Change, Science and Technology. The courses included in the CLIMASP minor are an integral part of the participating disciplines curricula. It is, thus,

An advantage for students seeking a meaningful and rewarding complement to their main field of study. As a pioneer experience, the following UJ Departments are offering courses as part of the CLIMASP program:

1. Department of Curriculum & Instruction, Faculty of Educational Sciences
2. Department of Business Economics, The school of Business.
3. Department of Mechanical Engineering, Faculty of Engineering & Technology
4. Department of Chemical Engineering, Faculty of Engineering & Technology.

Therefore, the student who wishes to benefit from this program needs to register and pass the following courses:

- ✓ Three core courses (9 Credit Hours or 15 ECTS), one from each of the Areas (A, B 1) and C).
- ✓ Capstone course (6 Credit Hours), which provides practice or training 2) in the field of climate change and environmental sustainability. A combination of 2 such courses with a total of 6 Credit Hours is accepted as capstone course.
- ✓ Elective Courses (15 Credit Hours), which can be taken by student from 3) his major B.Sc. program, or from outside his department.

The courses are selected from the existing UJ programs curricula to produce an interdisciplinary program in CLIMASP with minimum extra courses required by students from the Departments participating in the program. Students must have completed at least one semester before applying to the CLIMASP Minor program. The application must be accompanied by an approval from the CLIMASP faculty advisor. To register in the CLIMASP minor program, the student should contact the program coordinator in his/her faculty, who will be the student's advisor throughout the CLIMASP study. Students are advised to plan registering their CLIMASP courses early when they register to their B.Sc. Major courses. Also, they should give care to course prerequisites before registration to avoid studying unnecessary courses and make a written plan with the help of their CLIMASP advisor.

CLIMASP Steering Committee:

- University Vice President
- Dean of Scientific Research
- CLIMASP Project Coordinator University Registrar
- Project Design Team

The CLIMASP minor program will be administrated by the Euro-Arab Center for Interdisciplinary Studies at the University. The program structure and course details are given in Annex (2).

4.2.3 Peer and External Review

Peer review of course syllabi and modules was conducted during the first regional capacity building workshop held in Jordan in October, 25-27, 2014. The University of Jordan CLIMASP courses were peer-reviewed by The Hashemite University of Jordan.

U J team was involved in the peer-review of NDU courses.

External review of the course modules was conducted by sending them to two external evaluators assigned by CLIMASP program chief coordinator, Prof. V. Makrakis. The reviewers were Dr. Michele Biasutti, from University of Padova, Italy and Dr. Carmel Mulcahy, Dublin City University, Ireland.

The UJ CLIMASP team has completed modifying all the reviewed courses according to the reviewer's recommendations.

4.2.4 Establishing the Euro-Arab Center

WP 5: Setting-up the CLIMASP Infrastructure
- DEV 5.1 Centers for integrative and interdisciplinary studies
- DEV 5.2 ICT laboratory for CLIMASP

4.3 CHALLENGES FACED AND HOW THEY WERE OVERCOMED

1. The administrative protocol and legislations of the University of Jordan. Most of the processes need approval prior to initiation. This may be overwhelmed by Bureaucratic procedures.

2. Changing administrators, officials and directors without prior notice cause serious delays in getting proper approvals and making progress in general.

3. By contributing to CLIMASP project, some related courses have to fit with the project modules to cope with climate change and sustainability concepts. Changing/ editing the course plans and / or course descriptions and syllabi need to go through the University's committees and registration Office. The vice president approval is also a must, which may require time and convincing different parties among the school. This procedure took a long period of time, yet it has been resolved by persistent and determinations.

4. The University policy acquired that the number of the student registering per course should more than 30, otherwise course will be cancelled and removed from the schedule. Negotiation with the administration and registrar is still going on to resolve this issue and hence student completion of the program will not be delayed.

5. Expanding the network by Finding stakeholders and partners for training students require Memorandum of Understanding (MOU) between the partners and this should be regulated and

signed by the presidents of both institutions/ companies. The CLIMASP team members are working to widen the stakeholder, partners' umbrella by meeting, networking and negotiation.

6. One of the main dissemination tool for this project is the CLIMASP of UJ website, which should serve as the connection for all parties (students, faculties, researchers, administrators, stakeholders, and community). Launching the website should be approved by the Computer center of the UJ. Unjustified delays occur and there are promises to get over this issue very soon.

7. Convincing students to be part of this project require raising awareness of climate change and sustainability concepts school wide and nationwide. This is a complete strategy that should target (approach) student body, university staff and parents. Students may need to pay for extra credits

8. Cooperation among different faculties is rarely applied at UJ. There are almost no interdisciplinary courses.

9. Another related challenge is the lack of interest and commitment among professors. Some Faculties such as Agriculture (Department of Natural resources and Environment), Science (e.g. Departments of Biology and Geology and Environment) didn't participate even though they have courses that focus directly to climate change, sustainability and environment.

10. By meeting and dialogue, workshops and training some staff have been convinced to be part of the project.

4.3.2 **Challenges related to courses and Study Plan**

1. How to choose suitable courses that can be connected with climate change, keeping in mind the list of courses in the student's study plan?
2. We tried to find the best mix with lots of efforts being put to match climate change with various issues in a reasonable way.
3. The difficulty to access textbooks that relate climate change to certain fields.
4. Still needs to be solved. As this procedure should go through Tender Office at the UJ University.
5. The withdrawal of finance department courses in the mid-way.
6. Regarding the internship, in the economics department there is no training credit or graduation project.
7. We decided to fill this gap using community services credit. Students should serve certain number of hours in environmental activities, which should be arranged with some environmental institutions. Unfortunately, it will not be easy to monitor and evaluate students' performance, which will stay as a challenge.
8. The transcript / Certificate dilemma that should be a proof of student's completion of the courses and participation in the CLIMASP program.
   The University of Jordan doesn't recognize / offer a Minor degree for any discipline.
   There are some unresolved enquiries i.e.
   What is the shape of the certificate? (Who will sign it?)
9. Sustainability of the project? Considering climate change in the related courses in the future when the administrative team and involved parties change. Big challenge!! The guarantee for sustainability of the project should be protected by regulations and University legislations)?!!!
10. Lack of appreciation and recognition of the CLIMASP certificate among labor market in Jordan. Need to have workshops and meetings with partners, and raising awareness via social media

4.4 EXPLOITATION AND DISSEMINATION

4.4.1 Exploitation

The Pilot Study

For smooth introduction of an interdisciplinary curriculum, a piloting stage started in the spring of academic semester 2014-2015 on selected CLIMASP courses. Piloting creates the opportunity to demonstrate what interdisciplinary learning and teaching looks like throughout the semester and allows faculty members, students and evaluators to observe processes, methods and practices. Attempting to assess the CLIMASP courses piloted, an instrument was constructed that consists of five parts. In the first part, a number of student background variables were posed, including gender, faculty (college) and discipline, study year and previous attendance of courses related to sustainable development. In the second part, a scale was framed to measure teacher-centered (3 items) and student-centered (11 items) modes of teaching and learning. In the third part, the scale referred to the 10Cs, which is critical skills needed for the 21st century was framed. These skills and understandings are vitally important to support problem solving and sustainability decision-making.

To determine the students' perceptions of interdisciplinary teaching and learning of CLIMASP program courses, a questionnaire constructed by Prof. V. Makrakis, the project coordinator, as a survey instrument (Annex 3). The pilot phase survey was carried out on 306 student through a questionnaire that contained questions to evaluate the learning experience. The data of the survey were analyzed using the SPSS software in both pre and post-test; the percentage was calculated to identify the background of the students. Descriptive statistics (number and percentages) were used to describe the backgrounds of the students and the Likert scale was used to describe the perceptions (Chien-Ho, 2007). Nine of the CLIMASP courses were involved.

The survey showed an improvement of student perception after taking the courses. The mean for first section variables in the pre-questionnaire was 2.7 which indicate a medium perception, and the mean for post-questionnaire was 2.91 which indicate also a medium perception. The second section in the pre-questionnaire was 2.55 which indicate a high perception, and the mean for post-questionnaire was 2.8 which indicate also a high perception. The conclusion is that the programs affect the perception of students of the University of Jordan significantly. Figures 1 and 2 in Annex (3) demonstrates the difference between the means of the pre and post-tests. The means for both the pre and the post-tests shows that the students have medium perceptions, and there is an improvement for these perceptions at the end of the semester.

4.4.2 Dissemination

WP 8: Dissemination and Sustainability

DISS 8.1 Dissemination and sustainability strategic plan
DISS 8.2 Project Website & associated social media
DISS 8.3 CLIMASP Euro-Arab Pass Diploma
DISS 8.4 International Network of CLIMASP Studies
DISS 8.5 International Conference & list of publications/good practices

Time schedule: 36 months (1 till 36)

Dissemination activities ran for the duration of the project lifetime and will continue once the project has officially closed. It aimed to ensure that the overall concept, actions carried out within each Work Package and the results achieved through the project are widely disseminated to the target groups at both national and international level.

Objectives: Actions undertaken to ensure that the results and deliverables of the project will be made available to target groups

Deliverables:

1. Promotion Materials.
2. Project Website.
3. Events and Networking
4. Dissemination Workshops.

A correct definition of dissemination objectives is crucial to get the expected impact of the project and its outcomes. The main focus of the CLIMASP dissemination framework is defined in the following dissemination and sustainability objectives:

1. Ensure that the project outcomes are widely disseminated (spread and understood) to the appropriate target communities or users, at appropriate times and via appropriate methods or channels.
2. Involve all those who can contribute to the network outcomes and objectives

Press releases have been produced informing on the start of the project and the kick-off meeting and the workshops that held in Jordan

CLIMASP Brochure:
A brochure was produced informing about:

- ✓ What is CLIMASP Project?
- ✓ Main Objective
- ✓ Specific objectives
- ✓ Why choose the CLIMASP minor?
- ✓ Main faculties and disciplines involved in CLIMASP minor How to register in the program?
- ✓ PROJECT PARTNERS

Info days about CLIMASP project were conducted during the project life time at the:

- Faculty of Engineering and Technology
- Faculty of Business
- Faculty of Educational Science.

CLIMASP Website: A website for CLIMASP project was created with registration zone to enable the students who are interested to join the program knowing the new and updates of CLIMASP project https://sites.ju.edu.jo/en/climasp/Home.aspx.

This website is one of the main communication tools for educating the wider audience upon the CLIMASP project, impact and results.

CLIMASP DISSEMINATION ACTIVITIES					
Name of CLIMASP Partner		**The University of Jordan**			
No	**Event***	**Date**	**Place**	**Target****	**Outcomes*****
1	Meeting	14 December 2015	Class room in the economics department /JU.	Students of international trade theory course for the Fall semester.	Explanation and discussion of 2015 UNITED NATIONS Climate Change Conference held in Paris/France, which resulted in the adoption of Paris Agreement on 12 December 2015.
2	Power point presentation	18 April 2016	Small Theatre, Economics Department Building /JU.	Students of the Economics Department.	Questions and discussions of the presentation of a power –point on Climate Change and international trade, presented by the expert "Rebert Hamwey" from "Trade, Environment, Climate Change and Sustainable Development Branch" of UNCTAD (United National Conference on Trade and Development). Concentration has been put on the issues and policies related to mitigation of climate change problems.
3	Meeting	25 April 2016	Class room	Second Semester Students of "International Trade Theory" course.	Discussion of April 22 Paris Agreement Signing Ceremony in New York (22 April 2016), with emphasise on the need to sign this agreement from all countries.
4	Presentation	3 May 2016	Class room	M.SC. Students of "Economic Integration"course.	Presentation of a research prepared by one of the students on " Climate Change, the Environment and Integration", highlighting the role of regions to support every programme aims at mitigating Climate Change

5	Info-Day at The School of Business.	24 November,2015	The great Auditorium/ Building no. 1 School of Business	Undergraduate Students in Business Economic Department	1) About 100 students attended the event. 2) The S.B. Dean introduced the CLIMASP project and encouraged students to register. 3) A CLIMASP flyers and folders have been distributed among the students. 4) 15 students have been registered.
6	Info- day about CLIMASP project at the School of Engineering	24 December, 2015.	School of Engineering	Students at different levels, their families and faculty members	Info- day about CLIMASP project were held at the School of Engineering 24/12/2015 (the graduation day). Mugs and chocolate bars were produced and distributed. About 150 persons have attended the event.
7	CLIMASP press releases	During the project life time	UJ website, different electronic websites visual and audible media.	Students, stakeholders, and instructors, local community, and decision makers	Press releases have been produced informing on the start of the project and the kick-off meeting and the workshops that were held in Jordan and partner countries. (Attached)
8	CLIMASP promotional materials	During the project life time	Targeted departments	Students, stakeholders, and instructors	Mugs and chocolate bars were produced and distributed.

9	CLIMASP brochures, booklet, rollup and flyers.	April 2015	Targeted departments	Students, stakeholders, and instructors	500 copies of CLIMASP brochure, 2 rollups, 2 flyers and booklets were produced. And distributed in different dissemination activities
10	Workshop of strategic project on how to save the Dead Sea from drought	May 02, 2016	Faculty of Arts at the University of Jordan	Students of Sociology.	Academics, experts and scholars geologists introduced a strategic solution to save the Dead Sea from the threats of climate change ridden and contribute to its demise and dry. About 50 persons attended this workshop.
11	Euro-Arab Centre opining ceremony	May 03, 2016	School of Engineering, UJ	UJ decision makers, President, vice president, dean of scientific research,	http://ujnews2.ju.edu.jo/en/english/Lists/News/Disp_FormNews1.aspx?ID=5151 At the inauguration ceremony, a brief presentation about CLIMASP project and Euro-Arab centre for Interdisciplinary studies was presented by CLIMASP project coordinator at UJ, Prof. Al-Salaymeh. About 70 persons attended the event. CLIMASP flyers, brochures and folders have been distributed among the attendees
	CLIMASP website	May, 2015	UJ site	CLIMASP students, UJ students, employees, Instructors And public	https://sites.ju.edu.jo/en/climasp/Home.aspx Sharing CLIMASP overview, objectives, partners, toolkit, study plans, registration etc…

Euro-Arab Center of Interdisciplinary Studies:

Location: School of Engineering, UJ

Strategic Goals:

1. Support interdisciplinary courses and provide resources necessary to study and discuss sustainable development, climate change along with the other challenges at the local, regional and global levels.
2. Facilitate effective, non-traditional education
3. Facilitate communication and cooperation and promote dialogue among scholars and students in various institutions and across the globe

4. Establish an institutional framework for providing advice and capacity building in developing and revising courses and programs, especially those related to sustainable development and climate change
5. Develop into a renowned source of information and advice for various stakeholders including policy-makers about issues related to sustainable development and climate change.

Certificate:

The adopted procedure for awarding the CLIMASP certificate at the U of J is as follows:

1. The Registration Directorate issues a course transcript for the student.
2. The CLIMASP program committee reviews the transcript and ensures that all requirement are met and all information are accurate.
3. The Euro-Arab Centers for Interdisciplinary Studies issues the Euro Arab Pass Certificate.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The CLIMASP program is adopted by the University of Jordan which is one of the pioneers of higher education institutions and this appeared in its proactive vision towards the most contemporary issues and topics. The implementation of CLIMASP program in the undergraduate level stemmed from one of the university objectives of connecting students with reality and with environment around them.

Jordan is one of the countries that have been affected by climate change crisis. The interdisciplinary program of climate change and sustainability policy in UJ open up new opportunities for developing, directing, managing and influencing the education's outcomes in order to prepare interested students to become certified to take part in the evaluation and alleviation of climate change impacts on the Jordanian community and environment.

A qualified university teaching and administrative staff from five faculties has been involved in developing the required curriculum for the undergraduate interdisciplinary program on climate change and sustainability policy. Additionally, a partnership has been established between the University and the key stakeholders, local and regional partners to make the right backward and forward connections in terms of sustainability and internship perspective.

The Euro Arab center and its ICT lap have been launched in the engineering faculty to promote sustainability and maintain a continuous collaboration with European partners in future projects. Furthermore, the center and the competences involving education sciences, applied and engineering sciences as well as business school will be responsible of issuing a certificate that each student will obtain when he/she finish its requirements.

The university academic programs amalgamate traditional academic lecturing with more modern pedagogy which is based on discussion, research, analytical thinking, based problem learning and social media means. All these essentials were the basic instruments that play a role in CLIMASP program success.

More than four meetings have been conducted locally and regionally besides monitoring visits in which the University was one of the main contributors in such activities that support further knowledge and awareness on the environmental issues, climate change crisis and sustainability challenges that took place in the CLIMASP course revision process. In this process students were allowed to take the opportunity to compare their thoughts with their colleagues, to interact with their instructors and to contribute in developing course substance in momentous method.

Worth to mention that the dissemination plan of the CLIMASP interdisciplinary program that University accomplished through promotion materials, project website, events and networking, has focused on its definition that ensure the proper target communities and clients to exploit the project outcomes via suitable techniques or networks. The University of Jordan includes the interdisciplinary program of climate change and sustainability policy within its system and lessens all the obstacles and the challenges that may confront such program. The interdisciplinary philosophy and knowledge can be incorporated into content, techniques, and pedagogy of different disciplines to insure reasonable judgments and convenient education outcome.

Indeed, the University of Jordan is very interested in this program and aims to keep working in all dimensions to support its success. Based on our investigation, it is recommended that the following issues are addressed in order to enhance the project impact and achieve visible outcomes:

Based on our investigation, it is recommended that the following issues are addressed in order to enhance the project impact and achieve visible outcomes:

1. Effectively sharing all information related to the project.
2. The Ministry of Environment should play central role concerning the sustainability of the project.
3. Opening the door for the involvement of new departments in the project and supporting them.
4. Adding more flexibility regarding administrative and legislations of the University of Jordan, to ease the inclusion of new departments if applicable.
5. Effectively sharing all CLIMASP information with all faculty members in each member department, such that all should informed about the way that the included courses must be taught.

6. Maintaining to raise awareness on the climate change and sustainability concepts school wide and nationwide, and to encourage new students to acquire the CLIMASP certificate.
7. Protecting the sustainability of the project by regulations and University legislations.

8. Continue to ensure that the project outcomes are widely disseminated (spread and understood) to the appropriate target communities or users via proper methods or channels.
9. It is advised to establish follow-up mechanisms on implementation of project activity/work package and to request a regular feedback from CLIMASP faculty members and the students to provide sufficient information on the project's academic development.
10. It would be advisable to further enhance the cooperation and exchange activities between all included universities.
11. It would be desirable to keep updating and enriching the project website with more information about project progress.

ACKNOWLEDGMENT

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REFERENCES

1. http://www.ictinesd.org/unescochair/climasp/
2. Document 543879-TEMPUS-1-2013-1-GR-TEMPUS-JPCR
3. http://www.ictinesd.org/unescochair/climasp/workplan-wps
4. http://www.ictinesd.org/unescochair/climasp/wp-content/uploads/2014/04/University-of-Jordan- CLIMASP-MINOR.pdf
5. Vassilios Makrakis and Nelly Kostoulas-Makrakis/ University of Crete, Greece, 2015, Piloting the CLIMASP -Tempus Interdisciplinary Minor in Climate Change and Sustainability Policy: Outcomes Achieved. The European Conference on Sustainability, Energy & the Environment 2015 Official Conference Proceedings. Pp 189-206.
6. Makrakis, V., & Kostoulas–Makrakis, N. (2014). An instructional-learning model applying problem-based learning enabled by ICTs. In A. Anastasiadis et al. (Eds.), Proceedings of the 9th panhellenic conference on ICTs in education (pp. 921–933), October 5–7, 2014, University of Crete
7. Chien-Ho Wu, "Applied Mathematical Sciences", Vol. 1, 2007, no. 58, 2851 - 2862

ANNEXES

Annex (1): University Administration Decisions & Documents Regarding CLIMASP Project



Annex (2): CLIMASP Structure, Course mapping, syllabi, modules,

Table (1): Core Courses (All students of CLIMASP program should study)

Area	**Course Code**	**Course Title**	**Prerequisite**	**Department**	**Faculty**	**Course Category**
Environment and Society	2305100	Introduction to Sociology	None	Sociology	Arts	University Elective
Economics and Public Policy	1607100	International Political Economy	None	Business Economy	Business	University Elective
Science and Technology	0305100	Environment	None	Geology	Science	University Elective

Table (2): Elective Courses from the Department of Curriculum and Instruction / Faculty of Educational Sciences:

Course Code	**Course Title**	**Prerequisite**	**Course Category**
0802213	Basic Mathematical concepts and their teaching methods (1)	None	Dept. Core.
0802303	Designing and Producing Instructional Materials	None	Dept. Core
0802313	Basic Mathematical concepts and their teaching methods (2)	None	Dept. Core.
0802317	Child Computerized program	None	Dept. Core
0802391	Instructional Materials for Children	None	Dept. Core
0802414	Environmental Education Child	None	Dept. Core

Table (3): Elective Courses from the Department of Business Economics / School of Business:

Course Code	Course Title	Prerequisite	Course Category
1607225	Industrial Economics	1607110	Dept. Core.
1607330	International Trade Theory	1607110	Dept. Core
1607411	Contemporary Economic Issues	1607111	Dept. Core.
1607415	Economic development	1607111	Dept. Core
1607421	Managerial Economics	1607110	Dept. Core.
1607431	International Finance	1607111	Dept. Core

Table (4): Elective Courses from the Department of Mechanical Engineering / School of Engineering

Course Code	Course Title	Prerequisite	Course Category
0904445	Air Conditioning (1)	0904441, 0904342	Dept. Core
0904443	Thermal Power Plants	0904342	Dept. Elective
0904554	Solar Energy	0905441	Dept. Elective
0904453	Refrigeration Systems	0904342	Dept. Elective
0904459	Energy Conversion	0904342	Dept. Elective
0904545	Internal Combustion Engines	0904342	Dept. Core

Table (5): Elective Courses from the Department of Chemical Engineering / School of Engineering

Course Code	Course Title	Prerequisite	Course Category
0905371	Fuel and Energy	0905343	Dept. Elective
0905471	Energy Conservation and Manag	0905371	Dept. Elective
0905473	Environmental Engineering	0905342	Dept. Core
0905474	Waste Water Treatment	0905473	Dept. Elective
0905475	Air Pollution	0905421	Dept. Elective
0905573	Solid Waste Management	0905473	Dept. Elective
0905542	Water Desalination	0905442	Dept. Elective

Table (6): Capstone Courses for the Three Areas

Course Code	Course Title	Prerequisite	Department / Faculty	Course Category
0908319	Practicum (1)	0802290	Curriculum and Instruction / Faculty of Educational Sciences	Department Core
0908419	Practicum (2)	0802290	Curriculum and Instruction	Department Core
1600150	Community Service	None	Business Economics / Business	University Requirement
1607311	Scientific Research in Economics	1607150	Business Economics	Department Core
0904599	(Final Year) Project	Completing 124 C.H.	Mechanical Engineering	Department Core
0905599	(Final Year) Project	Completing 124 C.H.	Chemical Engineering	Department Core
0900500	Practical Training	Completing 120 C.H.	Mechanical and Chemical Engineering	College Requirement

COURSE DESCRIPTION

Core Courses

2305100 Introduction to Sociology

The relationships between Sociology and other sciences, its methods, basic concepts such as social structure, culture, identity, social institutions, social stratification, social problems, and social change.

1607100 International Political Economy

This course seeks to explore the interaction of economics and politics in global affairs- the struggle for power and wealth- within the international system. The course begins by identification of the economic science and economic problem, the development of economic thought across different economies schools, concentrating on their different standpoints regarding the role of the government in the economic activity. The course aims also to study and analyze different economic systems and their characteristics. Other topics of interest will be introduced such as the flow across borders of goods, capital, foreign investment and migration; environmentally sustainable development and climate change.

0305100 Environment
This course aims at introducing the student to the rudiments of environmental science whose corner stone was laid in the second half of the 20th century. This is being accomplished by discussing the following topics: The earth and natural hazards; Ecosystems; Biogeochemical Cycles; Man and the Environment and the Natural Resources in the Solid Earth System; Air Pollution; Water Resources, management and Pollution; Solid Waste; Food and Health; Environmental Impact Assessment.

Environment & Society Courses

0802213 Basic Mathematical concepts and their teaching methods (1)
This course discusses some mathematical concepts and their methods of teaching, such as: numbers, metric system, nation and proportion, prime and composite numbers, and other geometrical concepts such as area and volume, Also this course discusses mathematical goals and objectives

0802303 Designing and producing Instructional Materials
Introduces the concept of instructional materials; definition; relationship to instructional technology; classification; sources; role of such materials in the instructional process; the impact of perception and communication on designing different kinds of instructional materials such as transparencies, slides, audio cassettes, video tapes, and computer disks; principles of designing, producing and using instructional materials according to the system approach; practical application in designing, producing and using instructional materials in different subject matters.

0802313 Basic Mathematical concepts and their teaching methods (2)
This course discusses current trends of teaching elementary mathematics with the concentrating on constructivism. Also, this course focuses in different strategies of teaching mathematical concepts, generalization, skills and problem solving. Finally, this course focuses on teaching of some geometrical concepts such as points, lines, and congruence and similarity.

0802317 Child Computerized program
This course discuss some child computerized programs (software) for the purposes of instruction, fun, and literacy. The importance of the computerized programs assisted child creative thinking and develop different skills. In addition to that children will learn some basic skills in design, production analyzing and evaluating some computerized programs and some applications on it.

0802391 Instructional Materials for Children
Identifies educational materials for children their importance, sources and types, choosing ready – made materials according to appropriate criteria and identifying their uses in the classroom. Students will learn to design needed materials which promote children's thinking abilities such as classification, sorting, numbers, special relations, measurement, time, causality… etc. Emphasis is also placed on designing materials in ways that enhance children's total development and also to judge the efficiency of the produced learning materials.

0802414 Environmental Education Child
This course will include: Environmental education concept, the importance of integrating it with other subjects, ecosystems, sustaining, natural resources, environmental problem, desertification, distinction, greenhouse effect, environmental pollution, effects of natural phenomena and environment, protecting and managing environment, and national and international safety, science, technology, society and human. Also integrated approach in designing and implementation environmental curriculum will be included.

0802319 Practicum (1)
This course aims to introduce students the reality of the learning process in the Jordanian schools; resources available for teachers; visiting kindergarten, and observing classes; discussion of classroom observations at the university.

0832419 Practicum (2)
This course aims to introduce students the reality of the learning process in the Jordanian schools; resources available for teachers; visiting schools, and observing classes; discussion of classroom observations at the university and teaching in schools.

Economy & Public Policy Courses
1607225 Industrial Economics
Industrial organization is essentially a branch of applied microeconomics which seeks to understand the causes and effects of various market structures on pricing and product choices. The course focuses on the theory of the firm and the industry in imperfectly competitive markets. We will also explore the environmental and climate change issues that are related to industrial economics topics.

1607330 International Trade Theory
In this era of globalization and regionalism it is imperative that students of economics be adequately informed on the theories and policies concerning transactions of goods and services and factor movements among nations. This course analyzes the causes and consequences of international trade on trading partners and among different groups within each country. Various theories of international trade will be explained and evaluated. The relation between international trade from one hand, and climate change, the environment and sustainability on the other, will be also discussed.

1607411 Contemporary Economic Issues
This course is primarily concerned with contemporary economic issues at the domestic, regional and international levels. Specific topics are chosen from current and recent policy debates. Specifically, it will emphasize current economic subjects such as poverty and welfare, economic growth and development, inflation, energy prices, climate changes and environmental pollution.

1607415 Economic Development
This course introduces the theory of growth and economic development, providing a qualitative and analytical perspective of economic transformation of developing countries for undergraduate students. It tries to provide an explanation for the exceptional progress that has been made in many parts of the developing world, but fully deals with the massive problems and challenges that remain to be addressed in the years ahead such as poverty inequality and development, the environment and development, basic issues in Global warming and climate change and its fallout on economic development.

1607421 Managerial Economics
Economic theory is the fundamental determinant of firms' profitability and growth, and economic thinking should be an essential element in nearly every managerial decision. In this course, we will examine the principles of microeconomics, and show how they apply to managerial decision-making specifically in the environmental issues and climate change.

1607431 International Finance
This is a course in international monetary economics, which includes the connection between the exchange rates and international macroeconomic policies. The subject of international finance draws its importance from the consequences of worldwide economic policies on a country economy's main outcomes (Employment, National Saving, Trade Balance). The students will be challenged to employ this analytical framework to real-world applications, and try to link the global financial crisis with the climate
change issue.

1600150 Community Service
The student is required to spend eight weeks at a public institution or private company where he/she practices what he/she learned regarding climate change effects, environmental issues and policies of sustainable development. A detailed report is required be the end of service discussing activities and learned skills during this experience. The institution is also required to report the attendance and performance of the student.

1607311 Scientific Research in Economics
The concept of scientific research and its definition, and kinds of scientific research, stages and objectives of scientific research, kinds and sources of data and data collection: Questionnaire, population and sample: kinds of sampling, the relation between statistics and scientific research, implementation and analyzing data using statistical methods with SPSS, finally writing reports with focus in the climate change issues.

Science & Technology Courses
0904443 Thermal Power Plants
Review of power cycles related to steam and gas turbine power plants; types and characteristics of steam power plants including Mechanical Engineering 2005 21 various plant components; water treatment; corrosion; load management; power plant economics. Environmental aspects.

0904445 Air Conditioning (1)
Review of psychrometry; thermal comfort; air conditioning processes; inside and outside design conditions; heating load calculations, infiltration; cooling load calculations, solar gain; heating systems, design, layout; hot water, steam, hot air systems; under floor heating.

0904453 Refrigeration Systems
Basic definitions and concepts; review of vapor compression and absorption cycles; compressors, condensers, evaporators, expansion devices; refrigerants; cooling towers; components of an absorption cycles, controls.

0904459 Energy Conversion

Energy classification, sources and utilization; Energy growth and economics; Fossil-Fuel Systems and combustion in steam power plants. Steam generators. Boiler rating and performance. Environmental aspects of thermal power plants. Overview on renew-able energy sources with emphasis on solar and wind energy systems. Introduction to direct energy conversion systems; Thermoelectric, photovoltaic and thermionic converters. Energy Storage.

0904545 Internal Combustion Engines
Fundamentals of engines and their types. Review of air-standard, fuel-Air and actual cycles. Fuel and combustion. Fuel feeding systems. Engine testing and performance characteristics. Air pollution. Forced induction systems. The course also includes an experimental part which allows the student to estimate the performance of both spark ignition and compression ignition engines, effect of some parameters on engine performance like ignition timing, Air/Fuel ratio, compression ratio and perform an energy balance of the compression ignition engine.

0904554 Solar Energy
Fundamentals of solar radiation; methods of solar radiation collection; thermal systems components and analysis; transfer of collected heat; storage of collected heat; domestic hot water system; introduction to solar energy applications.

0900500 Practical Training
Engineering Students are required to enroll in practical training (internships) in the field of their study for a minimum period of eight weeks. The trainee should submit a technical report (in English) for his/her training experience. The report should include adequate sections to describe the experience gained and recommendations for improvement of the training process. Weekly progress reports signed by the training supervisor are also required.

0904599 Project
The project extends over a two-regular-semesters period. In the first semester, students (individually or in teams) are assigned engineering problems which may be theoretical, experimental or both and contains a major design component. In the first semester, the students study the problem assigned and its theoretical background, set the approach, conduct a literature review, make the problem analysis and preliminary design and write a proposal including a cost estimate and time table for implementation over the second semester. In the second semester, the students carry out detailed design, construction and testing (if any), write a comprehensive report on the work as per the format posted on the department web site. The report should include, where applicable, economic and environmental assessments. The project work is presented by the students to an examination panel who judge the work.

0905371 Fuel and Energy
Energy classification, sources and utilization. Non-renewable Energy: fossil fuels and Nuclear energy. Renewable Energy: solar energy, wind power, tidal power, and geothermal energy. Fossil-fuel systems and applications. Energy storage: chemical storage, thermal storage and fuel cells.

0905471 Energy Conservation and Management
Review of energy sources and their applications. Energy auditing. Energy conservation in industrial and commercial sectors. Choice of fuel. Waste heat recovery systems. Energy economics and economic use of electricity. Process integration for efficient use of electricity. Process integration for

efficient use of energy including energy cogeneration, selection of heat transfer equipment and enhancement of heat transfer.

093473 Environmental Engineering
Concepts and terminology. Sources and impacts of water pollutants. Conventional water and wastewater treatment processes: Sedimentation, flocculation, softening, filtration, disinfection and biological systems. Sources and impacts of air pollutants. Air pollution control through gas cleaning devices: cyclones and wet scrubbers. Solid waste classification, handling and ultimate disposal

0905474 Waste Water Treatment
Overview of water pollutants. Local and international standards for wastewater from industry effluents. Standard methods for wastewater treatment. Primary, secondary and tertiary treatment methods for wastewater such as flocculation, settling, flotation, filtration chemical treatment, biological treatment, sludge treatment and disposal. Membrane separation and adsorption.

0905475 Air Pollution
Air pollutants and sources of air pollution. Ventilation of confined space. Air streams including stack emissions and exhaust fans. Introduction to air dispersion, Gauss model. Local and international standards for air pollutants. Wet and dry air pollution control methods. Air pollution control instruments. Air sampling and measurement of pollutants.

0905573 Solid Waste Management
This course examines methods of managing solid and hazardous waste, with an emphasis on pollution prevention. Topics covered include relevant local and international legislation, recycling, incineration, landfill operations, management of radioactive waste, remediation of waste sites and site worker health and safety.

0905542 Water Desalination
Need for water desalination: Review of local, regional and worldwide water resources, Drinking water standards, Types and properties of saline waters. Water desalination technologies and criteria for process selection. Detailed description and design and operational aspects of commercial desalination methods mainly MSF, MEE, VC and RO including scale formation problems and pretreatment requirements. Post treatment of product water.

0900500 Practical Training
Engineering Students are required to enroll in practical training (internships) in the field of their study for a minimum period of eight weeks. The trainee should submit a technical report (in English) for his/her training experience. The report should include adequate sections to describe the experience gained and recommendations for improvement of the training process. Weekly progress reports signed by the training supervisor are also required.

0905599 Project
Project duration is two semesters. Students are allowed to register in project (1) after completion of 124 credit hours. Each student performs a detailed study of a chemical engineering problem from the selected process chosen in project (1). The final report submitted by the group should include mass and energy balances, process flow diagram and detailed design of one or more items of equipment and other equivalent tasks.

Sample Course Syllabus and Module before and after External Review



Course Syllabus

0935473 Environmental Engineering

University of Jordan, Faculty of Engineering & Technology,

Chemical Engineering Department

Fall Semester, 2014-2015

Instructor Information

Instructor:	Dr. Ahmad M. AbuYaghi
Office Location:	University Campus, Engineering Building, 2nd Floor
Office Telephone:	+962 6 535 5000 Ext. 22906
Office Hours:	Mon Wed 9:30- 11:00am
E-mail:	ahmad.ay55@gmail.com
Faculty Website:	http://www2.ju.edu.jo/sites/Academic/abuyaghi/default.aspx

Course Identification

Course Number:	**0935473**
Course Name:	Environmental Engineering
Course Location:	University Campus
Class Times:	Mon Wed 11:00am- 12:30pm
Prerequisites:	0955342

Course Description/Overview

Environmental Engineering uses environmental science principles, along with engineering concepts and techniques (design, operation and maintenance of engineering units, structures or equipment) to assess the impacts of societal activities on the environment and the impact of environment on people as well as to protect both human and environmental health. Environmental Engineering is a multidisciplinary area that requires a sound background in various subjects of pure and applied sciences covering both technical and social aspects to deal with the quality and availability of environmental resources.The catalog description of the course is as follows:

Concepts and terminology. Sources and impacts of water pollutants. Conventional water and wastewater treatment processes: Sedimentation, flocculation, softening, filtration, disinfection and biological systems. Sources and impacts of air pollutants. Air pollution control through gas cleaning devices: cyclones and wet scrubbers. Solid waste classification, handling and ultimate disposal.

Course Objectives

The overarching goals of this course are providing students with exposure to the main topics in environmental engineering in a multidisciplinary learning approach that integrates air, water and soil pollution covering issues of from scientific, engineering and management perspectives.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Be familiar with major environmental laws, regulations, standards and ethics.
2. Understand the environmental quality parameters and how to measure and communicate them.
3. Describe the major pollutants of environment as well as their sources, effects, measurement and expression.
4. Select and design basic processes and techniques for water treatment, waste management and pollution control.
5. Appreciate the role and responsibility of engineers in sustainable development .
6. Work in team.

Course Resources

Course Website(s)

Required Course Texts and Materials

1. Davis, M.L. and Cornwell, D.A. Introduction to Environmental Engineering, McGraw-Hill, 5th Edition, 2013.
   http://www.mcgrawhill.ca/highereducation/products/9780073401140/
2. Peavy, H.S.; D.R. Rowe and G. Tchobanoglous. Environmental Engineering, McGraw-Hill, 1985.
3. Hand-outs prepared by the instructor.

Optional Course Texts and Materials http\\:

Grading System

0 to 100 (where 50 is the least pass mark)

Grading Policy

Grades are divided on the following evaluation tools:

Assignments	10
Group Project	10
Midterm Exam	30
Final Exam	50
Total Points	**100**

Course Policy

Late Assignments

It is essential that papers and other assignments be completed and submitted on time. Once the due date is past, without notice and justification, the submission is not accepted.

Classroom Protocol

All students are expected to attend all classes and should arrive on time. Students should maintain discipline and respect for others. They are expected to come prepared and participate actively in class discussion. According to University regulations, the maximum absence allowed is 15% of classes. Makeup exams may be given for accepted excuses. No makeup for classwork.

Course Schedule

Week	Date	Topics, Assignments and Deadlines (Details on assignments and bibliography are available in the course modules)
1	15/9/2014	**Course Overview** Discussion of syllabus and evaluation tools, Course requirements and policy, Course Introduction: Concepts and terminology
2	22/9	Overview of ecological and environmental systems: Water, Air and solid waste management
3-4	29/9, 6/10	Environmental ethics, laws, regulations and standards. Environ impact assessment and sustainability policy.
5-6	13/10, 20/10	Water treatment, water pollution and water quality management Classwork #1
7-9	27/10, 3/11, 10/11	Environmental Microbiology, selection, design and operation of municipal wastewater treatment systems: suspended and attached growth processes, nutrient removal Classwork #2, Midterm Exam
10-11	17/11, 24/11	Air pollution and meteorology, climate change, global, regional and local effects
12	1/12, 8/12	Gas and particulate pollutants sources, effects, dispersion and control.

		Classwork #3
13-14	8/12, 15/12	Solid waste management including waste minimization, processing, recycling, recovery and ultimate disposal Classwork #4
15	22/12	Introduction to hazardous waste Term Project Submission
16	29/12	Environmental management in Jordan: discussion of policy, practice and case studies light of what have been learned from course

CLIMASP Course Modules for 0935473 Environmental Engineering



Course	**0935473**
Module 1	Introduction and overview of ecological andenvironmental systems
Key Concepts	Natural ecosystem, environment, pollution, water quality, water supply, air quality, waste management, role of engineer
Overview	Using the principles of biology and chemistry, environmental engineers develop solutions toenvironmental problems. They are involved in water and airpollution control, waste recycling and disposal as well as publichealth issues. Environmental engineering is concerned with local and worldwide environmental issues and is involved in the protection of wildlife.
Aim	To instil an understanding by students of the multidisciplinary nature of Environmental Engineering, basic concepts from natural ecology and main areasof built environment.

Learning Outcomes	At the end of this module, students will be able to: 1. Understand the role of microbiology and chemistry in natural ecosystems 2. Identify the components and process steps of water treatment, wastewater 3. Treatment/disposal, air quality management, solid waste processing/disposal
Units	Unit 1.1 What is Environmental Engineering Unit 1.2 Natural Ecological Systems Unit 1.3 Environmental Engineering Systems
Readings	Search relevant websites, explore resources
Activity	Reading and Class Discussion Read Chapter 1 of textbook (Davis & Cornwell)
Module 2	Environmental ethics, laws, regulations and standards; Environ impact assessment and sustainability policy.
Key Concepts	Ethics, regulations, standards, sustainable development, EIA
Overview	On key element of modern environmental science and engineering is that they are driven by government policy, which is increasingly set on the basis of risk. Therefore, knowledge of governmental policy and regulations is essential to environmental engineers in their profession
Aim	To familiarize students with common environmental values and national and international regulations at different level to protect the environment
Learning Outcomes	At the end of this module, students will be able to: 1. Disclose environmental ethics for professionals 2. Understand the legal framework for environmental protection 3. Distinguish different types of legislation 4. Understand the relationship between environment and development 5. Appreciate EIA studies as a tool for sustainable development
Units	Unit 2.1 Ethics and Regulations Unit 2.2 Sustainable Development and EIA
Readings	Optional reading of the book: Introduction to Environmental Impact Assessment: A Guide to Principles and Practice by Bram F. Noble, Oxford, 2009.
Activity	Website visit, Reading, Class Discussion Visit the website of the Ministry of Environment in Jordan:

	www.moenv.gov.jo Read about the national environmental regulations including penalty for violations, administrative structure of Ministry, their projects for environmental preservation and enhancement A group Term Project is initiated. Term project is literature or field survey on a topic offered by instructor and chosen by students. A professional technical report is sought.
Module 3	Water treatment, water pollution and water quality management
Key Concepts	Hardness, BOD, TKN, eutrophication, DO sag, coagulation, chlorination, softening
Overview	The responsibilities of the environmental engineer involves design and operation of water tre processes as well as control of the quality of water supply resources in the open environment. Testing and characterizing pollution parameters are essential to subsequent treatment processes
Aim	To develop an understanding and knowledge on water pollution indicators, factors affecting them and the practical methods of water purification
Learning Outcomes	At the end of this module, students will be able to: 1. Define water quality parameters and describe how they are measured and reported. 2. Understand why and how water quality in streams is deteriorated and restored using Streeter-Phelps DO sag model 3. Draw a full block diagram of surface and ground water treatment processes 4. Understand the chemistry of coagulation, softening and chlorination
Units	Unit 3.1*Water pollution and water quality management* *Unit 3.2*Drinking water treatment processes
Readings	BOD kinetics and Softening chemistry
Activity	Group classwork on problem solving of water chemistry and water pollution parameters, open book and notes
Module 4	Science & Engineering of Wastewater Treatment
Key Concepts	Microbiology, biomass growth, settling, biodegradation, aeration, nitrification / denitrification, phosphorus removal, design, operation
Overview	Among the key elements of modern environmental engineering is that it is based on chemistry, thus environmental quality is described by chemical composition of the system. Also, knowledge of fundamentals of biology, particularly microbiology, is a pre-requisite to

	studying wastewater treatment plants
Aim	To enable students understand, select and design the basic units in common municipal wastewater treatment plants.
Learning Outcomes	At the end of this module, students will be able to: 1. Understand the role of microorganisms in wastewater treatment 2. Know how to design a bioreactor in a suspended growth biological system based on growth kinetics 3. Able to select proper treatment system/process based on wastewater characteristics and other considerations
Units	Unit 4.1: Suspended growth aerobic system (mainly activated sludge process) Unit 4.2: Fixed growth system (Trickling filters and RBC) Unit 4.3: Biological removal of nitrogen and phosphorus Unit 4.4 Sludge Treatment and disposal (including anaerobic digestion)
Readings	Anaerobic pathways and biogas production
Activity	Group classwork on problem solving and design Midterm Exam
Module 5	Air pollution and Control
Key Concepts	Stratification of atmosphere, climate change, carbon footprint, GHC, ozone depletion, acid rain, smog, health risk, primary and secondary pollutants, dispersion, renewable energy, collection efficiency
Overview	The atmosphere is a complex natural gaseous system that is essential to support life on planet Earth. Air pollution due to both natural and anthropogenic sources is a major health and environmental hazard. The amounts and types of emissions change every year; caused by changes in economy, industrial activity, technology improvements, traffic and many other factors. Air pollution regulations and emission controls also have an effect.
Aim	Enable students to examine the various issues related to air pollution at the local, regional and global levels and how to manage and mitigate their consequences
Learning Outcomes	At the end of this module, students will be able to: 1. demonstrate knowledge and understanding of air pollutants, their sources, properties, dispersion and effects

	2. demonstrate knowledge and understanding of modern techniques and devices of gas and particulate removal
Units	Unit 5.1 Air Pollution Unit 5.2 Gas and particulate removal
Readings	Climates change and GHG control
Activity	Group classwork on problem solving and design of air pollution dispersion as well as gas and particulate removal devices
Module 6	Solid Waste Management (SWM)
Key Concepts	Waste classification, minimization, processing, recycling, recovery, landfill, incineration, Disposal, ground water contamination
Overview	Solid waste is not something that is taken to a 'dump' any more. SWM is a comprehensive system, including collection, storage, transportation, processing and ultimately disposal. Recycling is very important from sustainability point of view. Disposal techniques including landfilling, incineration, and composting. Both the engineering and socio-political aspects will be considered.
Aim	To enlighten students with basic components of solid waste management and enable them to explore various options of processing, recovery and disposal.
Learning Outcomes	At the end of this module, students will be able to: 1. Recognize different kinds of solid wastes and their general characteristics 2. Formulate a block diagram describing all major steps of SWM. 3. Differentiate between different options of solid waste processing, recycling and disposal 4. Understand the impact of landfills on groundwater pollution and mitigation options
Units	Unit 6.1 Types and characterization of solid waste Unit 6.2 Processing for resource and energy recovery Unit 6.3 Sanitary landfill design and operation
Readings	Ground water pollution due to uncontrolled waste dump
Activity	Group classwork Term project submission



Course Syllabus

0935473 Environmental Engineering

University of Jordan, Faculty of Engineering & Technology,

Chemical Engineering Department

Fall Semester, 2014-2015

Instructor Information

Instructor:	Dr. Ahmad M. AbuYaghi
Office Location:	University Campus, Engineering Building, 2nd Floor
Office Telephone:	+962 6 535 5000 Ext. 22906
Office Hours:	Mon Wed 9:30- 11:00am
E-mail:	ahmad.ay55@gmail.com
Faculty Website:	http://www2.ju.edu.jo/sites/Academic/abuyaghi/default.aspx

Course Identification

Course Number:	**0935473**
Course Name:	Environmental Engineering
Course Location:	University Campus
Class Times:	Mon Wed 11:00am- 12:30pm
Prerequisites:	0955342

Course Description/Overview

Environmental engineering refers to the use of multidisciplinary knowledge and scientific processes to protect the local and global environment and provide healthy land, water and air for human use in a sustainable manner. The goal of environmental engineering is to integrate scientific and engineering principles to minimize air pollution and waste discharge from urban development projects, clean up polluted sites, set up appropriate mechanism for waste disposal resulting from human activity and study the impact of proposed construction sites on environment. Environmental engineering also promotes energy conservation and is concerned with finding solutions in areas of public health such as implementing adequate sanitation facilities.

This course integrates the concepts and methods from four different disciplines, namely Chemistry, Biology, Management and Engineering (involving applied physics, math, design, etc.) to understand and solve environmental quality and pollution problems in the water, air and soil and at local and global scales. The course

Chapters are classified based on environmental systems, units and processes; however, the concepts and methods taken from the four different disciplines are embedded in almost each chapter.

The course contents are divided over the following main sections: *Conceptual introduction and overview on environmental science and engineering, overview of ecological and environmental systems, environmental ethics, regulations and impact assessment, water quality and water treatment, municipal wastewater treatment and residual handling, atmospheric local and global pollution: its impacts and control, solid and hazardous waste management.*

Course Objectives

The overarching goals of this course are providing students with exposure to the main topics in environmental engineering in a multidisciplinary learning approach that integrates the concepts of ethics, regulations, management, basic sciences and engineering (design, operation and problem solving) into systems and processes for controlling local and global environmental pollution.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Be familiar with major environmental laws, regulations, standards and ethics.
2. Understand the concept of sustainability and the inter-relationship between the environment and development projects including impact assessment and management.
3. Describe the major pollutants of air, water and soil as well as their sources, effects, measurement and expression as quality or pollution parameters.
4. Select and design basic processes and techniques for water & wastewater treatment, solid waste management and air pollution control.
5. Appreciate the role and responsibility of engineers in sustainable development.
6. Learn independently, to share ideas and cooperate in a team work.

Course Website: **https://elearning.ju.edu.jo/course/view.php?id=6740**

Required Course Texts and Materials

1. Davis, M.L. and Cornwell, D.A. Introduction to Environmental Engineering, McGraw-Hill, 5th Edition, 2013.
   http://www.mcgrawhill.ca/highereducation/products/9780073401140/

2. Peavy, H.S.; D.R. Rowe and G. Tchobanoglous. Environmental Engineering, McGraw-Hill, 1985.
3. Hand-outs prepared by the instructor.

Grading System

0 to 100 (where 50 is the least pass mark)

Grading Policy

Grades are divided on the following evaluation tools:

Assignments (Classwork)	10
Group Project	10
Midterm Exam	30
Final Exam	50
Total Points	**100**

Course Policy

Late Assignments

It is essential that papers and other assignments be completed and submitted on time. Once the due date is past, without notice and justification, the submission is not accepted.

Classroom Protocol

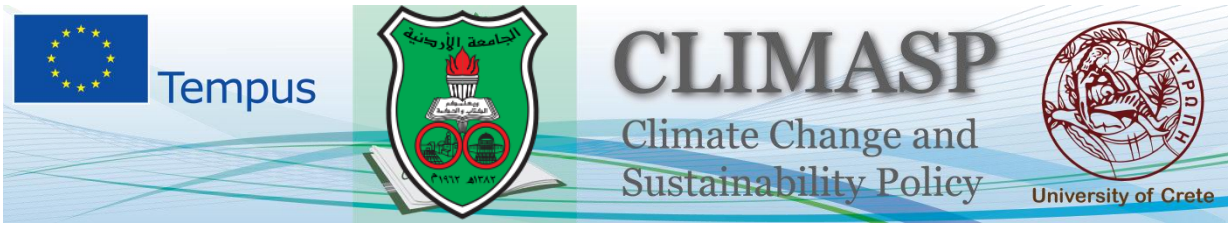
All students are expected to attend all classes and should arrive on time. Students should maintain discipline and respect for others. They are expected to come prepared and participate actively in class discussion.According to University regulations, the maximum absence allowed is 15% of classes. Makeup exams may be given for accepted excuses. No makeup for classwork.

Course Schedule

Week	Date	Topics, Assignments and Deadlines (Details on assignments and bibliography are available in the course modules)
1	15/9/2014	Course Introduction and Overview Discussion of syllabus and evaluation tools, Course requirements and policy, Course Introduction: Concepts and terminology, environ. science & engineering, Role of engineers in environmental protection.
2	22/9	Overview of ecological systems; Major nutrient cycles and introduction to micro Environmental systems: Water supply and wastewater management, Air management and Solid and hazardous waste management
3-4	29/9, 6/10	Environmental ethics; Environmental laws, regulations and standards in Jordan ir international treaties, Environmental impact assessment and sustainability policy.

5-6	13/10, 20/10	Water treatment,water pollution and water quality management Problem Solving: Classwork #1
7-9	27/10, 3/11, 10/11	Selection, design and operation of municipal wastewater treatment systems: suspended and attached growth processes, nutrient removal Problem Solving: Classwork #2, Midterm Exam
10-11	17/11, 24/11	Air pollution, climate change, global, regional and local effects
12	1/12, 8/12	Gas and particulate pollutants sources, effects, dispersion and control. Problem Solving: Classwork #3
13-14	8/12, 15/12	Solid waste management including waste minimization, processing, recycling recovery and landfill disposal Problem Solving: Classwork #4
15	22/12	Introduction to hazardous waste Term Project Submission: Climate change impacts and mitigation for Jordan
16	29/12	Environmental management in Jordan: discussion of policy, practice and Case Studie the light of what have been learned from course. Such Case Studies can be co through group Term Projects. Focus will be on Climate Change impacts and mitigati

CLIMASP Course Modules for 0935473 Environmental Engineering



Course	**0935473**
Module 1	Introduction and overview: Environmental Sciences basics for Environmental Engineering
Key Concepts	Global environment, biogeochemistry, natural ecosystem, microbiology, pollution, public environmental system
Overview	Using the principles of biology and chemistry, environmental engineers develop solut environmental problems. They are involved in water and air pollution control, waste recycling and disposal as well as public health issues. Environmental engineering is concerned with local and worldwide environmental issues and is involved in the protection of wildlife.
Aim	To instill an understanding by students of the multidisciplinary nature of Environmental Engineering, basic concepts from natural ecology and main areas of built environment.
Learning Outcomes	At the end of this module, students will be able to: 4. Understand the role of microbiology and chemistry in natural ecosystems 5. Identify the components and process steps of water treatment, wastewater Treatment / disposal, air quality management and solid waste processing / disposal 6. Appreciate the interdisciplinary nature of this field and the role of engineers an specialists.
Units	Unit 1.1 What is Environmental Engineering Unit 1.2 Natural Ecological Systems Unit 1.3 Environmental Engineering Systems
Readings	Search relevant websites, explore resources
Activity	Reading and Class Discussion Read Chapter 1 of textbook (Davis & Cornwell)

Module 2	Environmental Management: Ethics, laws, regulations and standards; Enviro impact assessment and sustainability policy
Key Concepts	Ethics, regulations, standards, sustainable development, EIA
Overview	On key element of modern environmental science and engineering is that they are driven by gov policy, which is increasingly set on the basis of risk. Therefore, knowledge of governmental policy and regulations is essential to environmental engineers in their profession
Aim	To familiarize students with common environmental values and national and international regul different level to protect the environment
Learning Outcomes	At the end of this module, students will be able to: 6. Disclose environmental ethics for professionals 7. Understand the legal framework for environmental protection in Jordan 8. Distinguish different types of legislation 9. Understand the relationship between environment and development 10. Appreciate EIA studies as a tool for sustainable development and environmental manage
Units	Unit 2.1 Ethics and Regulations Unit 2.2 EIA
Readings	Optional reading of the book: Introduction to Environmental Impact Assessment: A Guide to Principles and Practice by Bram F. Noble, Oxford, 2009.
Activity	Website visit, Reading, Class Discussion Visit the website of the Ministry of Environment in Jordan: www.moenv.gov.jo Read about the national environmental regulations including penalty for violations, admin structure of Ministry, their projects for environmental preservation and enhancement A group Term Project is initiated. Term project is literature or field survey on a topic off instructor and chosen by students. A professional technical report is sought. Climate sustainability and other local (Jordan) environmental issues are the topics of priority.
Module 3	Water treatment, water pollution and water quality management
Key Concepts	Hardness, BOD, TKN, eutrophication, DO sag, coagulation, chlorination, softening
Overview	The responsibilities of the environmental engineer involves design and operation of water treatment processes as well as control of the quality of water supply resources in the open envir

	Testing and characterizing pollution parameters are essential to subsequent treatment processes
Aim	To develop an understanding and knowledge on water pollution indicators, factors affecting them and the practical methods of water purification
Learning Outcomes	At the end of this module, students will be able to: 5. Define water quality parameters and describe how they are measured and reported. 6. Understand why and how water quality in streams is deteriorated and restored using Streeter-Phelps DO sag model 7. Draw a full block diagram of surface and ground water treatment processes 8. Understand the chemistry of coagulation, softening and chlorination
Units	Unit 3.1 *Water pollution and water quality parameters and management* *Unit 3.2* Drinking water treatment processes
Readings	BOD kinetics; Softening chemistry
Activity	Problem-Based Learning: Group classwork on problem solving of water chemistry and water pollution parameters, open book and notes
Module 4	Science & Engineering of Wastewater Treatment
Key Concepts	Bacterial growth, waste biodegradation, settling, aeration, nitrification /denitrification, phosphorus removal, design, operation
Overview	Among the key elements of modern environmental engineering is that it is based on chemistry, Thus environmental quality is described by chemical composition of the system. Also, knowl fundamentals of biology, particularly microbiology, is a pre-requisite to studying wastewater tr plants
Aim	To enable students understand, select and design the basic units in common municipal was treatment plants.
Learning Outcomes	At the end of this module, students will be able to: 4. Understand the role of microorganisms in wastewater treatment 5. Know how to design a bioreactor in a suspended growth biological system based on growth kinetics 6. Able to select proper treatment system/process based on wastewater characteristics

	and other considerations 7. Know key operational problems in wastewater treatment.
Units	Unit 4.1: Suspended growth aerobic system (mainly activated sludge process) Unit 4.2: Fixed growth system (Trickling filters and RBC) Unit 4.3: Biological removal of nitrogen and phosphorus Unit 4.4 Sludge Treatment and disposal (including anaerobic digestion)
Readings	Anaerobic pathways and biogas production
Activity	Problem-Based Learning: Group classwork on problem solving and design Midterm Exam
Module 5	Air pollution and Control
Key Concepts	Stratification of atmosphere, climate change, carbon footprint, GHC, ozone depletion, acid rain, smog, health risk, primary and secondary pollutants, dispersion, renewable energy, collection efficiency
Overview	The atmosphere is a complex natural gaseous system that is essential to support life on planet E pollution due to both natural and anthropogenic sources is a major health and environmental The amounts and types of emissions change every year; caused by changes in economy, in activity, technology improvements, traffic and many other factors. Air pollution regulatio emission controls also have an effect.
Aim	Enable students to examine the various issues related to air pollution at the local, regional and levels and how to manage and mitigate their consequences
Learning Outcomes	At the end of this module, students will be able to: 3. demonstrate knowledge and understanding of air pollutants, their sources, properties, dis and effects 4. demonstrate knowledge and understanding of modern techniques and devices of particulate removal
Units	Unit 5.1 Air Pollution Unit 5.2 Gas and particulate removal
Readings	Climates change and greenhouse gases (GHG) control

Activity	Problem-Based Learning: Group classwork on problem solving and design of air pollution dispersion as well as gas and particulate removal devices.
Module 6	Solid Waste Management (SWM)
Key Concepts	Waste classification, minimization, processing, recycling, recovery, landfill, incineration, disposal, ground water contamination, hazardous waste, physical, chemical and biological eve processes
Overview	Solid waste is not something that is taken to a 'dump' any more. SWM is a comprehensive including collection, storage, transportation, processing and ultimately disposal. Recycling important from sustainability point of view. Disposal techniques including landfilling, incinerat composting. Both the engineering and socio-political aspects will be considered.
Aim	To enlighten students with basic components of solid waste management and enable them to various options of processing, recovery and disposal.
Learning Outcomes	At the end of this module, students will be able to: 5. Recognize different kinds of solid wastes including hazardous waste and their characteristics 6. Formulate a block diagram describing all major steps of SWM. 7. Differentiate between different options of solid waste processing, recycling and disposal 8. Understand the impact of landfills on groundwater pollution and mitigation options 9. Applying the concepts of chemistry, physics and microbiology in waste processing and disposal
Units	Unit 6.1 Types and characterization of solid waste Unit 6.2 Processing for resource and energy recovery Unit 6.3 Sanitary landfill design and operation
Readings	Ground water pollution due to uncontrolled waste dump
Activity	Group classwork Term project submission



Course Syllabus

0905371 Fuel and Energy

University of Jordan, Faculty of Engineering & Technology,
Chemical Engineering Department
……. Semester, 2014-2015

Instructor Information

Instructor:	Dr. Zayed Al-Hamamre
Office Location:	University Campus, Engineering Building, 2nd Floor
Office Telephone:	+962 6 535 5000
Office Hours:	
E-mail:	z.hamamre@ju.edu.jo
Faculty Website:	http://eacademic.ju.edu.jo/z.hamamre/default.aspx

Course Identification

Course Number:	0905371
Course Name:	Fuel and Energy
Course Location:	University Campus
Class Times:	
Prerequisites:	0905343 Process Heat Transfer

Course Description/Overview

Energy is one of the most important factors in wealth generation, economic growth and social development, as well as poverty eradication and security of any nation. Energy growth is directly linked to well-being and prosperity worldwide. Security, climate change, and public health are closely interrelated with energy. Meeting the growing demand for energy in a safe and environmentally responsible manner represent a key challenge. The course examines where that energy comes from, and the advantages and disadvantages across different fuels. The catalog description of the course is as follows:

Energy classification, sources and utilization. Non-renewable Energy: Fossil fuels, Nuclear energy, hydrogen fuel. Fossil-fuel systems and applications, waste heat recovery systems. Renewable Energy:

solar energy, wind power, tidal power, geothermal energy, and Biofuels. Energy storage: chemical storage, thermal storage and fuel cells. Emerging technologies, environmental impacts of energy utilization, energy sustainability criteria.

Course Objectives

The overarching goals of this course are providing students with knowledge and understanding of the fundamentals of fuel and energy science and engineering. These are important to chemical engineers since they need to deal with energy as a major utility in the chemical process industry. Moreover, many chemical engineers work in power plants or the energy conversion industry.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Classify and describe energy sources and specify their potentials.
2. Analyze existing and proposed renewable and non-renewable energy systems.
3. Classify and describe the concepts of different types of energy conversion systems.
4. Describe the various types of energy storage.
5. Realize the general impacts of fuel use and energy processing on the environment.
6. Realize the relation between the energy sustainability and the three pillars of the overall sustainability: environmental sustainability, economic sustainability and social sustainability

Course Resources

Course Website(s)

Required Course Texts and Materials

1. Culp, A. W., "Principle of Energy Conversion", second edition, McGraw-Hill, 1991.
2. Hodge, B.K., "Alternative Energy Systems and Applications", John Wiley, 2010.
3. Weston, K. C., "Energy Conversion", electronic edition, 2000, revised from the 1992 edition, west Publishing.
4. Boyle, G. and Everett, B. and Ramage, J., "Energy Systems and Sustainability", Oxford University Press, UK, 2003.

Optional Course Texts and Materials

1. Boyle, G., "Renewable Energy", Oxford University Press, UK, 2004.
2. Probstein, R.F., Hicks, R. E., "Synthetic Fuels", 2nd edition, Dover publications, 2006.
3. *Speight, J.G. '* The Chemistry and Technology of Petroleu*m', 3rd edition, Pennwell, 1999.*

http\\:

Grading System

0 to 100 (where 50 is the least pass mark)

Grading Policy

Grades are divided on the following evaluation tools:

Quizzes	10
Project	10
Midterm Exam	30
Final Exam	50
Total Points	**100**

Course Policy

Late Assignments

It is essential that papers and other assignments be completed and submitted on time. Once the due date is past, without notice and justification, the submission is not accepted.

Classroom Protocol

All students are expected to attend all classes and should arrive on time.Students should maintain discipline and respect for others. They are expected to come prepared and participate actively in class discussion. According to University regulations, the maximum absence allowed is 15% of classes. Makeup exams may be given for accepted excuses only. No makeup for non-exam activities.

Course Schedule

Week	Date	Topics, Assignments and Deadlines (Details on assignments and bibliography are available in the course modules)
1		**Course Overview** Syllabus, Evaluation tools, Policy, Overview and Introduction
2		Energy Classifications, Sources and Utilization
3-4		Fossil Fuels: Coal, Petroleum, Natural gas
5-7		Synthetic Fuels & Nuclear fuel
8-10		Renewable energy: Solar, Wind Power , Geothermal energy, etc.
11		Combustion Calculations
12-13		Fossil Fuel systems and applications
14		Energy Storages
15		Energy sustainability pillars
16		Environmental Impacts

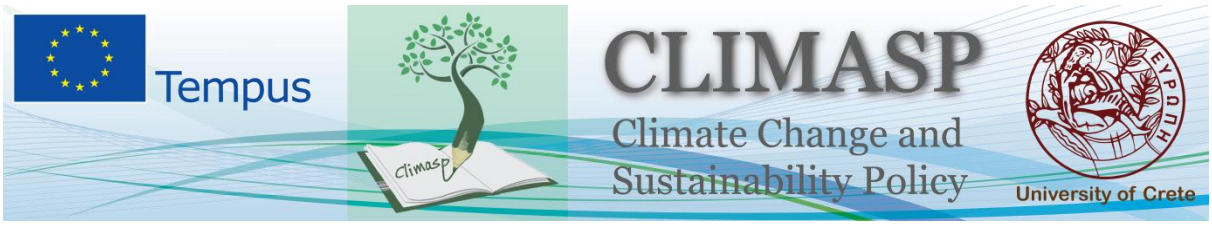
CLIMASP Course Modules for 0935371 Fuel and Energy

Course	0905371
Module 1	Course Overview; Energy Classification, Sources and Utilization
Key Concepts	Energy sources, renewable and nonrenewable resource, resources potential, utilization
Overview	Energy is broadly classified into two main groups: Renewable and Non-renewable. Energy can have many forms: kinetic, potential, light, sound, gravitational, elastic, electromagnetic or nuclear. According to the law of conservation of energy, any form of energy can be converted into another form and the total energy will remain the same.
Aim	To distinguish between renewable and nonrenewable sources of energy; to investigate a variety of renewable energy resources and compare the benefits and drawbacks of each.
Learning Outcomes	At the end of this module, students will be able to: 7. Classify and describe energy sources. 8. Specify the potentials of different energy resources, benefits, and challenges 9. Understand the concept of energy conversation. 10. Identify and analyse different energy conversion systems.
Units	Unit 1.1 Energy Classification, Sources and Utilization. Unit 1.2 Energy conversion: Technologies and economics Unit 1.3 Principal Fuels for Energy Conversion
Readings	Energy conversion efficiencies of different systems Text book # 1
Activity	Group classwork on problem solving and process synthesis
Module 2	Non-renewable Energy:
Key Concepts	Fossil fuels, Nuclear energy, hydrogen fuel and Non-renewable energy systems.
Overview	Non-renewable resources are resources of economic value for which there is a limited supply. Resources can generally be separated into two main categories; fossil fuels (such as coal oil and natural gas) and nuclear fuels (Uranium).
Aim	Introduce students to the different non-renewable energy resources including (coal, oil, natural gas and nuclear energy)
Learning Outcomes	At the end of this module, students will be able to 1. Explain how different fossil fuels form. 2. Describe the fundamentals and main characteristics of non-renewable energy sources 3. Explain and compare the technological basis for non-renewable energy sources

	conversion 4. Describe the main components of different non-renewable energy systems 5. Recognize the effects that non-renewable energy systems have over the environment and the society
Units	Unit 2.1 Fossil-Fuel Systems Unit 2.2 Production of Thermal Energy Unit 2.3 Nuclear Energy and Nuclear Reactor Design and Operation Unit 2.4 Emissions and waste associated with non-renewable energy utilizations
Readings	(text book # 1), Fossil fuel formation, nuclear solid fuel: enrichment and processing
Activity	Group classwork on problem solving of hydrocarbon oxidation chemistry. Nuclear fuels and nuclear wastes
Module 3	renewable energy resources
Key Concepts	renewable energy (RE), RE systems, Energy Sustainability and ethics of RE
Overview	Renewable energy is energy that is generated from natural processes that are continuously replenished. This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass. This energy cannot be exhausted and is constantly renewed. These resources are non-traditional resources that and have low environmental impact. These resources represent an alternative to using fossil fuels.
Aim	To develop an understanding of renewable energy (RE) issues in the context of science, technology, economics, policy and society.
Learning Outcomes	At the end of this module, students will be able to: 6. Identify the different types and main characteristics of renewable energy resources. 7. Understand operational principles, application, technical aspects of installation and maintenance of the different renewable energy systems. 8. Recognize the usefulness of various types of energy systems. 9. Nurturing the ability to develop RE systems considering sustainable development 10. Understanding the professional ethics of RE
Units	Unit 3.1 Type of renewable energy systems Unit 3.2 Design and Sizing of renewable energy systems Unit 3.3 Ethics of renewable energy
Readings	Electricity generation from renewable resources, Chapter 9 (renewable energies) (text book # 2)
Activity	Propose and/or cite utilizing current applications of renewable resource technologies within the energy industry. Analyze case studies involving the integration of renewable and non-renewable energy.
Module 4	Energy storage
Key Concepts	Fuel Cells and batteries, thermal energy storage, chemical energy storage, energy storage efficiency
Overview	Storing energy is important for both long-term and short-term uses: to meet changes in

	energy supply and demand and to iron out irregularities in energy output. Energy storage must consider both the amount of energy that can be stored (energy density of the material) and the efficiency at which it can be recovered.
Aim	Introduce students to the different energy storage technologies focusing mainly on chemical storage, thermal storage, fuel cells and technologies under investigations.
Learning Outcomes	At the end of this module, students will be able to: 1. Identify the different technologies used for energy storage. 2. Understand the advantage and disadvantage of the different energy storage concepts. 3. Understand the parameters and requirement for efficient energy storage. 4. Investigate the efficiency of energy storage systems
Units	Unit 4.1 Chemical energy storage Unit 4.2 Thermal storage systems Unit 4.3 Fuel cell systems Unit 4.4 pumped Hydro-power and compressed air energy storage
Readings	(Text book #1), chapter 11 (text book # 2),
Activity	Reading and Class Discussion Search relevant websites, explore resources
Module 5	Energy and the Environment
Key Concepts	Environmental pollution, climate change, global warming, clean use of energy
Overview	The exponential increase of energy consumption has produced significant changes in the global environment. Such impacts include: global warming, greenhouse effect, climate change, ozone layer depletion, acid rain, waste heat rejection, nuclear wastes and noise.
Aim	Enable students to examine environmental implications of various forms of energy production including major contaminants and modes of mitigation.
Learning Outcomes	At the end of this module, students will be able to: 1. Identify the impact of different emissions and wastes generated during energy production. 2. Developing the ability to relate RE and nonRE to climate change and other global contemporary issues 3. Apply and examine the proper energy technologies and energy mix concept to reduce impact of energy production on environment.
Units	Unit 5.1 Environmental Impact of Power Plant Operation Unit 5.2 Global Warming and Climate Change
Readings	Climates change and GHG control, Chapter 6 (text book # 1), chapter 3 (text book # 2)
Activity	Reading and Class Discussion Project (environmental assessments of renewable energy systems and conventional foss systems)

Module 6	Energy sustainability
Key Concepts	Energy sustainability, climate change, global warming, clean use of energy
Overview	Energy sustainability involves both sustainable energy sources, as well as, sustainable energy use in energy systems. It is well known that energy resources drive most of the world's economic activity. In addition, different fossil fuels or renewable energy resources are obtained from the environment, at the same time wastes generated from energy processes are typically released to the environment. Also, services provided by energy support social developments and stability in order to improve quality of life. Hence, energy sustainability is indirectly linked to the three pillars of the overall sustainability: environmental sustainability, economic sustainability and social sustainability
Aim	Enable students to understand the energy sustainability concept and systemic and realize challenges at the intersection of energy, sustainability and society.
Learning Outcomes	At the end of this module, students will be able to: 1. Recognize the energy sustainability pillars. 2. Imposes the sustainable use of energy in the overall energy system 3. Develop strategies for sustainable energy use.
Units	Unit 6.1 Energy sustainability pillars Unit 6.2 Sustainable use of Energy
Readings	Selected recently published articles will be considered
Activity	Reading and Class Discussion



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus

1607421: International Finance

University of Jordan, Faculty of Business, Department of Business Economics

Spring, 2016

Instructor Information

Instructor: Khawlah A. Abdalla Spetan, Assistant Professor
Office Location: Faculty of Business / Business Economic Department -Building # first floor

Telephone: 5355000 ext. 24163
Office Hours: Day(s) time: Mon. & Wed. 11:00-12:00
E-mail: khawlah.spetan@ju.edu.jo, khawlahs2000@yahoo.com

Course Identification

Course Number: 1607421
Course Name: International Finance
Course Location: Auditorium 4/ Building #3
Class Times: Monday & Wednesday 8:00– 9:30
Prerequisites: 1607111, Macroeconomics principles
Faculty Web Page: http://business.ju.edu.jo

Course Description/Overview

This is a course in international monetary economics, which includes the connection between the exchange rates and international macroeconomic policies. The subject of international finance draws its importance from the consequences of worldwide economic policies on a country economy's main outcomes (Employment, National Saving, Trade Balance and Price levels and Money). The course divided into three parts: The first part of the course will present several theories of exchange rate, and the second part will help you gather these theories into an overall analytical framework. The third part will challenge you to employ this analytical framework to real-world applications, and try to link the global financial crisis and the climate change issue. Provide students an up-to-date and understandable analytical framework for revealing current events. Help them grasp and retain the underlying logic of international finance through six to seven sections; first section we will talk about the national income accounts an d balance of payments, second section will be about the asset approach of exchange market and foreign exchange market, third section is about money market and inflation and exchange rate dynamics. In the fourth section the student will try to explore the causes of the fluctuations in exchange rate in long and short runs periods. The fixed exchange rates system will be introduced in section five. And finally in sixth section we will discuss the international macroeconomic policy and try to connect the causes of financial crisis with the most contemporary issue the climate change and their interaction.

Course Learning Objectives

The objectives of this course are: 1) introduce the main exchange rates theories and its determinants and understand the role of exchange rates in international trade. 2) students will understand the movements in macroeconomic variables such as the trade balance, the exchange rate, money, interest rate, national output, and inflation, in short and long runs. 3) Understanding how the interactions of national economies influence the worldwide pattern of macroeconomic activity.4) explore the various international currency arrangements and how did countries try to attain internal and external balance. 5) explain the linkages between the financial crisis and the environmental economics specifically the climate change issue.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:
LO **1- knowledge and understanding:**

- Understand the basic theory of international macroeconomics and finance.
- Understand the determination of the exchange rates in foreign exchange markets.
- Understand why exchange rates can change dramatically over periods of several years.

- Understand the complicated factors that cause output, exchange rates, and inflation to change in the short-run.
- Understand the role of the central bank foreign exchange intervention in the determination of the exchange rates under fixed and managed floating system.
- Understand how the international monetary system influenced the macroeconomic policy making during certain periods.
- Understand the sustainability of Jordan's exchange rate policies and external public debt.
- Understand the international finance of climate change from different perspectives.

LO **2- analytical and thinking skills**:
Students should have the ability to:

- Analyze, in an unbiased way, a wide array of important international macroeconomic policy issues and related to the Jordan's economy outcomes such as economic growth, unemployment, inflation and sustainability issues.
- Analyze the exchange rates movements in the modern theories of floating exchange rates taking in consideration their linkages with global issues such as sustainability and climate change problem .
- Relate mathematical and identification models to their assumptions and to the real world.
- Link the financial crisis with global warming problem (climate change issue).

LO **3- Teaching and learning methods**:

- There will be 2 lectures per week. Although the lectures cover the vast majority of the module material, students must make use of the textbooks extensively especially the empirical cases presented in the book.

- A number of problems (end-of-chapter problems) will be indicated in class, to be submitted by students. Students should attempt the homework and should come to class prepared to discuss the assigned problems.
- Case studies reinforcing material covered, illustrating its applicability in the real world.

Course Resources

Course Website(s)

- http://blackboard.ju.edu.jo
- http://www.facebook.com/groups/106367372820252
- www.cbj.gov.jo

Required Course Texts and Materials

- (International Economics: Theory and Policy) 9th edition, 2012. Addison Wesley, by Paul Krugman and Maurice Obstfeld.
- Climate Change and the Global Financial Crisis, Robin Leichenko, Karen O'Brien and William Solecki**.**

Climate change and the financial crisis: A case of double Exposure**,** Robin M. Leichenko, Karen L. O'Brien, and William D. Solecki**,** *Annals of the Association of American Geographers*, 100(4) 2010, pp. 963–972 C, Published by Taylor & Francis, LLC.

- The economics of climate change, Anothony D. Owen, Nick Hanley**,**2004.
- International Climate Change Financing: The Green Climate Fund (GCF). Richard K. Lattanzio Analyst in Environmental Policy, Congressional Research Service April 16, 2013.
- The Effect of the Global Financial Crisis on Climate Change, Imogen Reed. Posted on April 13, 2012 .
- Climate Change May Trigger the Next Financial Crisis.
- What is the impact of the economic crisis on the climate change debate? Question submitted by Soumaya Maghnouj, from Sciences-Po, March 22, 2013 Answered by: Daniel P. Ahn, Adjunct Fellow for Energy

- التجارة الدولية نظريات و سياسات، الدكتور طالب عوض، 1995

Optional Course Texts and Materials

- Peterson Institution for International Economics (http://www.piie.com).
- https://www.ufz.de/index.php?en=36821
- https://newanthropocene.wordpress.com/2012/04/13/the-effect-of-the-global-financial-crisis-on-climate-change/

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Failure**

Grading Policy

Students will be assessed based on the following:

Mid-term Exam	30%	30/3/2016
Participation & Quizzes	20%	13/3/2016
Final Exam	50%	

Assignments are individual assignments. Details of these assignments and the submission deadlines will be announced in class.

Course Policies

Late Assignments policy

All assignments are due at the beginning of class. Anything turned in after that will be considered late. Assignments will be accepted up to four days after the due date for half credit. Assignments will not be accepted after the four-days extension. Excessive absenteeism and late or missing work will effect in lowered grades. Contact with your teacher is strongly encouraged especially when you have been absent. In addition, please see handout on the college's policy on absence and make-up work.

Classroom Protocol

We oblige ourselves to a high standard of professional behavior. Accordingly, lateness, holding private conversations and indeed any behavior that interrupts me or your colleagues will be considered improper. Using cell phones is forbidden in the class. Repeated violations of this standard may affect your participation grade or may cause withdrawal from course.

Course Schedule

Detailed lecture schedule			
	Week:	**Material:**	**Homework and Assignments**
	Week 1+2	-Introduction Ch (13): National Income Accounting, the Balance of Payments and sustainability.	TBA
	Week 3+4	Ch (14):Exchange Rates and the Foreign Exchange Market. First Exam	TBA
	Week 5	Ch (15):Money, Interest Rates, and Exchange Rates.	TBA
	Week 6+7	Ch (16):Price Levels and the Exchange Rate in the Long-R.	TBA
	Week 8+9	Ch (17): Output and the Exchange rate in Short-R.	TBA
	Week 10	Ch (18): Fixed Exchange Rates and Foreign Exchange Intervention.	TBA
	Week 11+12	Ch (19): The International Monetary System, 1870-1973.	TBA
	Week 13+14	Ch (21): introduction to Developing Countries: Growth, Crisis and climate change problem	TBA
	Week 15	Final exam	TBA

Course	International Finance
Module 1	National Income Accounting and the Balance of Payments.
Key Concepts	Introduction, balance of payments, national Income, employment, national saving, and sustainability.
Overview	We try to explain the accounting concepts economists use to describe a country's level of production and its international transactions. We use two related and essential tools for macroeconomic linkages and relate it to economic sustainability. The first tool is the national income accounting, records all the expenditures that contribute to a country's income and output. The second tool, balance of payments accounting. Student should know how can economic policy ensure that factors of production are fully employed? And what determines how an economy's capacity to produce goods and services changes over time? To answer these questions, we must understand the branch of economics that studies how economies' overall levels of employment, production, and growth are determined. In this part we will try to simplify and connect the concept of sustainability and climate change problem with balance of payments and government budget.
Aim	The aim of this module is to make students able to discuss how the interactions of national economies influence the worldwide pattern of macroeconomic activities.
Learning Outcomes	At the end of this module learners will be able to: - Discuss the concept of the current account balance. - Use the current account balance to extend national income accounting to open economies. - Relates the balance of payment to changes in a country's net foreign wealth, sustainability issues and the climate change problem.
Units	Unit 13: National Income Accounting and Balance of Payments.
Readings	• Chapter 13, (International Economics: Theory and Policy) 9th edition, 2012. Addison Wesley, by Paul Krugman and Maurice Obstfeld. Monthly Bulletin, Central Bank of Jordan, 2014.

	التجارة الدولية نظريات و سياسات، الدكتور طالب عوض،1995 The economics of climate change, Anothony D. Owen, Nick Hanley,2004
Activity	**Overview**
	- Student draw the relationship between the national income identities in open economy: Y=C+I+G+CA(EX-IM) - The balance of payment keeps track of country's payments to and receipts from foreigners. The students should get the POB of Jordan and from the CBJ from the website and analyze the figures in each term. - Understanding the statistical concepts from monthly statistical bulletin. - Write examples of paired transactions: **Credit Debit** Fax machine purchase (Current account, U.S. good import) $1,000 Sale of bank deposit by Citibank (Financial account, U.S. asset sale) $1,000 - The officials reserves of Jordan in the BOP will be observed by students during the semester and analyzing its position and the economic stand. - Jordan's Balance of Payments, 2016. - Discus the climate change problem and its burden on GB and country's external sector.
Module 2	The exchange Rates Market and the Determinants
Key Concepts	Foreign exchange rate, foreign exchange market, money market, interest rates, expected rate of return, spot rate, forward rate, appreciation, depreciation, inflation, deflation, long-run equilibrium, Monetary Policy, climate chnage.
Overview	Introduce how the exchange rates is determined using the asset approach. In this approach student will recognize how the exchange rates market work. Describing all the variables and situations that affect the exchange rates. The student must know how the changes in interest rate expectations and the spot rates affect the expected returns on foreign deposit. How does money market influence the foreign exchange market? Find if there is any relationship between the monetary policy and climate change.
Aim	The main goal is to understand the role of exchange rates in international trade activity and to understand how exchange rates are determined.
Learning Outcomes	At the end of this module learners will be able to: - Relate exchange rate changes to changes in the relative prices of countries' exports.

	- Describe the structure and functions of the foreign exchange market. - Apply the interest parity condition to find equilibrium exchange rates. - Find the effects of interest rates and expectation shifts on exchange rates. - Show how monetary policy and interest rates interact in the foreign exchange market. - Draw the relationship between the short-run and the long-run effects of monetary policy. - Recognize the relationship between the climate change and exchange rates determinants (Monetary policy).
Units	Unit 14: Exchange rates and foreign exchange market Unit 15: Money, interest rates, and exchange rates.
Readings	Ch 14. & ch. 15. (International Economics: Theory and Policy) 9th edition, 2012. Addison Wesley, by Paul Krugman and Maurice Obstfeld. Paul R. Krugman. "The International Role of the Dollar: Theory and Prospect," in John F. O. Bilson and Richard C. Marston, eds. *Exchange Rate Theory and Practice*. Chicago: University of Chicago Press, 1984, pp. 261–278. Theoretical and empirical analysis of the dollar's position as"international money." Events in international finance issues will be followed and discussed. The Jordan times, The Economists, The Financial Times, are Journals that student may find useful as a source of information. MONETARY POLICY AND CLIMATE CHANGE: IS THERE A ROLE FOR THE CENTRAL BANK? Remarks by Hernán Lacunza General Manager, Central Bank of Argentina. The link of this article: http://storage.jak-stik.ac.id/ProdukHukum/BankIndonesia/HernanLacunzapdf.pdf
Activity	**Overview**
	-Construct a model of foreign exchange rates market. -Visit the Central bank of Jordan, the main financial institution in Jordan. - writing two pages describing how the monetary policy may have any role in climate change issue.
Module 3	Relative Prices and the Exchange Rates in the Long Run
Key concepts	Fisher effect, law of one price, nominal interest rate, purchasing power parity, real interest rate, monetary approach.
Overview	Many investors found price changes difficult to foresee, and as a consequence wealth were lost—and made—in the foreign exchange market. In this module student should acknowledge the question of What economic forces lie behind such dramatic long-term

	movements in exchange rates? National price levels play a crucial role in determining both interest rates and the relative prices at which countries' products are traded from long run perspective. A theory of how national price levels interact with exchange rates is thus central to understand why exchange rates can change dramatically over periods of several years. Theory of purchasing power parity (PPP) explains movements in the exchange rate between two countries' currencies by changes in the countries' price levels. Next, the students will determine the reasons why PPP may fail to give accurate long-run predictions and show how the theory must sometimes be modified to account for supply or demand shifts in countries' output markets.
Aim	This module aims to understand factors other than money supplies and demands that also can have sustained effects on exchange rates.
Learning Outcomes	At the end of this module learners will be able to: - Explain the purchasing power parity theory of exchange rates and its relationship to international goods-market integration. - Express how monetary factors such as ongoing price level inflation affect exchange rates in the long run. - Understand factors that affect real exchange rates and relative currency prices in the long run.
Units	Ch. 16 Relative Prices and the Exchange Rates
Readings	Ch.16 (International Economics: Theory and Policy) 9th edition, 2012. Addison Wesley, by Paul Krugman and Maurice Obstfeld. Taylor, A. and M. Taylor (2004), "The Purchasing Power Parity Debate", Journal of Economic Perspectives, Vol. 18, NO. 4, pp. 135-58 *Purchasing Power Parity: Weights Matter Finance & Development ,Tim Callen,2012* http://www.imf.org/external/pubs/ft/fandd/basics/ppp.htm
Activity	**Overview** *Assignment 1:* student should answer the following questions: 1) Explain the nature of the relationship between the increasing rate in the money supply and the increasing rate in prices (inflation), using a time series represents the variables available for Jordan. (You can use the electronic pages of central bank of

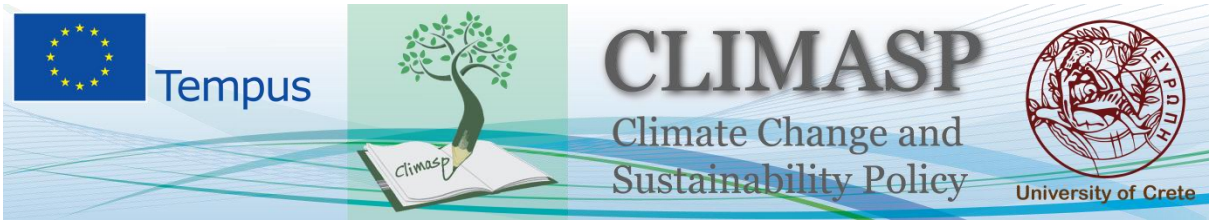
	Jordan to get the material required). 2) Assume that there is a decrease in the overall real demand for money. What are the short and long runs effects on exchange rates, interest rate and the general level of prices? 3) What is the name of the currency of each of the following countries: Brazil, Mexico, Malaysia, India, Morocco, Egypt, Mauritania, Belgium, Sweden, Australia, Libya, Kuwait, South Africa, China? 4) Suppose that the inflation rate in Russia was 50% within one year, and the rate of inflation in Britain only 10% in the same year. According to the relative purchasing power parity(Relative PPP) What will happen during the year to the exchange rate of the pound sterling against the Russian ruble?
Module 4	Current Account Determination
	AA schedule , aggregate demand, DD schedule, fiscal policy, J- curve, pass-through.
Overview	We now combine what we have learned about asset markets and the long-run behavior of exchange rates with a new element, a theory of how the real sector "output market" adjusts to demand changes when product prices in the economy are themselves slow to adjust.
Aim	The aim of this module is to restructure the complicated factors that cause output, exchange rates, and inflation to change, and examining how output and the exchange rate are determined in the short run.
Learning Outcomes	At the end of this module learners will be able to: - Clarify the role of the real exchange rate in determining the aggregate demand for a country's output. - Explain how monetary and fiscal policies affect the exchange rate and national output in the short run. - Describe and interpret the long-run effects of permanent macroeconomic changes. - Analyze the relationship among macroeconomic policies, the current account balance, and the exchange rate.
Units	Unit .17 Output and the Exchange Rate in the Short Run
Readings	Chapter 17. (International Economics: Theory and Policy) 9th edition, 2012. Addison Wesley, by Paul Krugman and Maurice Obstfeld. Mann, C (2002), "Perspectives on the U.S. Current Account Deficit and Sustainability", Journal of Economic Perspectives, Vol. 16, No.3, pp. 131-52. Robert A. Mundell. *International Economics*, chapter 17. New York: Macmillan,

	1968. A classic account of macroeconomic policy effects under floating exchange rates. Dominick Salvatore, international economics, ch.19;Wiley,"Prices and Output in an Open Economy: Aggregate Demand and Aggregate Supply.2005.
Activity	**Overview**
	The student will do a research about Financial Crisis the causes , effects and solutions and relate the financial crisis with sustainability, global warming and climate chnage. Students work in groups of 5. Each group chose a country to study its economic and social characteristics and explore any economic or financial crisis and any aspects of climate change and its financial and social impacts, and how each country solve its economic problems through applying the policy instruments they took during the semester. They suppose to be a future analyst in economic field. Students used all the tools and theories -they took in this semester and others - to understand and predict the economic crises and the way each country solve its finance problems. The Key objectives for this practice are: 1- Practice, analyzing and predict the different types of economic crises and its causes and link it with climate change crisis. 2- Implement the monetary and fiscal policy and other macroeconomic variables in the open economy. Each group choose a country and then try to collect the data they need for their country and study its own characteristics. They use graphs and tables, to explain their ideas. Meet some decision makers to see how and why policy is been talking this way or another. Then they submit the final draft of their projects and each group present their result and discuss it with the class.
Module 5	**International Macroeconomic Policy**
Key Concepts	Fixed Exchange Rates, The International Monetary System, Gold standard, Reserve currency system, devaluation, revaluation, gold exchange standard.
Overview	In this module the students will explore the issue of how central banks intervene in the foreign exchange market to fix exchange rates and how macroeconomic policies work when exchange rates are fixed. This will help us understand the role of central bank foreign exchange intervention in the determination of exchange rates under a system of managed floating. Also it will examine how the international monetary system

	influenced macroeconomic policy making and performance during four periods: the gold standard era (1870–1914), the interwar period (1918–1939), the post–World War II years during which exchange rates were fixed under the Bretton Woods agreement (1946–1973), and the recent period of widespread reliance on floating exchange rates (1973–present). In an open economy, macroeconomic policy has two essential goals, internal balance and external balance in this context we will try to relate both targets with sustainability matter. The goal of external balance presents a clear picture of how policy actions taken abroad may change an economy's position relative to the position its government prefers.
Aim	The aim of this module is to provide students with number of international currency arrangements since 1870, and explains how did countries try to attain internal and external balance, and how successful were they.
Learning Outcomes	At the end of this module learners will be able to: - Discuss causes and effects of balance of payments crises. - Describe how alternative multilateral systems for pegging exchange rates work. - Explain how the goals of internal and external balance motivate economic policy makers in open economies. - Describe the structure of the international gold standard that linked countries' exchange rates and policies prior to World War I, and the role of the Great Depression of the 1930s in ending efforts to restore the pre-1914 world monetary order and related to some cultural effects. - Discuss how the post–World War II Bretton Woods system of globally fixed exchange rates was designed to combine exchange rate stability with limited autonomy of national macroeconomic policies.
Units	Ch. 18: Fixed Exchange Rates and Foreign Exchange Intervention. Ch.19: The International Monetary System, 1870-1973.
Readings	Michael Mussa. *The Role of Official Intervention*. Occasional Paper 6. New York: Group of Thirty, 1981. Discusses the theory and practice of central bank foreign exchange intervention under a dirty float. Olivier Jeanne. *Currency Crises: A Perspective on Recent Theoretical Developments*. Princeton Special Papers in International Economics 20. International Finance Section, Department of Economics, Princeton University, March 2000. Recent thinking on speculative crises and attacks. Harold James. *The End of Globalization: Lessons from the Great Depression.*

	Cambridge, MA: Harvard University Press, 2001. Political and economic analysis of international economic disintegration between 1914 and 1939. Maurice Obstfeld and Alan M. Taylor. *Global Capital Markets: Integration, Crisis, and Growth.* Cambridge, U.K.: Cambridge University Press, 2004. Overview of the linkages between international financial integration and exchange rate regimes. John Williamson. *The Exchange Rate System*, 2nd edition. Policy Analyses in International Economics 5. Washington, D.C.: Institute for International Economics, 1985. An indictment of floating exchange rates and a case for target zones.
Activity	**Overview**
	Watching a documentary film in title: "End of the Road; How Money Became Worthless" The students discuss the financial crisis 2008 and try to analyze what documentary suggested and predicted.
Module 6	introduction of climate change problem
Key Concepts	Climate change, cost-benefit analysis, financial crises and global warming.
Overview	In this module we will try to explore the climate change as an environmental issue and relate it to the international finance subject from sustainability perspective.
Aim	The aim of this module is to learn how to link the environmental economic specifically climate change matter with global finance.
Learning Outcomes	At the end of this module learners will be able to: - Explain the climate change as an international issue and clarify it from economic prospect. - Link the climate change with international macroeconomic policy.
Units	- The economics of climate change.
Readings	A compilation of hands-out: • The economics of climate change, Anothony D. Owen, Nick Hanley,2004.
Activity	**Overview**
	Discuss the new issues regarding the climate change and international finance. Students start to represent their paper.

Module 7	Developing Countries: Growth, Crisis, global warming and climate change.
Key Concepts	Growth, sustainability, climate change
Overview	Student should explore these new issues ant try to find the link between them through searching new resources and contact environmental institution in Jordan and see the environmental policies that have been adopted by government of Jordan and the financial issues that may create some restrictions.
Aim	The aim of this module is to help students relate the financial crisis with sustainability policies.
Learning Outcomes	At the end of this module learners will be able to: - Understand the relationship between climate change and financial crisis. - Discuss this question: Is there any impact of global financial crisis on climate change?
Units	Climate change and the financial crisis
Readings	Climate Change and the Global Financial Crisis, Robin Leichenko, Karen O'Brien and William Solecki**.** Climate change and the financial crisis: A case of double Exposure**,** Robin M. Leichenko, Karen L. O'Brien, and William D. Solecki**,** *Annals of the Association of American Geographers*, 100(4) 2010, pp. 963–972 C, Published by Taylor & Francis, LLC. The economics of climate change, Anothony D. Owen, Nick Hanley**,** 2004. International Climate Change Financing: The Green Climate Fund (GCF). Richard K. Lattanzio Analyst in Environmental Policy, Congressional Research Service April 16, 2013. The Effect of the Global Financial Crisis on Climate Change, Imogen Reed. Posted on April 13, 2012 . Climate Change May Trigger the Next Financial Crisis. What is the impact of the economic crisis on the climate change debate? Question submitted by Soumaya Maghnouj, from Sciences-Po, March 22, 2013 Answered by: Daniel P. Ahn, Adjunct Fellow for Energy
Activity	**Overview**
	Explain and discuss the relationship between the financial crisis and climate change problem.



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus
Contemporary Economic Issues
The University of Jordan, the School of Business, Department of Business Economics

Instructor Information

Instructor: Dr. Khawlah Ali Abdalla Spetan
Office Location: The School of Business / Business Economics Department -Building #2 First Floor.
Telephone: 5355000 ext. 24163
Office Hours: (11:00-12:00), Mon, Wed. or by appointment.
E-mail: khawlahs2000@yahoo.com, Khawlah.spetan@ju.edu.jo

Course Identification

Course Number: 1607411
Course Name: Contemporary Economic Issues
Course Location: Auditorium 8/ Building #2
Class Times: 9:30-10:45 AM
Prerequisites: 1607210 and 1607211
Faculty Web Page: http://business.ju.edu.jo

Course Description/Overview

This course is primarily concerned with contemporary economic issues at the domestic, regional and international levels. Specific topics are chosen from current and recent policy debates. Specifically, it will emphasize current economic subjects such as poverty and welfare, economic growth and development, inflation, energy prices, climate changes and environmental pollution. Class participants will be encouraged to use economic theory to evaluate present events. Students will learn to read and construct basic theories and diagrams that explain and illustrate economic phenomena. Presentations and illustrations will be given for understanding the economic situations which directly affect our lives.

Course Learning Objectives

The main objective of this course is to augment the students' comprehension of the various contemporary economic issues which arise in the world, and analyze their negative and positive effects on the Jordanian community. Since we are talking in this course about the contemporary issues in economics this will give us flexibility and a wild range of issues that may come up during the semester related to recent economic event. Accordingly, the main objectives of this course are: 1) introduce the main current issues in the world of economics. 2) Students will understand the linkages and interactions in many macroeconomic and microeconomics variables. 3) Understanding issues in social policy such as the minimum wages and poverty and welfare topics and their effects on economy and society. 4) Explore several international issues and their internally and externally interactions such as the energy prices, the environment and the climate change, government deficit and foreign debt and economic growth and development.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:
LO **1- Knowledge and Understanding:**

A1) understand the new and important contemporary economic issues.
A2) understand the problems and reasons that are associated with economic issues.
A3) realize the importance of the issues that deal with environmental economics and climate change.

LO **2-Analytical and Thinking Skills**:
Students should have the ability to:

B1) collect and analyze relevant data associated with contemporary economic issues.
B2) perform basic analytical techniques and operations in the context of economic issues.
B3) comprehend and communicate positively and effectively data presented in dialogue forums.
B4) develop analytical skills through class presentations, discussions and writing research papers.
B5) apply microeconomic and macroeconomic analysis to evaluate a current public policy.

LO **3-Teaching and Learning Methods**:

Lectures, case studies, problem solving and tutorials.

- Lectures: 7 weeks, 21 hours
- Discussion forums: 7 weeks, 21 hours
- Tutorials: 2 weeks, 6 hours
- Applications (office hours): as requested

Course Resources

Students should use course description as general guidelines. Book lists and syllabi are subject to change.

Because the course focuses on current economic issues, students will be asked to supplement the chosen textbooks with readings from newspapers, magazines, and the internet

Course Website(s)

- https://www.facebook.com/groups/CEI.ju

Required Course Texts and Materials

Although the complete list of references and textbooks materials will be assigned during the course, these books are required:

- Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010 (chapters:12, 20, 22, 31, 35, 38, 40).
- Alan, Griffiths & Stuart Wall, Applied Economics, 12-th edition, Pearson, 2011.
- Ahmed, F. Al-Oran, "The Economics of Social Security; Challenges and Awareness ",1st edition, The International Institute of Islamic Thought, 2014.

Optional Course Texts and Materials

- Nick Hanley, Jason Shogren, and Ben White, *Introduction to Environmental Economics*

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Fail**

Grading Policy

Students will be assessed based on the following:

Mid-term Exam: 18/11/ 2015, Wed 30%

Participation, Homework & attendance: 10%

Short Paper: 10%

Final Exam: 50%

Assignments are individual assignments. Details of these assignments and the submission deadlines will be announced in class.

Course Policies

University Policies regarding class attendance, course pre-requisites, and academic honesty, grading, incompletes, and final exams will be observed as stated in the University of Jordan. You are responsible for all material discussed in class and assigned in the textbook. Missing class is strongly discouraged. Your professor is far less sympathetic to those who miss class regularly. If you miss class, you are responsible to get the notes from a classmate.
Any type of academic misconduct will result in (F). By Enrolling in this course, you agree with the University of Jordan Policy on Academic Misconduct.

Course Schedule

The contents of this course will be determined according to the economic issues that arise during a particular time period.
Below is a proposed list of some topics. We do not want to make this a formal Schedule because we want to be able to introduce topics as they arise. This may mean introducing new topics or shifting the order of the topics we have already chosen.

Detailed lecture schedule			
	Week:	**Material:**	**Homework & Assignments**
	Week 1+2	-Introduction 1- Government deficit, surplus, and national debt.	TBA
	Week 3	2-Minimum wages.	TBA
	Week 4	3- Economic growth and development.	TBA
	Week 5+6	4- Natural recourses, the environmental and climate change.	TBA
	Week7	5- Economics of climate change. Midterm Exam 18/11/2015	
	Week 8+9	6- Poverty and welfare.	TBA
	Week 10+11	7- Energy prices.	TBA
	Week 12+13	8-The Stock Market and crashes.	TBA
	Week 14	Papers presentations	
	Week 15	Final exam	TBA

Course	Contemporary Economic Issues
Module 1	Government deficit, surplus, and national debt.
Key Concepts	Introduction, Government budget (GB), fiscal policy, structural deficit, external debt, internal debt, national debt, procyclical, on- budget, off-budget, operating budget and capital budget, Jordan's GB.
Overview	We try to take a closer look at fiscal policy and its interaction with the deficit in international trade. Students will be asked about how the decisions of policy makers and the outcome of economy itself in raising or reducing tax revenues change the government budget status. Also we will explore the interaction of the government budget with net exports and foreign lending or borrowing. In this module students will try to analyze and understand Jordan's government budget deficit and its interactions. Moreover, the students should try to understand the fact of the nation's debt and who owns this debt. Moreover students will analyze the Jordanian GB and try to understand the structure of GB deficit.
Aim	The aim of this module is to make students able to discuss the main causes of government deficits and debt through time, how the history of deficits interactions of national economies influences the worldwide pattern of macroeconomic activities in Jordan .
Learning Outcomes	At the end of this module learners will be able to: - Define and discuss the concepts of the government budget. - Compare and analyze the different types and sources of government budget imbalances. - Determine and understand the aspect of nations' debt in general and specifically in Jordan.
Units	Unit 1: Government deficits, Surpluses, and the National Debt.

Readings	- Chapter 12, (pp. 142-152) Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Chapter 5 (134-143), Robert, J. Gordon, Macroeconomics, 12th ed., Pearson, 2011. - A study about the Jordan's Government budget 2015, done by Dr. Khaled Al Wazani, 2014. - Monthly Bulletin, Central Bank of Jordan, 2014.
Activity	**Overview**
	- Student draw a relationship between the opportunity cost concept and running a high government budget deficit. - The student will be asked about how this opportunity cost might depend on the shape of the supply curve for loanable funds. - The student will analyze the situation of Jordan's Government budget of 2015, and write a short report (two to three pages) about this matter. - Start to divide the students into four to five groups. Each group will choose one of the course main subjects and start to develop a project (paper) that contains the problem, the analysis and the solutions. Each group should show the instructor the progress of each stage of the project to give instructions and suggestions. And finally set a date for presentations of the projects .
Module 2	Minimum wages.
Key Concepts	Living wage, minimum wage
Overview	It is one of social policy; the student should know and understand why such a policy is exist. What is the traditional economic analysis of minimum wage and what is the rebuttals to this traditional analysis, an argument should the students deal with and interact through discussion and read more about this policy in Jordan and compare it with other countries' policy.
Aim	The main goal is to understand the economists arguments who tended to argue against the minimum wage and the one who are with this policy.
Learning Outcomes	At the end of this module learners will be able to: - Apply the supply and demand model to a labor market. - Define and describe the purpose of the minimum wages. - Identify real-world winners and losers of minimum wage increases.

	- Utilize the elasticity approach to the question whether a minimum wage increase would augment the unemployment.
Units	Unit 2: Minimum Wages
Readings	- Chapter 12, (pp.324-330), Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Minimum wages in Jordan. - Brown, Charles, Curtis Gilroy and Andrew Kohen," The Effects of the Minimum Wage on employment and Unemployment," Journal of Economic Literature 20,no.2 (June 1982),pp.487-528. - Fair wage Network: the minimum wage increase in Jordan from 1st of Feb. 2012: http://www.fair-wage.com/en/fair-wage-observatory/new-legal-provisions/109-the-minimum-wage-increase-in-jordan-from-1st-of-february-2012.html. - Pay equity in Jordan, http://www.ilo.org/dyn/travail/docs/639/Pay%20Equity%20in%20Jordan.%20Report%20of%20the%20ILO%20of%202010.pdf - Ministry of Labor: http://mol.gov.jo
Activity	**Overview**
	The students will be asked the following question: 1- Who is most likely to benefit from an increase in the minimum wages and who will most likely to lose? 2- Should small business firms be exempt from minimum wage laws? 3- Would our Jordanian community be better off with a higher minimum wage? 4- Divide students into two groups; one group who is pro minimum wages policy and the other one is against it, and each group should bring into table their points and arguments. This activity will emphasize the interaction atmosphere and discussion skills among students. 5- Asking about the progress of the project, and check the first stage of it (determine the problem of the research (project)).

Module 3	Economic growth and development and Indicators of Economic Development.
Key Concepts	Gini index, purchasing power parity, GDP, NI and poverty.
Overview	Why there are rich countries and poor countries? This is the question that this module is trying to answer. This unit has a little bit of everything. It combines macroeconomics, international trade, sustainability and government policy within the development and economic growth analysis. The student will explore the magnitude of the gap between developed and developing countries, and how some countries moved from developing to developed countries using different developmental paths.
Aim	This module aims to understand factors that affect the economic growth and the one that shape the economic development and each concept indicators.
Learning Outcomes	At the end of this module learners will be able to: Identify why some exist developed countries grow faster than others. - List the legal, political and institutional factors that have historically limited growth in many developing countries. - Identify and analyze the factors that explain the substantial differences between the economic growth and economic development.
Units	Unit 3: Economic growth Versus Development Unit 4: Indicators of Economic Development.
Readings	- Chapter 20,(221-226), Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Indicators of economic development, https://www.facebook.com/groups/CEI.ju. -World Development Indicators,2014,http://data.worldbank.org/sites/default/files/wdi-2014-book.pdf - World Bank , http://data.worldbank.org
Activity	**Overview**
	- The group who choose the economic growth and development topic for their

	project will discuss the main features of World Development Indicators Report 2014, and take the feedback for their paper from other groups. - Each student should go to the CIA Factbook Web pages and explore the economic statistics of the following countries: Jordan, Brazil, Egypt, Malaysia, South Africa, Morocco and India. Each has a per capita GDP between $4,000 and $17,500 per year. What country in that list do you think is most likely to move into the class of developed countries? And which is likely to have its per capita GDP rise the fastest and why? https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html - Ask students the following question: what does the world "SUSTAINABILITY" means to them in terms of economic development? Make a brief discussion and let each group evaluates the others and put the deserved mark.
Module 4	Natural recourses, the environmental and Economics of climate change.
Key concepts	Cap-and-trade, common property, externalities, limited natural resources, renewable natural resources, social cost, stewardship, sustainability and climate change.
Overview	In this module students will explore the environment issues and the central role of economics in solving environmental problems because in dealing with environment the society needs to reallocate the resources in direction that generally move consuming and growing in positive economic ways to preserving and living with economic slowdown. The student will be introduced to the different types of natural resources and the economic solutions to environmental problems, and how the economists try not to find just a way to reduce pollution but also to come up with a plan that will minimize the economic cost. One of the important economic activity externalities which this module will explore details is the climate change problem. Student will investigate the economics of climate change and its applications and try to explore the climate change as an environmental issue from sustainability perspective.
Aim	The aim of this module is to understand the environmental problems specially climate change problem and its interaction, as a science subject, with

	economics.
Learning Outcomes	At the end of this module students will be able to: - Apply the principles of present value to natural resources development. - Use marginal analysis to answer the question of how clean is clean enough. - Apply the concept of externalities to explain why pollution demands government intervention in the market. - Identify the environmental problems as well as the economic solutions. - Determine the causes and the effects of climate change on economy. - Understand how the climate change and the economics interactions.
Units	Unit 5: Natural Resources, The Environment, and Climate Change. Unit 6: The economics of Climate Change.
Readings	- Chapter 22, (238-247), Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Chapter 10, (pp.172-188), Alan, Griffiths & Stuart Wall, Applied Economics, 12-th edition, Pearson, 2011. - Alan, Griffiths & Stuart Wall, Applied Economics, 12-th edition, Pearson, 2011 - TED Talk Tim Jackson Economics Of Climate Change http://www.ted.com/talks/tim_jackson_s_economic_reality_check?language=ar - Ministry of Environment in Jordan. http://www.moenv.gov.jo - Jordan warned of severe droughts caused by climate change (Video). https://www.youtube.com/watch?v=Cuq3A-6VUDs
Activity	**Overview**
	Students should discuss the features of environmental problems, and try to apply environmental approaches into real world activities and the environment around us. Students may examine the green economy concept, and explore the wide and sometimes the confused meaning of such economy. Student should think about these questions? 1- Why would an increasing marginal cost of producing oil lead to a more

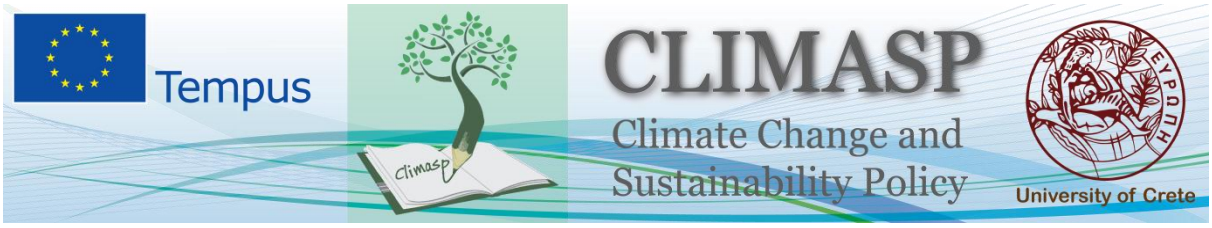
	spread-out utilization plan? 2- What is the economic problem that connected with climate change, and how the economics describe and analyze the climate change crisis? 3- Is there any causality relationship between the economic development and the Global warming, and to what extend the economic development did affect the world clime that lead to change. 4- Asking about the progress of the project, and check and evaluate the second stage of it, (prepare and write the analysis and explanation of the chosen topic).
Module 5	Poverty and welfare.
Key Concepts	In-kind subsidies, poverty gap, poverty line, poverty rate.
Overview	In this module we will introduce and defining what constitutes a state of "poverty" and describes the people who meet the criteria. Student will know how poverty is measured, and how the percentage of the population that is poor has changed through time. We may also here introduce the relationship between sustainability, climate change and the poverty problem specifically in Jordan and around the world.
Aim	The aim of this module is to provide students with the main concepts of poverty and welfare.
Learning Outcomes	At the end of this module learners will be able to: - Discuss how poverty is measured, sow the percentage summarize the demographics of poverty in the USA and Jordan. - List and describe the programs associated with the government's official poverty line. - Explain why the government prefers programs that grant the recipient goods and services rather than money. - List the incentives and disincentives of welfare. - Summarize the welfare reform issues that we currently face.
Units	Unit 7: poverty problem and social welfare.

Readings	- Chapter 35, (pp. 360-368), Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Poverty in Jordan. Poverty in Jordan Prepared by the Department of Statistics,Jordan1, Working paper 11 9 April 2015. http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.15/2015/WP_11_EN_Jordan.pdf
Activity	**Overview**
	Student try to answer the following: 1- What measure of poverty would give you the lowest estimate of the amount of money you would need to solve the nation's poverty problem? 2- What is the poverty line in Jordan, what does the data suggest with regard to poverty and the age profile of those in poverty relative to the age profile generally in Jordan? 3- Continue monitoring the groups' project progress.
Module 6	Energy prices.
Key Concepts	Cartel, natural monopoly,
Overview	In this module we will try to explore one of the important issues, the prices of energy the guts of the industrial development and economic growth. Students will explore the history of oil and gasoline prices and discuss the causes and effects of significant changes. OBEC and its effective oil cartel will be studied and examined. As we noticed recently the gasoline prices seem to rise and fall much more quickly than supplies why is that happening a question need to be answered. Looking into oil and gasoline price history will be useful in order to understand the source of fluctuations and how these changes affect the electricity prices and the industry. In Jordan still the energy prices take a lot of attention since the cost of energy is accelerate, which cause a government-nations conflict. Student will try to use their theoretical base to explain the different arguments.

Aim	The aim of this module is to understand and explain the causes and effects of oil prices fluctuations.
Learning Outcomes	At the end of this module learners will be able to: - Model how cartel can make its member large sums of money. - Evaluate whether OPEC qualifies as a cartel. - Summarize the history of inflation-adjusted oil and gasoline prices. - Identify the role of expectations in determining gasoline prices and explain why events in the Middle East can cause prices at the pump to change in a matter of days.
Units	Unit 8: oil and gasoline prices.
Readings	- Chapter 39,(pp.394-405), Robart, C.Guell, *Issues in Economics Today*, sixth edition, McGraw Hill, 2010. - Energy Costs: The Challenge Jordan Faces, May,2013. http://impatientbedouin.com/energy-costs-the-challenge-jordan-faces - Tom, Arnold ,Higher electricity prices pare down Jordan's budget deficit, April,2014. http://www.thenational.ae/business/economy/higher-electricity-prices-pare-down-jordans-budget-deficit - National Strategic Plan for Dealing with NEPCO's Losses. http://www.memr.gov.jo/LinkClick.aspx?fileticket=PHxs463H8U0%3D&tabid=255
Activity	**Overview**
	- Students will discuss the issue of energy prices around the world and in Jordan specifically. The student will be divided into two parties and each of two parties will adopt a different view regarding the increase of electricity prices, which is one of the hot economic issues in Jordan. Each party will defend his/her view, one party with increasing energy price and the other is against this policy, each party has to relate its arguments with sustainability and economic growth and development.

	- What do you think about cartel system and how it affect the market outcome? - A question to think about: All energy consumption engages externalities that are recognized. Given that the USA has spent billions of dollars military defending access to oil, should they consider that an externality? (ch.38, pp.407) - Think also about how much sensitive is the oil price to output changes, terrorist attacks, wars, climate change and other unexpected incidences.
Module 7	The Stock Market and Crashes and the Islamic point of view in Financial Crisis
Key Concepts	Bankruptcy, bubble, creditors, efficient market, fundamentals, stock index, Islamic view in financial crisis, sustainability and climate change.
Overview	Student should explore and understand how stock prices are determined and what stock markets do. Understanding the fundamental value of stock prices. Student will go through some financial crisis happened in the last three decades, and try to analyze and explain the causes and the effects of these crisis on the individual country and the whole world and also introduce the problem of climate change and the sustainability notion and try to explain it from Islamic point of view.
Aim	The aim of this module is to help students relate the financial crisis with financial markets, sustainability policies and climate change.
Learning Outcomes	At the end of this module student will be able to: - Apply the concept of present value to the fundamental elements of stock prices. - Explain that some of bankruptcy involved a level of deception on the part of their accountants that was potentially quite damaging. - Explain and describe the Islamic point of view about the financial crisis in general and the financial crisis of 2008 and the crisis of climate change around the world.
Units	Unit 9: The stock market
Readings	- Chapter 40, (pp. 419-428), Robart, "C.Guell, *Issues in Economics Today*", sixth edition, McGraw Hill, 2010.

	- Ahmed, F. Al- Oran, "The Economics of Social Security; Challenges and Awareness ",1st edition, The International Institute of Islamic Thought, 2014.
Activity	**Overview**
	Students will discuss and try to answer these questions: - Explain and discuss why a higher interest rate announced by the CB would result in lower stock prices. - How does the Islamic perspective look at the causes and effects of the financial crisis and sustainable policy? Groups will start to present their project and the students will participate in the evaluation of the paper and discuss the outcome of each group's project.



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus
International Political Economy
The University of Jordan, The School of Business, Department of Business Economics
Spring Semester, 2015/2016

Instructor Information

Instructor:	Dr. Buthaina M.A. Muhtaseb/ Associate Professor
Office Location:	The School of Business / Business Economics Department –Building 2 # First Floor.
Telephone:	5355000 ext. 24839
Office Hours:	Monday, Wednesday 11.00 / 12.00 am
E-mail:	b.muhtaseb@ju.edu.jo, b.muhtaseb@hotmail.com

Course Identification

Course Number:	1607100
Course Name:	International Political Economy
Course Location:	University Campus
Class Times:	Monday, Wednesday 9.30/ 11.00
Prerequisites:	None
Faculty Web Page:	http://business.ju.edu.jo

Course Description/Overview

This course seeks to explore the interaction of economics and politics in global affairs- the struggle for power and wealth within the international system. The course begins by identification of the economic science and economic problem, the development of economic thought across different economic schools, concentrating on their different standpoints regarding the role of the government in the economic activity. The course aims also to study and analyze different economic systems and their characteristics.

Special emphasis will be placed on the international dimension of political economy, focusing on the interconnected political and economic structures of the world and considering the undergoing enormous change, in order to understand the key elements of this change and see which paths lead to the most promising future. While the questions of international monetary, financial and trading systems are of particular importance, other topics of interest include: the flow across borders of goods, capital, foreign investment and migration ;role of multinational corporations, regional economic organizations and their role in economic integration, environmentally sustainable development, climate change, and prospects for welfare as an economic, political, technological and socio-cultural ongoing process.

Course Learning Objectives

The main goals of this course are to:

- Raise awareness that neither international politics nor international economics can be understood in isolation.
- Focus attention on the four types of cross-border flows (goods, capital, .investment and migration),and the polices- set forth by domestic and international institutions and arrangements- that regulate these flows.
- .Raise awareness of the environmental and climate change issues.
- Highlight the importance of coordinating domestic and global policies to face the challenges of climate change.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:

LO **1- Knowledge and Understanding:**

A1) Understand the major theoretical perspectives on international political economy, the assumptions concerning appropriate unit analysis and nature of interactions between units on which they are based, and their implications for policy.
A2)) Learn how economic organizations on the national and international levels compete and integrate with each other.
A3) Understand the importance of the ecological constraints on economic growth and development.
A4) Understand the interrelated nature of the measures undertaken by national and world organizations to mitigate and adapt to climate change.

A5) Try to investigate the extent of the Jordanian economy to influence and be affected by the world economy.

LO **2- Analytical and Thinking Skills**:

Students should have the ability to:

B1) Indentify and evaluate institutional, political, cultural and economic constraints on the speed and effectiveness of political and/or economic positive change in developing countries.
B2) Collect and analyze relevant data associated with international political economy.

LO **3- Teaching and Learning Methods**:

- Lectures, dialogue and discussion.
- Research.
- Cooperative learning.
- Brain – storming.

Course Resources

Course Website(s)

- http://blackboard.ju.edu.jo

Required Course Texts and Materials

- Balaam, David N. , and Bradford Dillman. (2010) *Introduction to International Political Economy*, 5th ed. Longman.
- Oatley, Thomas. (2011). *International Political Economy*, 5th Edition. New york, Longman.
- Joseph E. Stiglitz (2002) *Globalization and its Discontents*, New York : Norton.

Optional Course Texts and Materials

- To be assigned at the end of each module.

Assignments and Grading Scheme

Grading System

A , A-	**Excellent**
B+ , B, B-	**Very good**
C+, C, C-	**Good**
D+ , D	**pass**
D-, F	**Fail**

Grading Policy

Grades can be based on the following :

Attendence	**5 %**
Mid-term exam	**30%**
Final exam	**50%**
Participation in the seminars	**10%**
Short Paper	**5%**
Total	**100%**

Course Policies

University Policies regarding class attendance, course pre-requisites, and academic Honesty, dropout, grading, incompletes, and final exams will be observed as stated in the University of Jordan. You are responsible for all material discussed in class and assigned in the textbook. Missing class is strongly discouraged. Your professor is far less sympathetic to those who miss class regularly. If you miss class, you are responsible to get the notes from a classmate.

Any type of academic misconduct will result in (F). By Enrolling in this course, you agree with the University of Jordan Policy on Academic Misconduct.

Course Schedule

Week	Material
1	Introduction and basic concepts
2	Definition of economic science and economic problem
3+4	Development and analysis of different schools of economic thought
5+6	Economic systems + First examination
7	Sustainable global development
8	Financial systems and fiscal policy
9+10	International finance, third world debt and the macroeconomic stabilization controversy
11	Trade policy, regional and world trade organizations
12	Direct foreign investment and foreign aid
13	The global environmental threat
14 + 15	Climate protection + Final Examination



Course	**International Political Economy**
Module 1	**Introduction and Basic Concepts**
Key Concepts	Economic Science, Political Science, Interaction of economics and politics.
Overview	This module is a general introduction on the international political economy. It emphasizes the interconnectedness between economics and politics at the international level. Major concepts and topics at the international level are explored in a general manner, including the political economy of climate change.
Aim	To give a general idea about the concepts and issues of international political economy.

Learning Outcomes	After taking this module, students should be able to : • Realize the interaction nature of economics and politics. • Understand the general meaning of the main concepts of this subject.
Units	Unit 1.1: Introduction Unit 1.2 : basic concepts
Readings	- Balaaam, Vavid N. and Bradford Dillman (2010) Introduction to International Political Economy, 5th ed. Longman. Chapter 1.
Activity	• Explain why both economy and politics are interconnected.
Module 2	Definition of economic scince and economic problem
Key Concepts	Scarcity and efficiency, normative vs. positive economics, Laissez-faire, mixed economies, production-possipilities curve, opportunity cost.
Overview	As the "International Political Economy" trys to explore the interaction of economics and politics in global affairs, it is convenient to introduce at first the definition of " Economics ", and to explain how societies solve the three problems of economic organization, (what, How and for whom). Also this module through constructing the " production possibilities curve ", can illustrate many basic economic processes and issues. .
Aim	To introduce students to basic concepts of economics and the economic problem, as well as politics.
Learning Outcomes	At the end of this module, students will be able to: • Understand what is economics about. • Analyse key idea in economics such as: unlimited wants, scarce resources and that society must use them efficiently.
Units	Unit 2: Definition of economic science and economic problem
Readings	- Samuelson – Nordhous. Economics. MASS INSITTUTE of TECH, 19 th Edition 2010. - Robert Heilbronet, the world philosophers, seventh Edition, 1999.
Activity	* Define each of the following terms carefully and give examples: PPC, scarcity, production efficiency, inputs, outputs, politics. * Many scientists believe that we are rapidly depleting our natural resources. Assume that there are only two inputs (labor and natural

	resources) produce two goods (concerts and gasoline) with no improvement in society's technology over time. Show what would happen to PPC over time as natural resources are exhausted. How would invention and technological improvement modify your answer on the basis of this example, explain why it is said that " economic growth is a race between depletion and invention "
Module 3	Development and analysis of different schools of economic thought
Key Concepts	Classical school, new classical economic thought, Chicago school of economics.
Overview	This module deals with different thinkers and theories in the political economy and economics. These schools of economic thought include : Islamic economics (Ibn Khaldun), Mercantilism (nationalism and international trade) the physiocrats (and the circular flow), classical economics, capitalism, communism and Karl Marx, Neoclassical economic thought. John Mynard Keynes and Keynesianism, the globalization era, the Chicago school of economics, Milton Freedman (capitalism and freedom). This module includes also main arguments made by these schools and their impacts on the economy.
Aim	The aim of this modules is to provide students with a base to understand the development of ideas and points of view toward economic issues and the impacts of these thoughts on policymakers.
Learning Outcomes	• Identify and discuss the different schools of economic thought. • Discuss how thoughts can have an impact on the economy, and how can they change it.
Units	Unit 3: Development and analysis of different schools of economic thought
Readings	- Balaaam, Vavid N. and Bradford Dillman (2010) Introduction to International Political Economy, 5th ed. Longman. Chapter 2.
Activity	* What is the main differences between the classical school and keynesian school? How did each of them affect economic policy?
Module 4	**Economic Systems.**
Key Concepts	Economic system of Islam, capitalism, socialism and communism, mixed economy.

Overview	Main criteria to distinguish between the different economic system are: ownership of means of production, the role of the government in the economy, the role of the profit motive in directing business, and the distribution of wealth and income among the people. The major economic systems are: Islamic economic system, capitalism and socialism, and how they organize the economy differently.
Aim	To provide students with the characteristics of each of the major economic systems and to show them how these systems are different in political, economic and social aspects.
Learning Outcomes	At the end of this module learners will be able to: • Discuss the characteristics of each of the Islamic economic system, capitalism and socialism. • Differentiate among the main economic systems
Units	Unit 4.1: Economic System of Islam Unit 4.2 : Capitalism Unit 4.3: Socialism Unit 4.4: Mixed Economy
Readings	- Balaaam, Vavid N. and Bradford Dillman (2010) Introduction to International Political Economy, 5th ed. Longman. Chapter 3&4 .
Activity	• Discuss the (pros) and (cons) of the major economic systems.
Module 5	Sustainable Global Development.
Key Concepts	Economic, social and environmental dimensions or " ecology, economy and equity ".
Overview	A widely accepted definition of sustainable development is the general definition of Bruntland (1987). It is understood that this concept encompasses a number of areas and highlights sustainability as the idea of international global issues of environmental, economic and social progress and equaty, all within is based on the limits of natural resources. This concept is based on elements of nature, life support, community (peace and culture), people and economy. Although in theory, development that is sustainable and not damaging to the planet is very possible, inreality there are a lot of politics and challenges involved.
Aim	To introduce the concept of global sustainable development in terms of issues,

	impacts, institutions and technology.
Learning Outcomes	After reading this module students will be able to: • Understand the meaning of global sustained development and its different elements . • Know how much progress has been attained in sustainable development since the 1992 Rio Earth summit. • Discuss the political challenges in facing this issue.
Units	Unit 5: Sustainable Global Development.
Readings	- العوران, أحمد, الإقتصاد و الأمن الإجتماعي: التحدي والإستجابة (2014) المعهد العالمي للفكر الإسلامي, الولايات المتحدة. - Katie,Willis (2006) Theories and Practices of Development, London: Routledge. - Tanner, t. (2011) The Political Economy of Climate Change and Development, Institute of Development Studies.
Activity	-Discuss the climate-land-energy-water-development nexus in the case of Jordan.
Module 6	**Financial and monetary systems, international finance third world debt and the macroeconomic controversy**
Key Concepts	Bretton Woods System, IMF, Developing-country borrowing and debt.
Overview	This module covers several issues related to international finance, global capital flows and the global distribution of income, focusing on the impacts of the global institution on developing counties.
Aim	To explain international and monetary systems, as well as the third world debt and the debate on the IMF-WB structural adjustment programs
Learning Outcomes	After reading this module, students will be able to: • Understand the Bretton Woods System. • Discuss the need for reforming the world's finanicial " architecture "
Units	Unit 6.1 : Financial system and fiscal policy. Unit 6.2 : International Finance. Unit 6.3 : Third world debt and the macroeconomic stabilization controversy.

Readings	-Dooly Michael, P.& David Folkerts (2004) The Revized Bretten Woods System, International journal of Finance and Development, vol.9,307-313.
Activity	Discuss the relation between politics and the international monetary – financial instutions.
Module 7	**Trade policy, FDI and foreign aid**
Key Concepts	Trade policy, WTO, regional trade agreements, FDI.
Overview	This module emphasizes the importance of the issues related to trade policy and how this is dominated by political considerations. Also the flow of foreign direct investment and foreign aid will be discussed.
Aim	To provide students with major concepts on the international flow of capital, aid and trade, as well as discussing this with respect of developing countries.
Learning Outcomes	After completion of this module students will be able to : • Understand how some restrictions on the flow of international trade, foreign direct investment are desirable, particularly for developing countries.
Units	Unit 7.1 : Trade policy, regional and world trade organizations. Unit 7.2 : Direct foreign investment Unit 7.3 : Foreign aid.
Readings	-Global Political Economy (2004) O'Brien and Williams,Ch.5 and Ch. 8.
Activity	Discuss the impact of the trade agreement among Arab countries (GAFTA) on Arab's trade and welfare.
Module 8	**The global environmental threat and climate protection.**
Key Concepts	Externalities, air / water pollution, ozone depletion, global warming, solid waste management , political economy of climate change, climate mitigation, climate adaptation.
Overview	This module is a general introduction to the environmental threat and climate change. The emphasis is on identification sources of environmental problems, valuing environmental resources and designing environmental policy within the global framework. Climate change elements are also considered. These include: global warming, Kyoto protocol, the role of economic instruments, the role of energy prices, developing countries and climate change, and the

	transition to renewable energy. "Political Economy of Climate Change" is an approach that applies the political economy thinking of collective or political processes to study the decision –making on climate change.
Aim	To give an overall idea about the environmental threat facing the globe, and how to deal with climate change, emphasizing that these two topics are fully global (and ethical) phenomenon.
Learning Outcomes	After taking this module, students will be able to : • Explain the foundations of environmental problems, conflicts and policy. • Understand that there is a need for globally coordinated action. • Understand what is the new political economy approach to climate policy. • Discuss climate change negotiations, national interest, and the political economy of bargaining positions.
Units	Unit 8.1 : The global environmental threat. Unit 8.2 : Climate protection.
Readings	- Ahmad M. Hussen (2012). Principles of Environmental Economics and sustainability An Integrated Economic and Ecological Approach, 3rd Edition. Routledge - Nick Hanley and Anthonoy Owen (2004). The Economics of Climate Change, Routledge. htto://www.ids.ac.uk/idspuplication/political-economy-of-climate-change).

CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus
Managerial Economics
The University of Jordan, the School of Business, Department of Business Economics

Instructor Information

Instructor: Dr. Ghazi Al-Assaf

Office Location: The School of Business / Business Economics Department -Building #1 First Floor.

Telephone: 5355000 ext. 24177

Office Hours: 12-1 Sun, Tue, Thur.

E-mail: g.alassaf@ju.edu.jo

Course Identification

Course Number: 1607421

Course Name: Managerial Economics

Course Location: Building #2/ Business School

Class Times: 9-10

Prerequisites: 1607210 and 1607211

Faculty Web Page: http://business.ju.edu.jo

Course Description/Overview

Economic theory is the fundamental determinant of firms' profitability and growth, and economic thinking should be an essential element in nearly every managerial decision. In this course, we will examine the principles of microeconomics, and show how they apply to managerial decision-making.

In addition, the course deals with the optimal managerial decisions that are related to the climate change issues and externalities.

Course Learning Objectives

1. To equip the student with the principles he or she needs to make sense out of the conflicting and contradictory discussions of economic conditions and policies in newspapers and news magazines.
2. Enable the student to evaluate the performance of decision makers, and to predict the impact of their policy actions on families and business.
3. Understand and predict the economic forces shaping real-world business decisions.
4. Develop and strengthen overall analytical skills.
   Develop critical thinking skills about markets and business decisions.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:
LO **1- Knowledge and Understanding:**

- Understand managerial behavior regarding maximizing the profit of the firm under different market structure.

- Understand managerial reaction concerning government policy and activities.

- Understand mathematical methods (Derivative, linear programming), and statistical techniques (regression – model) to help managers taking optimal decisions.

LO **2- Analytical and Thinking Skills**:
Students should have the ability to:

- Present written and/or oral reports using critical thinking, economic data, and economic theory.
- Perform mathematics, and statistical knowledge and its application on economic-decision of the firms.
- Comprehend and communicate data presented graphically and/or mathematically.
- relate mathematical and statistical models to their assumptions and to the real world.

- Analyze the managerial decision-making for the environmental issues by concentrating on the behavior of firms and their production decisions and environmental protection procedures.
- Analyze environmental policies from the viewpoint of economic theory.

LO **3- Teaching and Learning Methods**:

Lectures, case studies, problem solving and tutorials.
- Lectures: 7 weeks, 21 hours

- Discussion forums: 7 weeks, 21 hours
- Tutorials: 2 weeks, 6 hours
- Applications (office hours): as requested

Course Resources

There will be 3 lectures per week. Although the lectures cover the vast majority of the module material, students must make use of the textbooks extensively especially the empirical cases presented in the book.

Course Website(s)

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Required Course Texts and Materials

(Managerial Economics) 10th edition, 2011. *McGraw Hill* By: Thomas and Maurice.

.Optional Course Texts and Materials

- Nick Hanley, Jason Shogren, and Ben White, *Introduction to Environmental Economics*
- Nathaniel Keohane and Sheila Olmstead, Markets and the Environment: An Introduction to Environmental and Resource Economics (Washington, D.C.: Island Press, 2007).

Grading Policy

Students will be assessed based on the following:

Mid-term Exam	30%
Second exam	15%
Participation	5%
Final Exam	50%

Assignments are individual assignments. Details of these assignments and the submission deadlines will be announced in class.

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Fail**

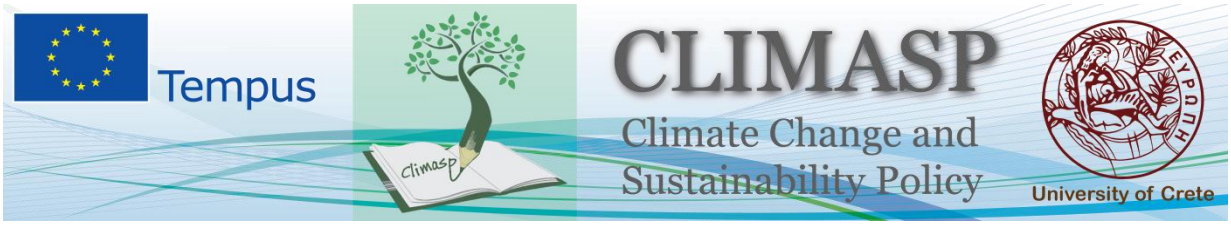
Course Policies

University Policies regarding class attendance, course pre-requisites, and academic honesty, grading, incompletes, and final exams will be observed as stated in the University of Jordan. You are responsible for all material discussed in class and assigned in the textbook. Missing class is strongly discouraged. Your professor is far less sympathetic to those who miss class regularly. If you miss class, you are responsible to get the notes from a classmate.
Any type of academic misconduct will result in (F). By Enrolling in this course, you agree with the University of Jordan Policy on Academic Misconduct.

Course Schedule

Detailed lecture schedule			
	Week:	Material:	Homework and Assignments
	Week 1	Ch (1): Managers, Profits and Markets(2-28)	TBA
	Week 2+3	Ch (2): Demand, Supply, & Market Equilibrium (36-64).	TBA
	Week 4	Ch (6): Elasticity and Demand (204-229)	TBA
	Week 5+6+7	Ch (3): Marginal Analysis for Optimal Decision	TBA

		Making(86-108) Ch (7): Demand Estimation & Forecasting(243-262)	
	Week 8+9	Ch (8+9): Production and Cost in the Short (284-312),and long Runs (320-359),	TBA
	Week 10	Ch (10): Production and Cost Estimation (371-377)	
	Week 11+12	Ch (11): Managerial Decisions in Competitive Markets (398-441)	TBA
	Week 13+14	Ch (12): Managerial Decisions for Firms with Market Power. (453-478)	TBA
	Week 15	Linear programming	
	Week 16	Final exam	TBA



Course	Managerial Economics

Module 1	**Introduction to Managerial Economics**
Key Concepts	Introduction Managers, Profits and Markets
Opportunity cost, market-supplied resources, owner-supplied resources, Total economic Overview	We try to explain the accounting concepts in the area of microeconomics and industrial organization such as: Business practices (or) tactics, Industrial organization, Strategic Decisions In addition, we will go over some concepts related to Economic Cost of Using Resources such as: cost, explicit costs, implicit costs, economic profit, and accounting profit. We also analyze environmental policies from the viewpoint of economic theory.
Aim	The aim of this module is to make students able to apply microeconomic theories to business problems
Learning Outcomes	At the end of this module learners will be able to: - Discuss the economic way of thinking about business. - Measuring and maximizing economic profit - Understand Separation of ownership and control.
Units	Unit 1: Managers, Profits and Markets.
Readings	(Managerial Economics) 11th edition, 2013. *McGraw Hill* By: Thomas and Maurice. Theobald, R.H., Environmental management, Nova Science Publishers, 2008.
Activity	**Overview**
	Students should be able to answer the following questions: - Explain the role of economic theory in managerial economics? - Measure the explicit opportunity cost of using market-supplied resources to produce goods or services. - Over the next three years, a firm is expected to earn economic profit of $700,000 in the first year, $800,000 in the second year, and $500,000 in the third year. After the end of the third year, the firm goes out of business.

	a. If the risk-adjusted discount rate is 16 percent for each of the next three years, how much the value of the firm will be? b. If the risk-adjusted discount rate is 10 percent for each of the next three years, then, how much the value of the firm will be?

Module 2	**(Demand, Supply, and Market Equilibrium) and (Elasticity of Demand)**
Key Concepts	(Demand, Supply, and Market Equilibrium) and (Elasticity of Demand)
Overview	- In this part, students will work with three different types of demand relations: general, direct, and inverse demand functions. - We will List six principal variables that determine the quantity demanded of a good, and another six principal variables that determine the quantity supplied. - Distinguish between changes in "quantity demanded" (i.e., a movement along demand) and changes in "demand" (i.e., a shift in the demand curve) - Explain why market equilibrium occurs at the price for which quantity demanded equals quantity supplied (i.e., neither excess demand nor excess supply exist). - Employ the concepts of consumer surplus, producer surplus, and social surplus to measure the gains to society from market exchange between buyers and sellers. - Explain the role that price elasticity plays in determining how a change in the price of a commodity affects the total revenue (TR = P × Q) received. - List and explain several factors that affect the elasticity of demand. - Calculate the elasticity of demand (a) over an interval using the interval (or arc) formula, and (b) at a point on a demand curve. - Define and compute the income elasticity of demand (EM) and the cross-price elasticity of demand (EX Y). - Relate marginal revenue to total revenue and demand elasticity.
Aim	The main goal is to understand the role of demand and supply in affecting the equilibrium of the market. In addition, a one should know how he/she will response (presented by the quantity purchased of one good) to changes in price of that good, income, and the price of related goods.
Learning Outcomes	At the end of this module learners will be able to: - Explain the determinants of Supply and demand and understanding the meaning of equilibrium of the market. - Explain how price elasticity of demand (E) is used to measure the responsiveness or sensitivity of consumers to a change in the price of a good.
Units	Unit 2: Demand, Supply, and Market Equilibrium Unit 6: Elasticity of Demand
Readings	(Managerial Economics) 11th edition, 2013. *McGraw Hill* By: Thomas and Maurice. Theobald, R.H., Environmental management, Nova Science Publishers, 2008.
Activity	**Overview**
	Construct two models: The first one is for the demand of one good (explaining the factors that determine the relationship with it). The second model shows the determinants of supply of that good (explaining the relationships of these determinants with that good).

Module 3	**(Demand Estimation and Forecasting)**
Key Concepts	Demand Estimation, Demand Forecasting, least-squares regression
Overview	- In this part, students will work on specifying an empirical demand function—both linear and nonlinear functional forms. - Forecast sales and prices using time-series regression analysis. - Employ dummy variables to account for cyclical or seasonal variation in sales.
Aim	- After reading and understanding this chapter, students should be able to: - For price-setting firms with market power, we will learn to how to use least-squares regression methodology to estimate a firm's demand function. - Discuss and explain several important problems that arise when using statistical methods to forecast demand. -
Learning Outcomes	At the end of this module learners will be able to: forecast the demand on one good.
Units	- Unit 7: Demand Estimation and Forecasting
Readings	(Managerial Economics) 11th edition, 2013. *McGraw Hill* By: Thomas and Maurice.
Activity	**Overview**
	Construct a model for the demand of one good (explaining the factors that determine the relationship with it). Then collecting data on these variables. Finally, performing how to forecast that model.

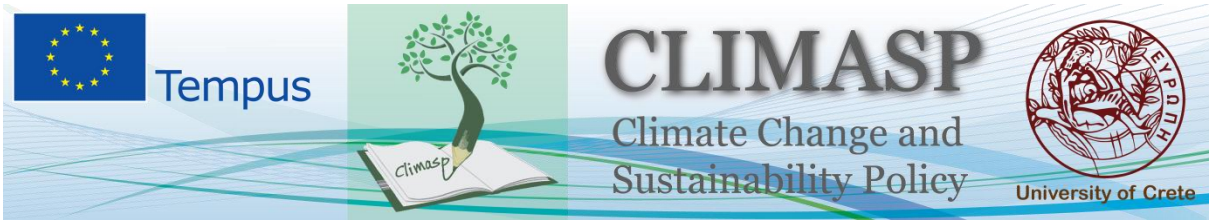
Module 4	**Production and Cost in the Short-Run and the Long-Run**
Key Concepts	production, cost, short run, long run, Environmental Impact Assessment.
Overview	In this part, students should be able to: - Understand the information given by a production function. - Explain the difference between long-run and short-run production time periods.

	- Define and explain the law of diminishing marginal product. - Explain the difference between fixed costs and variable costs. - Define and draw graphs of total fixed cost (TFC), total variable cost (TVC), total cost (TC), and short-run marginal cost (SMC). - Define and draw graphs of average fixed cost (AFC), average variable cost (AVC), and average total cost (ATC). - Draw a graph of a typical production isoquant and use the definition of an isoquant to explain why isoquants must be downward sloping. - Construct isocost curves for a given level of expenditure on inputs. - Construct an expansion path. - Define and illustrate graphically the concept of returns to scale. - Construct a long-run total cost curve from an expansion path. - Define economies of scope and explain how to measure economies of scope. - Show the relation between long-run and short-run cost curves. - Defining Environmental Product Differentiation. - Able to make Environmental Impact Assessment.
Aim	The main goal is to understand the role - Compute average product (AP) and marginal product (MP) and explain the relation among total, average, and marginal products. - Apply the theory of optimization to find the optimal input combination. - Show graphically that the conditions for minimizing the total cost of producing a given level of output are the same conditions for maximizing the level of output for a given level of total cost.
Learning Outcomes	At the end of this module learners will be able to: - Compare and contrast technical efficiency and economic efficiency. - Relate short-run costs to the production function using the relations between (i) average variable cost and average product, and (ii) short-run marginal cost and marginal product. - Discuss the properties of an isoquant. - Explain the concept of economies and diseconomies of scale. - Distinguishing Environmental Product Differentiation - Conducting basic Environmental Impact Assessment
Units	Unit 7: Production and Cost in the Short-Run Unit 8: Production and Cost in the Long-Run
Readings	(Managerial Economics) 11th edition, 2013. *McGraw Hill* By: Thomas and Maurice. Theobald, R.H., Environmental management, Nova Science Publishers, 2008.

Activity	Overview
	Collecting data for a commercial company about its of production and cost levels. Try to isolate fixed and variable costs. Draw all data in useful figures.

Module 5	(Marginal Analysis for Optimal Decisions)
Key Concepts	Marginal Analysis, Marginal Benefit, Marginal Cost, externalities.
Overview	In this part, students will work with the following economic concepts: marginal analysis, net benefit, the choice variables (continuous or discrete), marginal benefit, and how to formulate an optimization problem especially in the presence of externalities.
Aim	The main goal is to understand how to employ marginal analysis to find the optimal levels of activities in unconstrained maximization problems. It is also important to be able to understand the concept of externalities.
Learning Outcomes	At the end of this module learners will be able to: - Explain why sunk costs, fixed costs, and average costs are irrelevant for determining the optimal levels of activities. - Employ marginal analysis to find the optimal levels of two or more activities in constrained maximization and minimization problems.
Units	Unit 3: Marginal Analysis for Optimal Decisions
Readings	(Managerial Economics) 11th edition, 2013. *McGraw Hill* By: Thomas and Maurice. Theobald, R.H., Environmental management, Nova Science Publishers, 2008.
Activity	**Overview**

Module 6	(Economic Growth, Technology and Greenhouse Gas Emissions)
Key Concepts	Economic Growth, Managerial decision under climate changes, Gas Emissions, Greenhouse
Overview	- In this part, students will work with economic models that include climate change variables. In addition, we will go over the essential concepts about that subject.
Aim	The main goal is to understand the role - Understand the climate change problem - Considering climate change effects when making economic decisions.
Learning Outcomes	At the end of this module learners will be able to: – Build a simple growth model that includes the climate change variable. – Calculating costs and revenues based on the climate change consequences.
Units	Unit 4: Economic Growth, Technology
Readings	*The Economics of Climate Change: A Primer*. US Congressional Budget Office, 2003



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus
Scientific Research in Economics
The University of Jordan, the School of Business, Department of Business Economics

Instructor Information

Instructor: Dr. Ghazi Al-Assaf
Office Location: Faculty of Business / Business Economics Department – Building #2, 1st floor
Telephone: 5355000 ext. 24177
Office Hours:

E-mail: g.alassaf@ju.edu.jo
Website: www.ju.edu.jo

Course Identification

Course Number: **1607311**
Course Name: **Scientific Research in Economics**
Course Location:
Class Times:
Prerequisites: Principles of Statistics 1607150
Faculty Web Page: www.ju.edu.jo

Course Description/Overview

Covers these topics: the concept of scientific research and its definition, and kinds of scientific research, stages and objectives of scientific research, kinds and sources of data and data collection: Questionnaire, population and sample: kinds of sampling, the relation between statistics and scientific research, implementation and analyzing data using statistical methods with SPSS, finally writing reports with focus in the climate change issues.

Course Learning Objectives

Providing students with concepts and definition and the importance of scientific research, also providing students with skills in choosing the appropriate way of writing the Questionnaire, the statistical analysis and writing the final report.

Note: Students who are involved in CLIMASP certificate can apply their research work on environmental issues.

Course Content Learning Outcomes

A. Knowledge and Understanding:
Students should have knowledge of:

- The main concepts of scientific research, and its importance.
- How to think wisely and scientifically.
- How to write questions in the Questionnaire.
- How to deal with the data.
- How to integrate climate change variables into a research project.

B. Intellectual Analytical and Cognitive Skills:
Student is expected to:

- Write the questions in the Questionnaire correctly.
- Choosing and applying the appropriate statistical analysis particularly for the environmental issues.

- Writing the reports.

Course Resources

Hands-out prepared by the instructor for the class

- Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS".
- Wooldridge, J. (2010), "Econometric Analysis of Cross Section and Panel Data". MIT Press.
- Becker, Egon and Thomas Jahn (1999), Sustainability and the Social Sciences: A Cross Disciplinary Approach to Integrating Envrionmental Considerations into Theoretical Reorientation. London/New York: Zed Books.

Grading System

Grades can be based on the following:

Evaluation	**Point %**	**Date**
Midterm Exam	30	TBA
Second Exam & assignments	20	TBA
Final Exam	50	TBA
Total Points	**100**	

Grading System

A , A- ***Excellent***
B+ , B, B- ***Very good***
C+, C, C- ***Good***
D+ , D, D- ***pass***
D-, F = ***Fail***

Content	Reference	Week	ILO/s
Introduction to scientific research methodology: - Definition of scientific research. - Kinds of scientific research. - The role of researchers in scientific research. - The role of government and companies in scientific research. - Integrating climate change variables.		1	A&B
- Stages for research development. - Methods and types of scientific research for environmental issues.		2	A&B
- Stages in scientific research. - Objectives of scientific research.		3	A&B
Data and observations: - Kinds of data. - Sources of data. - Data collection. - Data on climate change and for environmental variables.		4	A&B
Questionnaires.		5	A&B
Population and samples: kind of samples.		6	A&B
Statistics: - Relationship between the definition of statistics and scientific research methodology. - Relationship between statistical methods and scientific research methods. - Relationship between statistical theory and scientific research methodology. - Reflecting the awareness of respondents toward climate change.		7	A&B
Starting the program SPSS: - Entering the data and creating files. - Descriptive statistics and its applications.		8	A&B
- Statistical graphical methods and its applications. - Inferential statistics methods.		9	A&B
- Statistical method determination. - Statistical methods and its applications.		10	A&B
- Applying the steps to write Questionnaire. - Applying the steps to analyze data. - Starting writing reports.		11	A&B
- Methods and rules in writing Quotations. - Methods and rules in writing footnotes.		12	A&B
- Methods and rules in writing references. - Methods and rules in writing reports.		13	A&B
Recognizing the parts of the report which are preliminaries, the body of the research, and the appendix.		14	
Presenting the reports by students about climate change issues.		15	
Presenting the reports by students about economic impact of climate change and other environmental issues.		16	

Assignments are individual assignments. Details of these assignments and the submission deadlines will be announced in class.

Course Policies

Learning Methodology

Duration: 16 weeks, 48 hours in total

Lectures: 42 hours, 3 per week (including two 1-hour term exams)

Although the lectures cover the vast majority of the course material, students must use the text book.
A number of problems (some could be chosen from the end of chapter problems) will be indicated in class, specifying their due time. A discussion of the assigned problems can be done through the preceding lectures. Also, applying all steps for different statistical methods using SPSS by students.

Classroom Protocol

Details of the assignments and the submission deadlines will be announced in class and/or posted on the course website. Students are advised to keep track of what is announced in class, it is their responsibility to do so, BEING ABSENT IS NOT AN EXCUSE FOR NOT KNOWING WHAT IS GOING ON.

Late Assignments

It is essential that papers and other assignments be completed and submitted on time. Once the due date is past, without notice and justification, the submission is not accepted.

Dissability

Students who have disabilities should have a confidential appointment to discuss their need for accommodations. Establishing reasonable accommodations should be considered on a case-by-case basis.

Course Contents

Course	**Scientific Research in Economics**
Module 1	**Introduction to scientific research methodology**
Key Concepts	Introduction Definition of scientific research. Research development, methods of scientific research
Overview	We try to explain the Definition of scientific research and the kinds of scientific research. In addition, explaining the role of researchers in scientific research, and the role of government and companies in scientific research. We also try to integrate variables on climate change issue.
Aim	The aim of this module is to make students able to understand the concept of scientific research and its importance as well as determining the objectives of scientific research.
Learning Outcomes	At the end of this module learners will be able to: - Define the concept of scientific research. - Classifying the scientific research.

	- Understand the role of government in scientific research. - Understand Research development and methods of scientific research
Units	Unit 1: Definition of scientific research and Objectives of scientific research.
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS".
Activity	**Overview**
	Students should be able to answer the following questions: - Define scientific research? - Determine the kinds of research? - Based on different case studies, explain the suitable methods to conduct research?

Module 2	**Data and observations**
Key Concepts	Data, observations, questionnaire, population, sample, and environmental variables.
Overview	- Distinguish between sample and population. - Explain the concept of data collection and observations based on the case studies including climate change issues. - Construct questionnaire regarding climate change effects issues. - Relate sample to population. - Integrating climate change variables.
Aim	The main goal is to understand how to distinguish between sample and population as well as the data collection. It is also important to be able to construct a scientific questionnaire about different economic and environmental issues.
Learning Outcomes	At the end of this module learners will be able to: - Distinguish between sample and population. - Able to build a scientific questionnaire about an economic phenomenon. - Choosing the appropriate way of writing the questionnaire.
Units	Unit 2: Data Collection and Data Structures. Unit 3: Sample and Population.
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS". Becker, Egon and Thomas Jahn (1999), Sustainability and the Social Sciences: A Cross Disciplinary Approach to Integrating Envrionmental Considerations into Theoretical Reorientation. London/New York: Zed Books.
Activity	**Overview**
	Construct examples about data collection and sample and population. Providing the concepts and definition and the importance of scientific research, also providing students with skills in choosing the appropriate way of writing the Questionnaire and selecting the variables that reflect issue related to global warming.

Module 3	**Statistics**
Key Concepts	Statistics, Statistical theory
Overview	- This unit will explain the concept of statistics and the use of statistical tool in scientific research. - Relationship between the definition of statistics and scientific research methodology. - Relationship between statistical methods and scientific research methods.
Aim	- After reading and understanding these chapters, students should be able to: - Define the concept of statistics and its use in scientific research. - Determine the relationship between statistical theory and scientific research methodology.
Learning Outcomes	At the end of this module learners will be able to: define statistics.
Units	- Unit 5: statistical theory

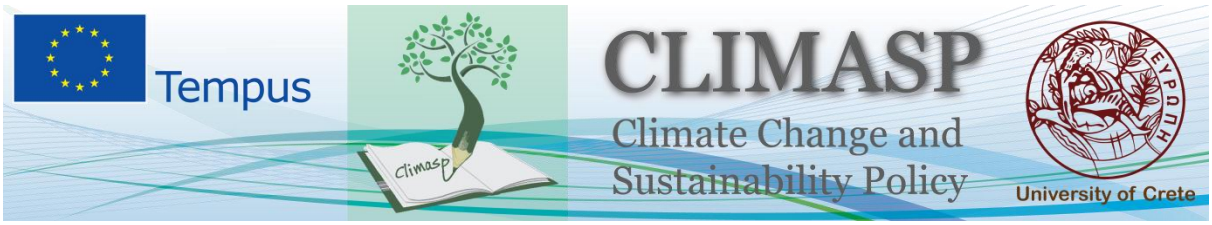
	- Unit 6: statistical tools.
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS".
Activity	**Overview**
	Determining the statistical tools require to investigate various economic and environmental problems.

Module 4	**Introduction to Use SPSS**
Key Concepts	SPSS, Analysis.
Overview	In this part, students should be able to: - Know how to enter the data to SPSS. - Arrange the data and define the variables. - Label the series included in the analysis. - Generate data and create descriptive analysis. - Generate graphs for the series.
Aim	The main goal is to know how to do the following: - Entering the data and creating files. - Descriptive statistics and its applications.
Learning Outcomes	At the end of this module learners will be able to: - Use the dataset on the SPSS. - Generate statistical graphs using SPSS - Create descriptive analysis using SPSS.
Units	Unit 10: Using SPSS
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS".
Activity	**Overview**
	Collecting data for a selected case study and enter the data into the SPSS and generate graphs and descriptive statistics.

Module 5	**Inferential statistics methods.**
Key Concepts	Inference, Statistical methods determination.
Overview	This part will be focused on application about how to employ statistical methods to make inference about economic and environmental problem.
Aim	The main goal is to use statistical methods to make inference, apply the questionnaire, construct data, and analyze it.
Learning Outcomes	At the end of this module learners will be able to: - Understand the concept of statistical inference. - Employ statistical methods in an issue related to climate change.
Units	Unit 11: Statistical Inference.
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data

	Analysis using SPSS". Wooldridge, J. (2010), "Econometric Analysis of Cross Section and Panel Data". MIT Press.
Activity	**Overview**
	- Statistical method determination. - Statistical methods and its applications.
	- Applying the steps to write Questionnaire. - Applying the steps to analyze data.

Module 6	**Writing Report**
Key Concepts	Report, references, footnotes, climate change.
Overview	- In this part, students will work with economic models that include climate change variables. In addition, we will go over the essential concepts about that subject. Students will also prepare a draft of report about a specific topic collecting required data and start the statistical analysis.
Aim	The main goal is to be able to - Start writing report - Make a scientific citation and list of references. - Organize the body of the research about climate change issue.
Learning Outcomes	At the end of this module learners will be able to: – write a full report. - Prepare list of references. - Make presentation.
Units	Unit 12: writing scientific report.
Readings	Alkadi, D. (2008), "Methodology and techniques of Scientific Research and Data Analysis using SPSS". Wooldridge, J. (2010), "Econometric Analysis of Cross Section and Panel Data". MIT Press. Becker, Egon and Thomas Jahn (1999), Sustainability and the Social Sciences: A Cross Disciplinary Approach to Integrating Envrionmental Considerations into Theoretical Reorientation. London/New York: Zed Books.
Activity	**Overview**
	- Recognizing the parts of the report which are preliminaries, the body of the research, and the appendix. - Presenting the reports by students about climate change issues.



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus

Industrial Economics

University of Jordan, Faculty of Business, Department of Business Economics

Instructor Information

Instructor:	Nahil I. Saqfalhait, Associate Professor
Office Location:	Faculty of Business / Business Economics Department -Building #2, second floor.
Telephone:	5355000 ext. 24172
Office Hours:	TBD
E-mail:	nahil.saqfalhait@ju.edu.jo

Course Identification

Course Number:	1607225
Course Name:	Industrial Economics
Course Location:	TBD
Class Times:	TBD
Prerequisites:	Principles of Microeconomics (1607110)
Faculty Web Page:	http://business.ju.edu.jo

Course Description/Overview

Industrial organization is essentially a branch of applied microeconomics which seeks to understand the causes and effects of various market structures on pricing and product choices. The course focuses on the theory of the firm and the industry in imperfectly competitive markets with an emphasis upon oligopoly theory, but it also addresses empirical applications of the theory. The course explains how firms compete with each other; it models firms' strategies on imperfect markets and derives the impact of firms' behavior on welfare and market structures. Additionally, the effect of industrial revolution on climate change will be examined.

We will analyze market structure, firm conduct, and economic performance of industries. Of special interest is firms' strategic behavior in price and non-price competition. The types of behavior, or conduct, include oligopoly pricing and production, strategic entry deterrence, location strategies, product differentiation, advertising, vertical and horizontal integration, and research and development. The effects of firms' conduct upon economic welfare and feedback effects upon market structure are examined. Of special interest, the dangers of an unregulated extractive monopoly on environment will be investigated. Moreover, we will analyze the acquisition and use of market power by firms, antitrust law or/and the role of government competition policy.

We will also look at how institutions and industry can shape improvements in environmental quality and support efficient allocations of resources.

Course Learning Objectives

This module aims at providing students with major topics in the field of Industrial Organization. The knowledge that the student will derive from the course is useful for further study of firms and markets as well as the study of effects of regulatory and legal systems (such as antitrust law or competitive policies) upon firms. The knowledge is also useful in further study of the internal operation of firms. Topics covered in this course are useful not only for academic consideration, but also in private enterprises, including financial and legal institutions; in government regulatory agencies; and in international trade.

Course Content Learning Outcomes

Upon the completion of this module, students should be able to achieve the following:

LO **1- knowledge and understanding:**

Students should have knowledge of:

- The definition, measurement and analysis of various key elements of industrial organization.
- Why markets are organized as they are and behave in the way they do.
- Models of competitive, oligopolistic, and monopoly markets.
- The basic dimensions of industries structure, conduct, and performance.
- Price and non-price competition among firms.
- The acquisition and use of market power by firms.
- Role of government competition policy and regulation.
- Industrial environmental economics issues.

LO **2- analytical and thinking skills**:

Students should have the ability to:

- Analyze and evaluate models of competitive, oligopolistic, and monopoly markets.
- Analyze and evaluate how firms' structure and conduct affect economic welfare and how these results feed back to effect structure and conduct.
- Explain the various types of industry structures, conduct, and performance; business strategies; and policy alternatives.
- Understand how firms make their decisions based on strategic thinking.
- Discuss theoretical and empirical issues relating to the interactions among firms in a market economy.
- Apply basic concepts of economic analysis of market structures and understand current debates concerning plausible reform of competition policy.
- Evaluate antitrust policies and other government regulations of industry.
- Analyze environmental issues through a deeper understanding of firms' economic behavior and incentives.

LO **3- Teaching and learning methods**:

- There will be 3 hours per week. Although the lectures cover the vast majority of the module material, students must make use of the textbooks extensively especially the empirical cases presented in the book.
- A number of problems will be indicated in class, to be submitted by students. Students should attempt the homework and should come to class prepared to discuss the assigned problems.

Course Resources

Course Website

- http://blackboard.ju.edu.jo

Main textbook

Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach

Additional readings

- *Industrial Organization: Contemporary Theory and Empirical Applications,* 4th edition, Lynne Pepall, Dan Richards, and George Norman, Blackwell Publishing, 2008.

- *Modern Industrial Organization*, 4th Edition, Dennis Carlton and Jeffrey Perloff, Adison-Wesley, 2004.

- Hanley, N., H. Folmer (1998) *Game Theory and the Environment*. Edward Elgar Publishing.

- Dutta, P. and R.K. Sundaram (1993) "*The Tragedy of the Commons?*" Economic Theory, 3, pp. 413-426.

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Failure**

Grading Policy

Students will be assessed based on the following:

Mid-term Exam 30%

Second exam 15%

Short Paper 5%

Final Exam 50%

The objective of the paper is to provide students with an opportunity to apply concepts from this course to a "real" market. Each student's presentation is expected to include the following three parts:

1. Clear description of the market to be discussed.

2. Complete analysis of recent strategic behavior within this market, across all relevant dimensions of firm behavior, including the choice of prices, capacity, products, advertising, R&D, entry, exit, etc.

3. Detailed analysis of one firm in this market (main focus of the presentation).

Details of the assignment and the submission deadline will be announced in class. Dates of exams will be announced in the class.

Course Policies

Classroom Protocol

We oblige ourselves to a high standard of professional behavior. Accordingly, lateness, holding private conversations and indeed any behavior that interrupts me or your colleagues will be considered improper. Using cell phones is forbidden in the class. Repeated violations of this standard may affect your participation grade or may cause withdrawal from course.

Academic Honesty

All the assignments and work submitted by the student should be his or her own. All actions of academic dishonesty including cheating, lifting or helping other students in such actions will be dealt with strictly according to the university regulations**.**

Course Schedule

Detailed lecture schedule: this is a tentative course outline. The instructor reserves the right to make changes whenever necessary. An advance notice will be given to students.			
	Week:	Material:	Homework and Assignments
	Week 1+2	Introduction • The Field of Industrial Organization • Market Structure and Welfare Measures • Theory of the Firm • Industrial Revolution and Climate Change	TBA
	Week 3+4	Market Structure and Welfare Measures • Perfect Competition and Its Efficiency Monopoly Pricing and Its Inefficiency • Monopolistic Competition and Product Differentiation • Oligopoly Markets • Industrial Concentration	TBA
	Week 5+6	Theory of the Firm	TBA

		• Nature of the Firm • Review of Cost Functions • Economies of Scale • Economies of Scope • Seller Concentration • Monopoly Pricing and Its Inefficiency • The dangers of an unregulated extractive monopoly on environment	
	Week 7	Monopoly and Market Power • Determinants of Market Power • Sources of Market • Pricing Strategies • Oil Monopoly and the Climate	TBA
	Week 8+9+10	Models of Oligopoly • Introduction to Game Theory • Cournot Oligopoly • Bertrand Duopoly • Stackelberg (sequential) Oligopoly • Collusive Behavior • Game Theory and the Environment	TBA
	Week 11	Business Practices: Strategies and Conduct • Strategic and Tactical Choices • Entry Deterrence • Non-Price Discrimination • Horizontal Mergers • Integration and Vertical Restraints • Industrial proliferation and environmental preservation	TBA

	Week 12	The Role of Government and regulations • Antitrust and the Role of Government • The impacts of environmental regulations on industrial activity • pollution control policies	TBA
	Week 13+14	Presentations	TBA
	Week 15	Final exam	TBA

Course	Industrial Economics
Module 1	The Field of Industrial Organization
Key Concepts	Market power, the structure of markets, behavior of firms, market performance and climate change and sustainable policy.
Overview	The most basic questions that concern the field of Industrial Organization are: How do firms acquire market power? How do firms use market power? What are the implications of market power? And can public policy limit growth of market power? This section of the course will address the systematic frameworks in which the theory of markets and the behaviour of firms can be studied. Additionally, the effect of industrial revolution on climate change will be investigated.
Learning Outcomes	Upon successful completion of this unit, students will be able to: o Broadly define the scope and focus of industrial organization. o Identify the topics that lie within the scope of industrial organization, especially topics related to: ➢ the structure of markets, ➢ the organization of markets affecting the behaviour of firms and the market performance, and ➢ the behaviour of firms affecting the organization of markets and the market performance. o Identify the different approaches used in answering questions within

	the field of industrial organization. o Realize how industrial revolution has affected climate change.
Units and Readings	1.1 What Is Industrial Organization? 1.2 Methodologies in Industrial Organization 1.2.1 The Structure-Conduct-Performance Paradigm Note: This is the traditional approach to studying Industrial Organization. This approach dominated the field from the 1940s to the 1960s, but by the early '70s, a new approach, called the "new industrial economics," gained popularity. While the former approach was more empirical and linked common elements of market structure observed across industries to their conduct and performance, the latter approach emanated based on the need to develop and test theoretical models of firm conduct. 1.2.2 The New Industrial Organization 1.3 Methodologies in Industrial Organization 1.3.1 The New Industrial Organization 1.3.2 The Theory of Business Strategy 1.4 Topics in Industrial Organization Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: Chapter 1 University of North Carolina, Chapel Hill: Professor Ralph Byrns's Economicae: An Illustrated Encyclopedia of Economics: "The Structure-Conduct-Performance Paradigm" 1.5. Climate Change and Industrial Revolution EPA, *Global Warming—Individual Emissions*, *at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/emissionsindividual.html (last modified Jan. 7, 2000). U.S. Environmental Protection Agency,*Global Warming — Climate*, *at:*http://yosemite.epa.gov/oar/globalwarming.nsf/content/climate.html (last modified Jan. 7, 2000)

	UNESCO/UNEP. *Climate Change Starter's Guidebook: An issues guide for education planners and practitioners*. Paris: United Nations Educational, Scientific and Cultural Organization and the United Nations Environment Programme, 2011.
Activity	1. Students watch a video about major industries from local markets and how their structure changed over time, and write a report giving more examples. 2. Students watch a video about the effects of industrial activities on climate change.
Module 2	MARKET STRUCTURES AND WELFARE MEASURES
Key Concepts	Market structure characteristics and industrial concentration.
Overview	In this unit we will review different market structures and their characteristics. At this point in the course, it is important to recall how firms set their prices under each market structure in order to analyze the degree of market power in different kinds of markets. We will also study Industrial Concentration, its causes, and its consequences, as well as learn about the index used to measure the level of concentration in an industry.
Learning Outcomes	Upon successful completion of this unit, students will be able to: o Describe and calculate the profit maximizing behaviour of firms. o Describe and explain the characteristics of a perfectly competitive firm. o Define, graphically identify, and calculate the following: Consumers surplus, willingness to pay, producers surplus, and the total surplus. o Analyze the problems associated with assessing efficiency on the basis of changes in total surplus. o Define "market power", analyze what gives rise to market power. o Analyze the characteristics that constitute a monopoly especially with respect to pricing, elasticity, and efficiency concerns. o Define product differentiation and the dimensions along which products may differ. o Define Oligopoly and analyze the characteristics that constitute an oligopoly. o Explain the meaning of collusion and identify different kinds of collusion and their consequences.

Units and Readings	2.1 Perfect Competition and Its Efficiency 2.2 Monopoly Pricing and Its 2.3 Monopolistic Competition and Product Differentiation 2.4 Oligopoly Markets 2.5 Industrial Concentration 2.5.1 Determinants of Concentration 2.5.2 Measurements of Concentration- The Lerner Index 2.5.3 Consequences of Industrial Concentration Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: Chapter 2 Annenberg Media's Learner.org: Economics U$A:"19. Monopoly" Kwanghui.com: Professor Joshua Gans's Managerial Economics Online: "Pricing Strategies" California State University, San Bernardino: Professor Eric Nilsson's Capitalism Text: "Chapter 13: Product Differentiation and Competition" Web Media: Annenberg Media's Learner.org: Economics U$A:"20. Oligopolies" California State University, San Bernardino: Professor Eric Nilsson's Capitalism Text: "Chapter 19: Oligopoly"
Activity	Lecture: TED talks: "YochaiBenkler on the New Open-Source Economics" Link: TED talks: "Yochai Benkler on the New Open-Source Economics" (Adobe Flash) Instructions: This is an optional lecture and not a requirement of the course. Please listen to this guest lecture, in which the speaker discusses the emergence of a new type of market structure based on human organization, social production, and innovation.

Module 3	Theory of the Firm
Key Concepts	Marginal cost, average cost, economies of scale, economies of scope, seller concentration and unregulated extractive monopoly.
Overview	In order to understand the mechanics of Industrial Organization, you must have a solid grasp of microeconomic concepts, especially that of competitive markets. We will therefore begin by reviewing some principles of microeconomics. Even if the material seems familiar, take your time reviewing it to ensure you fully grasp the particulars of each concept. revisit: marginal cost and average cost functions, both in the short run as well as in the long run, economies of scale, economies of scope, and seller concentration. Some cases will be discussed to show the dangers of an unregulated extractive monopoly on environment.
Learning Outcomes	Upon successful completion of this unit, students will be able to: · Explain the intuition behind costs functions. · Define and calculate marginal and average cost functions, both in the short run and in the long run, and describe the relationship between the two. · Relate the cost functions to the behaviour of firms. · Define and calculate each of the following cost concepts: - Opportunity costs, - The economic costs of durable inputs, - Avoidable costs and sunk expenditures, - Short run versus the long run, and - Variable and fixed costs. · Define economies of scale. · Identify the conditions that lead to, or create economies of scale. · Define economies of scope. · Define multiplant economies of scope. · Distinguish between economies of scale, economies of scope, and multiplant economies of scope. . Show the dangers of an unregulated extractive monopoly on environment.
Units and Readings	3.1 Perfect Competition and Its Efficiency 3.1.1 Nature of the Firm 3.1.2 Review of Cost Functions 3.1.3 Economies of Scale

	3.1.4 Economies of Scope 3.1.5 Seller Concentration 3.2 Monopoly Pricing and Its Inefficiency 3.3 The dangers of an unregulated extractive monopoly on environment Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: Chapter 3. San José State University: Professor Thayer Watkins's "The Transaction Cost Approach to the Theory of the Firm"
Activity	Wikipedia.org: "Theory of the Firm" Link: Wikipedia.org: "Theory of the Firm" (HTML) Link: San José State University: Professor Thayer Watkins's "The Transaction Cost Approach to the Theory of the Firm" (HTML)
Module 4	Monopoly
Key Concepts	Monopoly, sources of market power, entry barriers, patents, and price discrimination.
Overview	• A market with a single seller of a product or service has an obvious advantage in pricing, thus posing a persistent threat to desirable competitive outcomes. In this unit, we will identify the possible sources of market power, including scale economies and network organization, both of which are advantageous to a firm seeking to establish monopoly. Entry barriers also foster monopoly by keeping potential competitors out, while patents enable firms to enjoy exclusive rights as a reward for the discovery of an idea and can often result in monopoly as well. After discussing the sources of monopoly, we will study monopolistic pricing strategies including price discrimination. Additionally, we will discuss the case of oil monopoly and the climate.
Learning Outcomes	Upon successful completion of this unit, students will be able to: - Describe and explain what is meant by market power and what are the determinants of a firm's market power. - Analyze why firms in the same industry have different degrees of market power.

	- Analyze how entry barriers contribute to market power. - Explain the government's role and its rationale in creating entry barriers. - Identify and analyze the structural characteristics that pose to be entry barriers, including economies of scale, cost advantages, sunk expenditures of the entrant, sunk expenditures by consumers, and product differentiation. - Identify and analyze how strategic behaviour of incumbents can cause entry barriers. - Explain and identify the pricing strategies of a monopolist: linear pricing, two-part tariff, and price discrimination. - Numerically calculate three of the approaches explained: linear pricing, two-part tariff, and price discrimination. - What is meant by bundling. - Analyze the effect of oil monopoly on the climate
Units and Readings	4.1 Market Power 4.1.1 Price Setting Behaviour in the Presence of Market Power 4.1.2 Determinants of Market Power 4.1.3 Sources of Market Power 4.1.3.1 Entry Barriers by the Government 4.1.3.2 Structural Characteristics 4.1.3.3 Entry Deterrence by Incumbents 4.2 Pricing Strategies 4.2.1 Single Price 4.2.2 Price Discrimination and Non-Linear Pricing Reading: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach:", Sections 5.1-5.4(5.4.1-5.4.4): Non-Linear Pricing and Price Discrimination" 4.2.2.1 Examples of Price Discrimination 4.2.2.2 Necessary Conditions 4.2.2.3 Types of Price Discrimination 4.2.2.4 Non-Linear Pricing 4.2.3 More on Pricing Strategies 4.3 Oil monopoly and the climate

	Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: Chapter 4 and Chapter 5. Kwanghui.com: Professor Joshua Gans's Managerial Economics Online: "Market Power" Link: Kwanghui.com: Professor Joshua Gans's Managerial Economics Online: "Market Power" (HTML) Reading: Kwanghui.com: Professor Joshua Gans's Managerial Economics Online: "Pricing Strategies" Reading: University of Louisville: Professor Barry Haworth's "Pricing Strategies for the Monopolist" Link: University of Louisville: Professor Barry Haworth's "Pricing Strategies for the Monopolist" (HTML) John Hassler, Per Krusell and Conny Olovsson, Oil Monopoly and the Climate, The American Economic Review, Vol. 100, No. 2, 2010.
Activity	1. Web Media: Flashecon.org: Living Economics' Microeconomic Lectures: Bundling Link: Flashecon.org: Living Economics' Microeconomic Lectures: Bundling (Adobe Flash) Instructions: Please click on the play tab to hear this 5 minute lecture on Bundling. Link: Kwanghui.com: Professor Joshua Gans's "Pricing Strategies" (HTML) Instructions: As you read along, please click on the hyperlinks to learn more about the examples of each form of pricing strategy. Terms of Use: Please respect the copyright and terms of use displayed on the web pages above. 2. Students are required to write a report about the effect of an industry from Jordanian economy on climate and environment.
Module 5	Models of Oligopoly

Key Concepts	Oligopoly, Cournot model, Bertrand model, Stackelberg model, and static and dynamic games.
Aim and Overview	Numerous models to study the strategy of firms and their competitors in oligopolistic competition. Please note that different models apply to different situations; in this regard, no one model can be deemed "better" than the other. This section will introduce you to some of the first models of oligopoly that were built using the tools of noncooperative game theory. The Cournot and Bertrand models presented here are known as static games of complete information, while the Stackelberg model belongs to the category of dynamic games. Static and dynamic games will be explained.
Learning Outcomes	• Understand various strategies of firms and their competitors in oligopolistic competition in different conditions. • Students will be familiar with basic concepts of game theory and their applications on oligopolistic industries. • Analyze environmental issues through a deeper understanding of firms' economic behavior and incentives • Understand the role of cost-benefit analysis in environmental decision making processes of firms and societies.
Units and Readings	5.1 Concepts in Game Theory 5.1.1 Introduction to Game Theory 5.1.2 Static Games and Nash Equilibrium 5.2 Cournot Oligopoly (Homogenous Products) 5.3 Bertrand Duopoly 5.4 Stackelberg (sequential) Oligopoly 5.5 Collusive Behaviour 5.6 Game Theory and the Environment 5.6.1 Free-riding and Cooperation in Environmental games 5.6.2 Incentives to participate in an international environmental agreements 5.6.3 The Economics of Exhaustible Resources

	5.6.4 The Tragedy of the Commons 5.6.5 The Problem of Externalities Readings: Clemson University: Professor Michael T. Maloney's Econ 424: Industrial Organization: "Provisional Text and Lecture Notes" Link: Clemson University: Professor Michael T. Maloney's Econ 424: Industrial Organization: "Provisional Text and Lecture Notes" (PDF) University of Toronto: Professor Martin J. Osborne's "Collusion among Oligopolists" Link: University of Toronto: Professor Martin J. Osborne's "Collusion among Oligopolists" (HTML) Reading: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: "Chapter 7, Sections 7.1: Why Game Theory? and 7.2: Game-Theoretic Examples" Link: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach: Chapter 7 Link: Drexel University: Professor Roger McCain's Strategy and Conflict: An Introductory Sketch of Game Theory (HTML) University of Toronto: Professor Martin J. Osborne's Theories of Oligopoly: "Strategic Games" and "Cournot's Duopoly Model" Link: University of Toronto: Professor Martin J. Osborne's Theories of Oligopoly: "Strategic Games" (HTML) and "Cournot's Duopoly Model" (HTML) Iowa State University: Arne Hallam's Econ 501: Microeconomics: "Oligopoly" Link: Iowa State University: Arne Hallam's Econ 501: Microeconomics: "Oligopoly" (PDF) Folmer, H., P. Van Mouche, S. Ragland (1993) Interconnected games and international environmental problems, Environmental and Resource Economics 3 , 313–35.

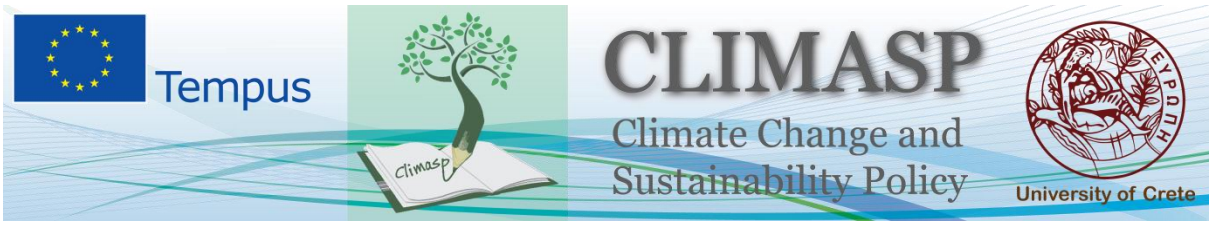
	Hanley, N., H. Folmer (1998) Game Theory and the Environment. Edward Elgar Publishing.
Activity	Students will work in groups and select major oligopoly industries from the local market and analyze their behavior and determine how they are competing with each other and they are required to detect the influence of their behavior on environment and climate when exist.
Module 6	Business Practices: Strategies and Conduct
Key Concepts	Information, price-discrimination, non-price discrimination, research and development, horizontal merging, and vertical integration, and industrial proliferation and environmental preservation.
Overview	Competitive models tend to assume that consumers and competitors have perfect information about every firm's single price. In reality, however, markets deviate substantially from this scenario and indulge in all kinds of strategic behaviour that makes such information ambiguous. This behaviour enables a firm, for example, to price-discriminate to its advantage. Other strategies may include non-price discrimination or engaging in research and development to have an edge on rivals as well as merging horizontally or integrating vertically. We will study the impact that such behaviours have on other firms in the market. It will also look at how institutions, organizations, industry, and individuals can shape improvements in environmental quality and support efficient allocations of resources. Additionally, this module looks at environmental issues and destructions that are related to industrial economics topics.
Learning Outcomes	• Upon successful completion of this unit, students will be able to: Define strategic behavior. • Analyze the factors that influence the strategic behaviors of firms in the short run, the long run, and the very long run. • Identify the first mover advantage in the Stackelberg game. • Analyze how firms use predatory pricing as strategic behavior. • Analyze how investments and sunk expenditures of an incumbent firm provides a cost advantage to it and deters entry of new firms and the antitrust ramifications of such behavior. • Define entry barriers and distinguish it from entry deterrence. • Derive the best response functions in a game-theoretic model. • Define the different types of mergers that firms engage in. Analyze the vertical relations and vertical restraints among firms. • Understand core economic concepts such as efficiency, costs and benefits, and trade-offs, and apply them to environmental issues.
Units and	6.1 Introduction to Strategic Behavior

Readings	6.1.1 Strategic and Tactical Choices 6.1.2 The Stackelberg Model 6.1.3 Entry Deterrence 6.1.3.1 Entry Deterrence With Constant Returns to Scale 6.1.3.2 Entry Deterrence With Economies of Scale 6.1.4 Limit Pricing 6.2 Anticompetitive Strategic Behavior 6.2.1 Predatory Pricing 6.2.2 Entry Deterrence 6.2.2.1 Sunk expenditures and Investments 6.2.2.2 Entry Barriers 6.3 Principles of Strategic Behaviour 6.4 Applications of Strategic Behaviour 6.5 Non-Price Discrimination 6.5.1 Advertising 6.5.2 Research and Development 6.6 Horizontal Mergers 6.7 Vertical Integration and Vertical Restraints 6.8 Issues in industrial proliferation and environmental preservation, pollution control policies Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach:"Chapter 13,14,15,16, 17, and 18. Reading: Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 3: Predatory Pricing"

	Link: Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 3: Predatory Pricing" (PDF) Reading: Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 7: Horizontal Mergers" Link: Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 7: Horizontal Mergers" (PDF) Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 8: Vertical Mergers" Link: Ohio State University: Kerry M. Tan's Economics 367.02: Current Economic Issues in the United States: "Lecture 8: Vertical Mergers" and "Lecture 9: Resale Price Maintenance" (PDF) Schelling, T. (2006) Strategies of Commitment and Other Essays, Cambridge, MA : Harvard University Press.
Activity	Students write a report about real mergers and vertical integration from local industry.
Module 7	Antitrust Markets and The Role of Government
Key Concepts	Antitrust, social welfare, inefficiency, regulation, public utilities, environmental regulations, free-riding, international environmental agreements, exhaustible Resources, tragedy of the commons, and externalities.
Overview	In this section, we will study the boundaries of a market that is essential to antitrust enforcement. In order to ensure that the firms do not infringe upon each other's rights or have unfair practices, a market needs to be clearly defined. From the perspective of consumers and policymakers, market power implies reduced social welfare, as firms make consumers pay higher prices for their products and services. While policymakers work to reduce the resulting inefficiencies through regulation, there are situations where imperfect markets may be preferable to regulated outcomes. This section also studies the regulation of large business firms and corporations through antitrust laws. It also discusses the regulation of industries in which services are provided exclusively by privately owned

	firms, but regulated by public agencies. These firms are often called "public utilities." Additionally, pollution control policies and the impacts of environmental regulations on industrial activity will be explored.
Learning Outcomes	Upon successful completion of this unit, students will be able to: • Explain the concept of an antitrust market. • Identify the factors that determine market power. • Describe the relationship between market power and market shares. • Analyze why regulation can be important. • Explain the role of government in the regulation of competition, regulation of industries, and in social regulation. • Analyze how government intervention can affect market outcomes, such as prices, quality, product variety, or the number of service providers, by changing market institutions. • Define a natural monopoly, derive pricing strategies for a natural monopoly, and describe regulation of a natural monopoly. • Analyze the problems associated with regulation.
Unitsand Readings	7.1 Economic Markets and Antitrust Markets 7.2 The Search for Market Power 7.3 Case Study 7.4 The Rationale for Regulation 7.4.1 Governmental Regulation 7.4.2 Problems with Regulation 7.4.3 The impacts of environmental regulations on industrial activities. Readings: Berkeley Electronic Press: Jeffrey R. Church and Roger Ware's Industrial Organization: A Strategic Approach:Chapter 19, and 24. KevinHinde.com: Kevin Hinde's The Economics of Competition: A Global Perspective Link: KevinHinde.com: Kevin Hinde'sThe Economics of Competition: A Global Perspective (PDF) Kevin Hinde's The Economics of Competition: A Global Perspective Link: Kevin Hinde's The Economics of Competition: A Global

	Perspective (PDF) Barrett, S. (1994a) Self-enforcing international environmental agreements, Oxford Economic Papers 46 , 878–94. Barrett, S. (1999) A theory of full international cooperation, Journal of Theoretical Politics 11 , 519–41. Espinola-Arredondo, A. (2009) Free-riding and Cooperation in Environmental games, Journal of Public Economic Theory, Volume 11, Issue 1, Pages 119-158 Hoel, M., K. Schneider (1997) Incentives to participate in an international environmental agreement, Environmental and Resource Economics 9 , 153–170. Whalley, J. (1991) The interface between environmental and trade policies, The Economic Journal 101 , 180–189 Hotelling, H. (1931) "The Economics of Exhaustible Resources," Journal of Political Economy, 39, pp. 137-175 Dutta, P. and R.K. Sundaram (1993) "The Tragedy of the Commons?" Economic Theory, 3, pp. 413-426 Apesteguia, J. (2006) "Does Information Matter in the Commons? Experimental Evidence," Journal of Economic Behavior & Organization, 60, pp. 55-69. Levhari, D. and L.J. Mirman (1980) "The Great Fish War: An Example Greenstone, M. (2002), The impacts of environmental regulations on industrial activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufacturers, Journal of Political Economy 110, 1175-1219.
Activity	1. Student visit the competition unit at the Ministry of Industry and Trade and write a report about examples of government intervention and antitrust, and evaluate that on the basis of what they have learned in this unit. 2. Students watch a video about the tragedy of commons. And write a report giving more examples.



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus

Economic Development

University of Jordan, The School of Business,

Department of Business Economics

Instructor Information

Instructor: Alaaeddin Al-Tarawneh, Assistant Professor
Office Location: The School of Business/ Business Economic Department -Building #2 2nd floor.
Telephone: 5355000 ext. 24176
Office Hours: TBA
E-mail: a.altarawneh@ju.edu.jo

Course Identification

Course Number: 1607415
Course Name: Economic Development
Course Location: University Campus
Class Times: TBA
Prerequisites: 1607111 Principle of Macroeconomics
Faculty Web Page: http://business.ju.edu.jo

Course Description/Overview

This course introduces the theory of growth and economic development, providing a qualitative and analytical perspective of economic transformation of developing countries for undergraduate students. It tries to provide an explanation for the exceptional progress that has been made in many parts of the developing world, but fully deals with the massive problems and challenges that remain to be addressed in the years ahead. It explains measurements of and obstacles to growth and development and tries to explore the difficulties that confront the sustainable development policies. The module focuses on the theory of growth and development and its interaction with trade, population, poverty, and income distribution. The pace and extent of economic development continues its prompt, imbalanced, and sometimes unexpected evolution. The course has been divided into two parts, the first part is about concepts and principles and includes three sections; an introduction of economic development from global perspective, comparative economic development and analysis of convergence, and Classic theories of economic growth and development. The second part is about problems and polices that faces the development in less developing countries; poverty inequality and development, Population Growth and Economic Development and finally the environment and development, basic issues in Global warming and climate change and its fallout on economic development.

Course Learning Objectives

- The main objectives of this course are: 1) to offer an analytical approach to the concepts related to growth and economic development in the context of sustainable development. 2) to equip students with appropriate tools and techniques that help them to analyze situations related to growth and development such as poverty and inequalities …. 3) draw the attention to some issues in environmental pollution and global economic and its relation with economic development. 4) realize the climate change consequences on sustainable economic development. 5) to provide students with the resources to draw independent conclusions as they confront development problems.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:

LO **1- knowledge and understanding:**

- Understanding different theories related to economic development
- Comparing developing and developed countries experiences.
- Understanding the aims of development and how to reach them through the different sectors of the economy.
- Classifying the stages of economic development.
- Identifying the problems related to sustainability and the impact of climate change in economic development over time.

LO **2- analytical and thinking skills**:

Students should have the ability to:

- Comparing theories and finding the best suitable one which can be applied in Jordan economy.
- Developing some of the core models in poverty and inequality measurement and analysis.
- Highlighting and developing some of the core models in microeconomics of fertility and relationships between population growth and economic growth.
- Discuss the relationship between the environmental economics models and the sustainable economic development.

LO **3- Teaching and learning methods**:

- There will be 2 lectures per week. Although the lectures cover the vast majority of the module material, students must make use of the textbooks extensively especially the empirical and the qualitative cases presented in the book.

- A number of problems (end-of-chapter problems) will be indicated in class, to be submitted by students. Students should do the homework and should come to class prepared to discuss the assigned problems.

Course Resources

Course Website(s):

- http://www.global-economic-symposium.org/knowledgebase/the-global-environment/climate-change-and-economic-development.

Required Course Texts and Materials

- Hands-out prepared by the instructor for the class.
- Todaro, M. and S. Smith, Economic Development, 11th edition,2012
- Robert E. LUCAS, Jr., On the Mechanics of Economics Development, University of Chicago, Chicago, 1L 60637, USA,1988.
- Human Development Report 2011. Sustainability and Equity: A better future for All, UNDP.
- Anthony D. Owen & Nick Hanley, The Economics of climate Change, Routledge,2004.
- http://www.unep.org/pdf/ourplanet/op_english_17v2.pdf
- https://environment.yale.edu/files/biblio/YaleFES-00000397.pdf
  - فايز ابراهيم الحبيب، نظريات التنمية والنمو الاقتصادي
  - سالم النجفي، مقدمة في اقتصاد التنمية
  - عبد الوهاب الأمين، التنمية الاقتصادية: السياسات والمشكلات
  - الأسرة،2010، دائرة الإحصاءات العامة، الأردن. ودخل نفقات مسح لبيانات أ إستناد تقرير حالة الفقر في الأردن،

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Failure**

Grading Policy

Students will be assessed based on the following:

Mid-term Exam 30%

Second exam 7%

Participation 5%

Short Paper 8%

Final Exam 50%

Assignments are individual assignments. Details of these assignments and the submission deadlines will be announced in class.

Course Policies

Late Assignments policy

All assignments are due at the beginning of class. Anything turned in after that will be considered late. Assignments will be accepted up to four days after the due date for half credit. Assignments will not be accepted after the four-day extension. Excessive absenteeism and late or missing work will effect in lowered grades. Contact with your teacher is strongly encouraged especially when you have been absent. In addition, please see handout on the college's policy on absence and make-up work.

Classroom Protocol

We oblige ourselves to a high standard of professional behavior. Accordingly, lateness, holding private conversations and indeed any behavior that interrupts me or your colleagues will be considered improper. Using cell phones is forbidden in the class. Repeated violations of this standard may affect your participation grade or may cause withdrawal from course.

Course Schedule

Detailed lecture schedule			
	Week:	**Material:**	**Homework and Assignments**
	Week 1+2	Ch 1: Introduction	TBA
	Week 3+4	Ch 2:Comparative economic development First Exam	TBA
	Week 5+6	Ch 3:Classic theories of economic growth and development	TBA
	Week 7+8	Ch 5: Poverty, inequality and development Second Exam	TBA
	Week 9+10	Ch 6: Population growth and economic development	TBA
	Week	Ch 10: Environmental and Economic	TBA

	11+12	Development	
	Week 13+14	Climate Change and its consequences on Economic Development	TBA
	Week 15	Final exam	TBA

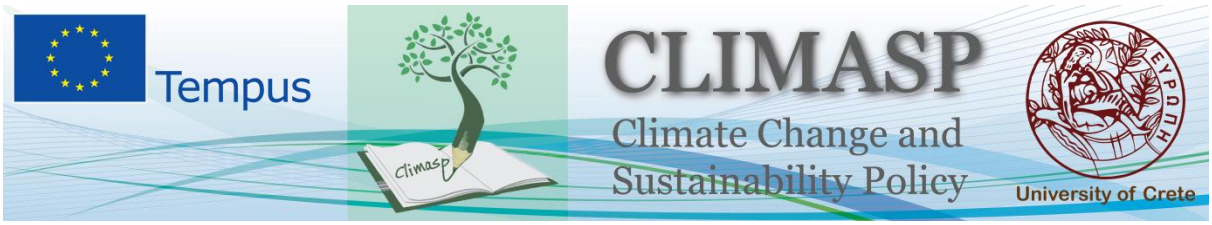
Course	**Development Economics**
Module 1	**Introducing Development Economics**
Key Concepts	Development Economics, Economic growth.
Overview	This course introduces the theory of growth and economic development, providing a qualitative and analytical perspective of economic transformation of developing countries for undergraduate students.
Aim	To create the awareness of the importance of Development Economics itself, and the importance of studying it. Also, to introduce students to development economics concepts and issues.
Learning Outcomes	At the end of this module learner will be able to : • Understanding different theories related to economic development.
Units	Chapter 1
Readings	• Todaro, M. and S. Smith, Economic Development, 11th edition,2012. • سالم النجفي، مقدمة في اقتصاد التنمية
Activity	- What is meant by Economic development?
Module 2	**Comparative economic development.**
Key Concepts	Developing countries, developed countries.
Overview	It tries to provide an explanation for the exceptional progress that has been made in many parts of the developing world, but fully deals with the massive problems and challenges that remain to be addressed in the years ahead.

Aim	The main aim here is to offer an analytical approach to the concepts related to growth and economic development in the context of sustainable development.
Learning Outcomes	After reading this module, the student will be able to: - Comparing developing and developed countries experiences. - Understanding the aims of development and how to reach them through the different sectors of the economy.
Units	Chapter 2
Readings	- Todaro, M. and S. Smith, Economic Development, 11th edition,2012. - Robert E. LUCAS, Jr., On the Mechanics of Economics Development, University of Chicago, Chicago, 1L 60637, USA,1988. • عبد الوهاب الأمين، التنمية الاقتصادية: السياسات والمشكلات
Activity	- Discuss with the students what they think the common features of developing countries are. - Discuss interesting statistics as part of the discussion of common characteristics - Ask students whether they think becoming more economically developed is equivalent to becoming more industrialized. - The diversity that exists between developing nations can be discussed partly by highlighting the differences between countries in Africa, Asia, and Latin America in terms of colonial experience, income level, political regime, wars, culture, trade strategy, and level of education.
Module 3	**Classic theories of economic growth and development.**
Key Concepts	Linear stages, structural change models, international dependence revolution, Neoclassical counterrevolution.
Overview	The module focuses on the theory of growth and development.
Aim	The main aim here is to provide students with the resources to draw independent conclusions as they confront development problems.
Learning Outcomes	At the end of this module learners will be able to: - Classifying the stages of economic development. - Comparing theories and finding the best suitable one which can be applied in Jordan economy.
Units	Chapter 3

Readings	- Todaro, M. and S. Smith, Economic Development, 11th edition,2012. • فايز ابراهيم الحبيب، نظريات التنمية والنمو الاقتصادي
Activity	What type of technology is most appropriate for developing countries? What are the advantages and disadvantages to the developing country of borrowing technologies from developed countries as opposed to developing their own technologies?
Module 4	**Poverty, inequality and development.**
Key Concepts	Poverty, income inequality.
Overview	The module focuses on the theory of growth and development and its interaction with poverty, and income distribution.
Aim	The main aim here is to equip students with appropriate tools and techniques that help them to analyze situations related to growth and development such as poverty and inequalities ….
Learning Outcomes	After reading this module, students will be able to: - Developing some of the core models in poverty and inequality measurement and analysis.
Units	Chapter 5
Readings	- Todaro, M. and S. Smith, Economic Development, 11th edition,2012. • الأسرة،2010، دائرة الإحصاءات العامة، ودخل نفقات مسح لبيانات اً إستناد تقرير حالة الفقر في الأردن، الأردن.
Activity	- Discuss the relative importance of income inequality and absolute poverty as problems that need to be solved. The lecturer will present data from the developed countries for comparison. - Discuss policy options and the opportunity cost of devoting resources to such policies.
Module 5	**Population growth and economic development.**
Key Concepts	Population growth.
Overview	The module focuses on the theory of growth and development and its interaction with population.
Aim	The aim of this module is to focus on the relation between development economics and population growth.
Learning Outcomes	After reading this module students will be able to: - Highlighting and developing some of the core models in microeconomics of

	fertility and relationships between population growth and economic growth.
Units	Chapter 6
Readings	- Todaro, M. and S. Smith, Economic Development, 11th edition,2012. - Human Development Report 2011. Sustainability and Equity: A better future for All, UNDP.
Activity	- Download HDI data from http://hdr.undp.org/en/data - Calculate the HDI for the top 10 countries - Calculate the HDI for the bottom 10 countries - Explain why you observe such a large difference - Classify countries using GNP per capita, or the human development index and compare the two classifications.
Module 6	**Environmental and Economic Development.**
Key Concepts	Environmental.
Overview	The module focuses on the theory of growth and development and its interaction with environment.
Aim	The main aim here is to draw the attention to some issues in environmental pollution and global economic and its relation with economic development.
Learning Outcomes	After reading this module, students will be able to: • Discuss the relationship between the environmental economics models and the sustainable economic development.
Units	Chapter 10
Readings	• Todaro, M. and S. Smith, Economic Development, 11th edition,2012
Activity	- Select some specific environmental problems in Jordan and discuss the problems and consequences of possible solutions in class. - Discuss possible alternative measures of the quality of life. What indicators are important?
Module 7	**Climate Change and its consequences on Development Economics.**
Key Concepts	Climate change.
Overview	The module focuses on the theory of growth and development and its interaction with climate change.
Aim	To introduce students to the climate change and its consequences on development economics.

Learning Outcomes	After reading this module, students will be able to: - Identifying the problems related to sustainability and the impact of climate change in economic development over time. - Discuss the relationship between the environmental economics models and the sustainable economic development.
Units	Chapter
Readings	• Anthony D. Owen & Nick Hanley, The Economics of climate Change, Routledge,2004. • http://www.unep.org/pdf/ourplanet/op_english_17v2.pdf • https://environment.yale.edu/files/biblio/YaleFES-00000397.pdf
Activity	Discuss the role and responsibilities of developing and developed countries with respect to climate change and its impact on the economy and the lives of people.



CLIMASP COURSE SYLLABUS TEMPLATE

Course Syllabus

Environmental Economics

University of Jordan, The School of Business,

Department of Business Economics

Instructor Information

Instructor: Alaaeddin Al-Tarawneh, Assistant Professor

Office Location: The School of Business / Business Economic Department -Building #2 2nd floor.

Telephone: 5355000 ext. 24176

Office Hours: TBD

E-mail: a.altarawneh@ju.edu.jo

Course Identification

Course Number:

Course Name: Environmental Economics

Course Location: TBD

Class Times: TBD

Prerequisites:

Faculty Web Page: http://business.ju.edu.jo

Course Description/Overview

This course tries to shed the light on a very important issue that started to affect all aspects of our life. Students will be introduced to the environmental issues from economics point of view. It offers an integrated understanding of environmental and natural resource economics. Important principles and concepts will be presented to provide students with clear understanding for contemporary environmental and natural resource issues and policy considerations. The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered. Basic concepts of environmental economics will be explored and examined, such as the economics of natural resource scarcity, climate change, environmental pollution, natural disasters, the economics of pollution, and the economics of sustainable development. The course provides an introduction to the subject of environmental economics without assuming any in-depth prior knowledge of economics. Part one explains the fundamental economic concepts. Part two uses these concepts in understanding and developing policy responses to some of the major environmental issues of our time. Examples will be drawn from all over the world and include such fundamental issues as climate change, water pollution, and loss of biodiversity.

Course Learning Objectives

The main objectives of this course are:1) increasing awareness towards the contemporary environmental issues caused by various human activities. 2) Identifying the issues of environmental pollution and global economic and development effects. 3) Cost Benefit Analysis of the various economic activities to determine their environmental impacts. 4) Understanding the economics of climate change and its impact on economic development issues.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:

LO **1- knowledge and understanding:**

- Understanding the linkages between economics and environmental issues.
- Understanding economic concepts in the context of environmental problems.
- Understanding the problems of climate change, water pollution, and loss of biodiversity within global overview of environmental issues.
- Understanding the various possible policy responses to major environmental issues.

LO **2- analytical and thinking skills**:

Students should have the ability to:

- Apply microeconomic theory to the study of environmental issues.
- Identify and critically evaluate alternative environmental policy instruments.
- Develop written and verbal skills in communicating an environmental economic perspective.

LO **3- Teaching and learning methods**:

- There will be three lectures per week. Although the lectures cover the vast majority of the module material, students must make use of the textbooks extensively especially the empirical cases presented in the book.

- A number of problems (end-of-chapter problems) will be indicated in class, to be submitted by students. Students should attempt the homework and should prepare to discuss the assigned problems in the class.

Course Resources

Course Website(s)

- http://blackboard.ju.edu.jo

Required Course Texts and Materials

- Handouts prepared by the instructor for the class.
- Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009).

Optional Course Texts and Materials

• Keohane and Olmstead, *Markets and the Environment* (Island Press, 2007)

• Matthew Kahn, *Fundamentals of Environmental Economics: Solving Urban Pollution Problems*

• Charles Kolstad, *Environmental Economics* (Oxford University Press, 1st edition 2000, or 2nd edition 2010)

• *The RFF Reader in Environmental and Resource Policy* (Wallace Oates Editor, 2nd edition 2006, RFF Press)

Assignments and Grading Scheme

Grading System

A , A- **Excellent**
B+ , B, B- **Very good**
C+, C, C- **Good**
D+ , D, D- **pass**
D-, F = **Failure**

Grading Policy

Students will be assessed based on the following:

Mid-term Exam 30%

Second exam 7%

Participation 5%

Short Paper 8%

Final Exam 50%

Details of assignments and the submission deadlines will be announced in class.

Course Policies

Late Assignments policy

All assignments are due at the beginning of class. Anything turned in after that will be considered late. Assignments will be accepted up to four days after the due date for half credit. Assignments will not be accepted at all after the four-day extension. Excessive absenteeism and late or missing work will result in lower grades. Contact with your teacher is strongly encouraged especially in the case of being absent. Additionally, please read the college's policy regarding absence and make-up work.

Classroom Protocol

We oblige ourselves to a high standard of professional behavior. Accordingly, lateness, holding private conversations and indeed any behavior that interrupts me or your colleagues will be considered improper. Using cell phones is forbidden in the class. Repeated violations of this standard may affect your participation grade or may cause withdrawal from course.

Course Schedule

Detailed lecture schedule			
	Week:	**Material:**	**Homework and Assignments**
	Week 1+2	**I. INTRODUCTION** **Economics and the Environment: Introduction** What is Environmental Economics? Ch. 1 and Ch. 2.	TBA
	Week 3+4	**ENVIRONMENTAL ECONOMIC ANALYSIS** **A. Environmental Analysis** Benefits and Costs, Supply and Demand, Ch. 3 Economic Efficiency: Markets, Ch. 4. Economics of Environmental Quality, Ch. 5	TBA

	Week 5 + 6	***B. Analytical Methods*** Framework of Analysis Ch. 6 Benefit-Cost Analysis: Benefits Ch. 7 Benefit-Cost Analysis: Costs Ch. 8 **MIDTERM EXAMINATION** Chapters (1 – 8)	TBA
	Week 7	ENVIRONMENTAL POLICY ANALYSIS **A. Criteria and Strategies** Criteria for Evaluating Environmental Policies, Ch. 9 Decentralized Policies: Liability Laws, Property Rights, Moral Suasion", Ch. 10	TBA
	Week 8 + 9	Command-and-Control Strategies: The Case of Standards, Ch. 11 Incentive-Based Strategies: Emission Charges and Subsidies, Ch. 12	TBA
	Week 10	Incentive-Based Strategies: Transferable Discharge Permits, Ch. 13	TBA
	Week 11	**B. Water Pollution** Water Pollution-Control Policy, Ch. 14	TBA
	Week 12	**C. Air Pollution** Air Pollution-Control Policy, Ch. 15	TBA
	Week 13+14	***D. Waste Pollution*** Government Policy on Toxics and Hazardous Substances, Ch. 16	TBA

		State and Local Environmental Issues, Ch. 17	
	Week 15	Final exam	TBA

Course	**Environmental Economics**
Module 1	**Introduction: Economics and the Environment.**
Key Concepts	Environmental Economics, natural resources.
Overview	This course tries to shed the light on a very important issue that started to affect all aspects of our life. Students will be introduced to the environmental issues from economics point of view. It offers an integrated understanding of environmental and natural resource economics. Important principles and concepts will be presented to provide students with clear understanding for contemporary environmental and natural resource issues and policy considerations.
Aim	To increase awareness towards the contemporary environmental issues caused by various human activities. And understanding the economics of climate change and its impact on economic development issues.
Learning Outcomes	At the end of this module learner will be able to : • Understanding the linkages between economics and environmental issues. • Understanding economic concepts in the context of environmental problems.
Units	Chapter 1 & 2: What is Environmental Economics?
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • Charles Kolstad, *Environmental Economics* (Oxford University Press, 1st edition 2000, or 2nd edition 2010) • Keohane and Olmstead, *Markets and the Environment* (Island Press, 2007)
Activity	What is meant by environmental economics?
Module 2	**ENVIRONMENTAL ECONOMIC ANALYSIS.**
Key Concepts	Demand, supply, benefit, cost, economic efficiency, environment quality.

Overview	The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered.
Aim	The aim of this module is to study the Cost Benefit Analysis of the various economic activities to determine their environmental impacts.
Learning Outcomes	After reading this module, the student will be able to: • Understanding the various possible policy responses to major environmental issues. • Identify and critically evaluate alternative environmental policy instruments.
Units	Chapter 3: Benefits and Costs, Supply and Demand. Chapter 4: Economic Efficiency: Markets. Chapter 5: Economics of Environmental Quality.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • *The RFF Reader in Environmental and Resource Policy* (Wallace Oates Editor, 2nd edition 2006, RFF Press)
Activity	Identify the environmental policies in Jordan and their impact on the economy and the lives of people in different regions of Jordan.
Module 3	**Analytical Methods.**
Key Concepts	Benefit-costs analysis, environmental policies.
Overview	The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered.
Aim	The aim of this module is to study the Cost Benefit Analysis of the various economic activities to determine their environmental impacts.
Learning Outcomes	At the end of this module learners will be able to: • Understanding the various possible policy responses to major environmental issues. • Identify and critically evaluate alternative environmental policy instruments.
Units	Chapter 6: Framework of Analysis.

	Chapter 7: Benefit-Cost Analysis: Benefits. Chapter 8: Benefit-Cost Analysis: Costs.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • *The RFF Reader in Environmental and Resource Policy* (Wallace Oates Editor, 2nd edition 2006, RFF Press)
Activity	- A problem set related to the discussion will let the students learn about the difficulty of the concept of environmental valuation. - A set of costs and benefits is given for a time period. The problem is set up so that the net present value changes from positive to negative with a change in the discount rate. - The example is also set up so that a different project would be pursued at a different rate.
Module 4	**ENVIRONMENTAL POLICY ANALYSIS: Criteria.**
Key Concepts	Environmental policies, cost-benefit analysis.
Overview	The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered.
Aim	The aim of this module is to study the Cost Benefit Analysis of the various economic activities to determine their environmental impacts.
Learning Outcomes	After reading this module, students will be able to: • Understanding the various possible policy responses to major environmental issues. • Identify and critically evaluate alternative environmental policy instruments.
Units	Chapter 9: Criteria for Evaluating Environmental Policies. Chapter 10: Decentralized Policies: Liability Laws, Property Rights, Moral Suasion"
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009).
Activity	Discuss the environmental policies in Jordan and their impact on the economy and the lives of people in different regions of Jordan.
Module 5	**ENVIRONMENTAL POLICY ANALYSIS: Strategies.**

Key Concepts	Environmental policies, strategies.
Overview	The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered.
Aim	The aim of this module is to study the Cost Benefit Analysis of the various economic activities to determine their environmental impacts.
Learning Outcomes	After reading this module students will be able to: • Understanding the various possible policy responses to major environmental issues. • Develop written and verbal skills in communicating an environmental economic perspective.
Units	Chapter 11: Command-and-Control Strategies: The Case of Standards. Chapter 12: Incentive-Based Strategies: Emission Charges and Subsidies.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • *The RFF Reader in Environmental and Resource Policy* (Wallace Oates Editor, 2nd edition 2006, RFF Press)
Activity	Analyze the environmental strategic in Jordan and its impact on the economy and the lives of people in different regions of Jordan.
Module 6	**ENVIRONMENTAL POLICY ANALYSIS: Strategies (continue).**
Key Concepts	Environmental policies, strategies.
Overview	The course includes real world case studies to demonstrate the policy relevance and implications of key notions. Many areas of economics and impact of environmental policies will be covered.
Aim	The aim of this module is to study the Cost Benefit Analysis of the various economic activities to determine their environmental impacts.
Learning Outcomes	After reading this module, students will be able to: • Understanding the various possible policy responses to major environmental issues. • Develop written and verbal skills in communicating an environmental economic perspective.
Units	Chapter 13: Incentive-Based Strategies: Transferable Discharge Permits
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th

	Edition (San Francisco, CA: McGraw-Hill, 2009). • *The RFF Reader in Environmental and Resource Policy* (Wallace Oates Editor, 2nd edition 2006, RFF Press)
Activity	Analyze the environmental strategic in Jordan and its impact on the economy and the lives of people in different regions of Jordan.
Module 7	**Water Pollution.**
Key Concepts	Water pollution.
Overview	Basic concepts of environmental economics will be explored and examined, such as the water pollution and the economics of sustainable development.
Aim	The aim of this module is to identifying the issues of water pollution and global economic and development effects.
Learning Outcomes	After reading this module, students will be able to: • Understanding the problems of climate change, water pollution, and loss of biodiversity within global overview of environmental issues. • Apply microeconomic theory to the study of environmental issues.
Units	Chapter 14: Water Pollution-Control Policy.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • Charles Kolstad, *Environmental Economics* (Oxford University Press, 1st edition 2000, or 2nd edition 2010)
Activity	Discuss the water management problem in Jordan and its impact on the economy and the lives of people in different regions of Jordan.
Module 8	**Air Pollution.**
Key Concepts	Air pollution.
Overview	Basic concepts of environmental economics will be explored and examined, such as the air pollution and the economics of sustainable development.
Aim	The aim of this module is to identifying the issues of air pollution and global economic and development effects.
Learning Outcomes	After reading this module, students will be able to: • Understanding the problems of climate change, water pollution, and loss of

	biodiversity within global overview of environmental issues. • Apply microeconomic theory to the study of environmental issues.
Units	Chapter 15: Air Pollution-Control Policy.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • Charles Kolstad, *Environmental Economics* (Oxford University Press, 1st edition 2000, or 2nd edition 2010)
Activity	Discuss the air management problem in Jordan and its impact on the economy and the lives of people in different regions of Jordan.
Module 9	**Waste Pollution.**
Key Concepts	Waste pollution.
Overview	Basic concepts of environmental economics will be explored and examined, such as the waste pollution, natural disasters and the economics of sustainable development.
Aim	The aim of this module is to identifying the issues of waste pollution and global economic and development effects.
Learning Outcomes	After reading this module, students will be able to: • Understanding the problems of climate change, water pollution, and loss of biodiversity within global overview of environmental issues. • Apply microeconomic theory to the study of environmental issues.
Units	Chapter 16: Government Policy on Toxics and Hazardous Substances. Chapter 17: State and Local Environmental Issues.
Readings	• Field, Barry C. and Martha K. Field, Environmental Economics, 5th Edition (San Francisco, CA: McGraw-Hill, 2009). • Charles Kolstad, *Environmental Economics* (Oxford University Press, 1st edition 2000, or 2nd edition 2010)
Activity	Discuss the waste management problem in Jordan and its impact on the economy and the lives of people in different regions of Jordan.

Annex (3): Pilot Study Results

Figure (1): The difference between the means for the first section

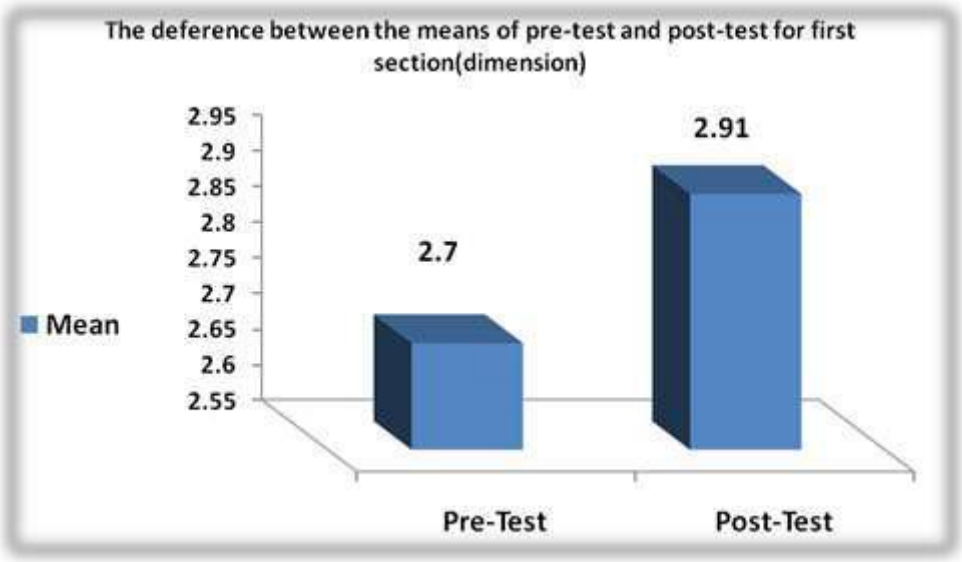
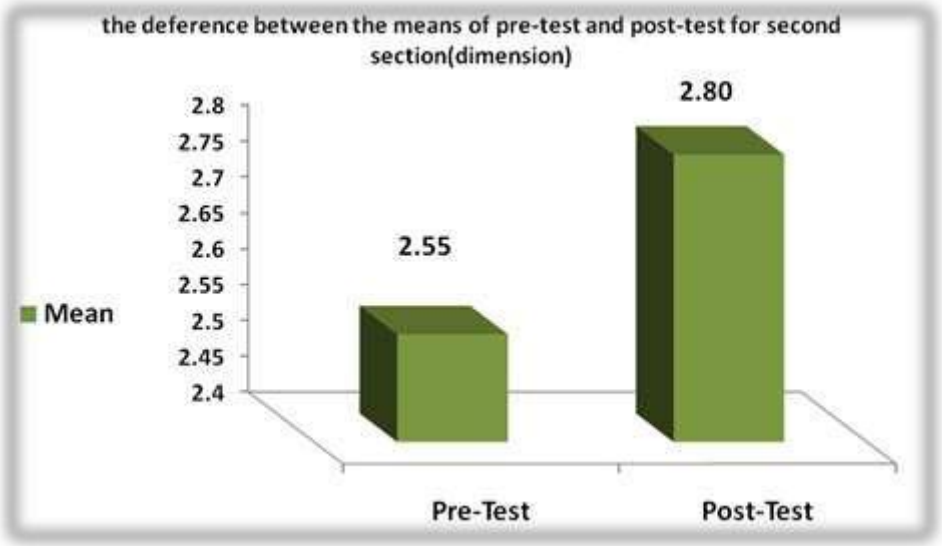


Figure (2): The difference between the means for the second section



Annex (4): Euro Arab Center and ICT Lab

Figures (3-6) Lab location & Design
Location: School of Engineering, UJ





Area=	**61.87m^2**
Width:	5.50 m
Length:	11.25m
Height:	3 m

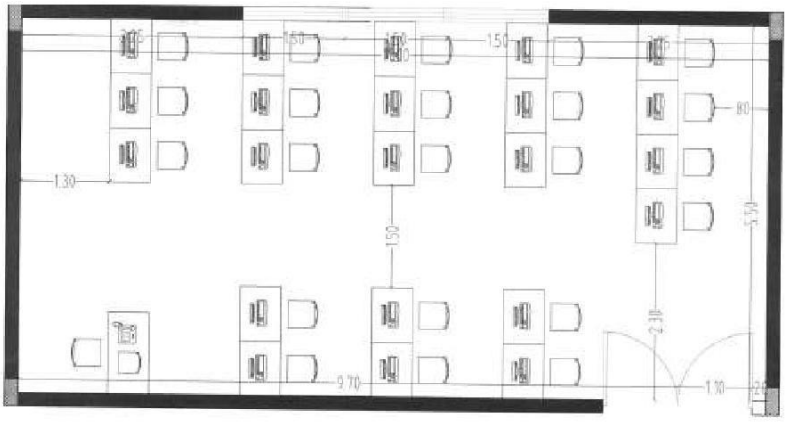


Figure (7): ICT lab Opening Ceremony invitation









افتتاح مقر المركز العربي الاوروبي لمشروع التغيرات المناخية في "الأردنية"

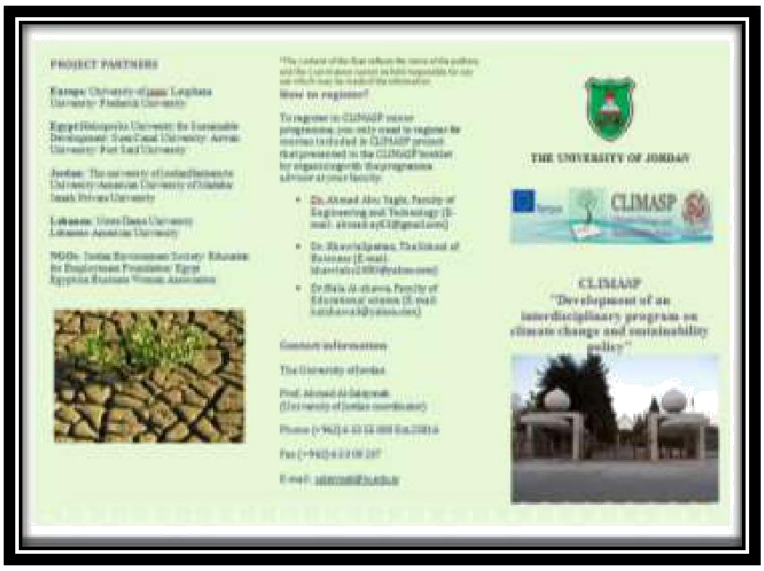
Annex (5): Dissemination activities

Figure (1): Press releases have been produced informing on the start of the project and the kick-off meeting and the workshops that held in Jordan.





Figure (2): CLIMASP Brochure



PROJECT PARTNERS

THE UNIVERSITY OF JORDAN

CLIMASP

"Development of an interdisciplinary program on climate change and sustainability policy"



What is CLIMASP Project?

Specific objectives

Main Objectives

Why choose the CLIMASP minor?

Main faculties and disciplines involved in CLIMASP minor:

Other faculties and disciplines involved in CLIMASP minor:

Figure (3, 4) : Info Day for CLIMASP project at the Faculty of Business.





Figure (5): Prof. Ahmed Al-Salaymeh while presenting CLIMASP project at UJ the European funded project's Info-Day.



Figure (6): Disseminating CLIMASP in the Second Arab Euro Conference which was held In July, 2014. The Conference was held under the porterage or HRH, Princess Sumaya Al-Hasan.



CLIMASP Banner



Figure (8): CLIMASP folders & Chocolate were distributed among the students and the stakeholder who attended the workshops.



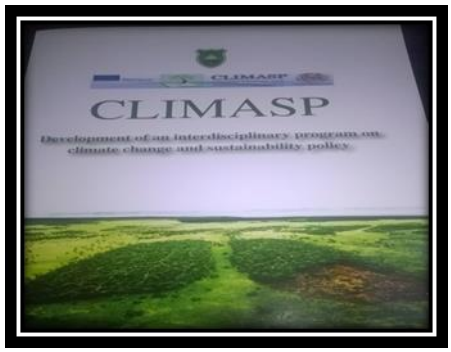
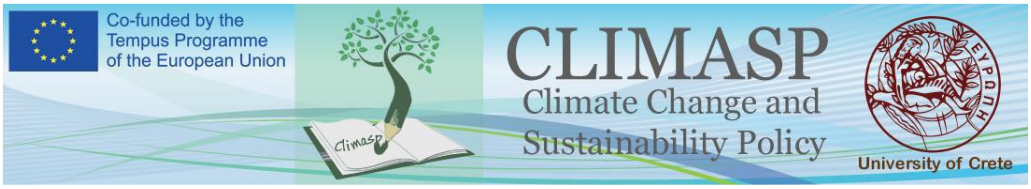


Figure (9): CLIMASP Website





DEVELOPING AND IMPLEMENTING CLIMASP MINOR IN THE LEBANESE AMERICAN UNIVERSITY

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INTRODUCTION

This document outlines the CLIMASP journey at LAU. Faculty from different schools joined the CLIMASP project during different stages of development and/or implementation. CLIMASP represented a unique opportunity to meet other regional partners and work in collaboration to develop a minor in CLIMASP in the different institutions of the region. The objective of this case study is to reflect on the implementation journey and outline opportunities and setbacks identified in the development and implementation phases.

UNIVERSITY BACKGROUND

The American School for girls established in 1924, which is considered the birth date of LAU, grew out of this early Presbyterian mission. In 1927 the American Junior College for Women (AJCW) became a separate institution and was transferred to Ras Beirut. By 1950, AJCW transformed into a four-year institution of higher learning and became Beirut College for Women (BCW). In 1955, the Board of Regents of the State University of New York chartered the college, and in 1970 the Bachelor's degree was recognized by the Lebanese Government. In 1974, and in order to increase enrollment enabling the offering of more programs and majors, the college became co-educational and was renamed Beirut University College (BUC). In 1995, Lebanese American University (LAU) emerged as a two-campus university with its historic home in Beirut, and a new campus in Byblos. Up to the late eighties, program offerings were limited to majors in the School of Arts and Sciences and the School of Business; the Schools of

Engineering and Architecture, and Pharmacy were added in the early nineties; two additional schools, Medicine and Architecture & Design were launched in 2010 and the School of Nursing in 2011.

In 2004, LAU is committed to creating a university-wide strategic planning process focused on the sustainability of the institution at even greater levels of excellence. As a result LAU Strategic Plan 2005 - 2010 was completed. All university constituencies worked diligently on the implementation of SP 2005-10, and on the two self-studies for candidacy and membership with the Commission on Institutions of Higher Education (CIHE) of NEASC.

A new Strategic Plan 2011-2016 was developed with a fundamental aspiration behind it to take LAU to a higher level of academic excellence. Pillar 5 of this SP 2011-2016 concentrates on Areas of Focus and calls for identifying and targeting substantive areas of University strength that correspond to national and regional needs and nurture initiatives that are responsive to those needs. As a result the goals addressing this Pillar concentrated on:

1. Develop academic majors, minors and areas of concentration that are responsive to workforce needs in the health services sector, particularly in supportive fields such as business, engineering and information technology, architecture, and natural and social sciences;
2. Commit to introduce Green curricula in relevant majors and adopt a University culture that contributes to environmental sustainability;
3. Strengthen the design, creative and performing arts programs at LAU to ensure that they are distinctive in Lebanon;
4. Strengthen the gender perspective in all disciplines and programs in line with LAU's distinctive heritage;
5. Capitalize on our leadership role in Lebanon on conflict resolution, mediation and peace studies.

This shows the commitment of LAU to the development of minors and programs that relate to sustainability. The CLIMASP Minor falls within the Pillar 5 implementation. As a result, we have received the required support from LAU Administration during proposal submission, planning, kickoff, development, and implementation. There is a commitment from the Administration that is evident in the fast approval of changes to course descriptions during the development of the Minor. CLIMASP made good impact on LAU curriculum. There has been great interest in CLIMASP and this led to good ownership/commitment manifested by the involvement of a large numbers of faculty members from LAU in activities and the fact that quite a large numbers of courses exceeding the required have been revised and updated to incorporate principles and concepts of climate change and sustainability policy in different disciplines. In addition, a Coordinator was assigned at LAU to handle the management activities and a steering committee composed of 6 faculty members was formed with over 17 faculty members involved. Support staff include administrative assistant, Budget Office staff, among many others where coordination is ongoing. This shows the commitment of the faculty and the institution to the success of the program.

Another issue that was taken into consideration to ensure its interdisciplinary nature and sustainability and ensure participation form different schools is that courses were selected

carefully. Most Minor courses do not require any pre-requisites that could limit enrolment of students. Thus, students have a variety of courses to select from.

SETTING THE CONTEXT

Lebanon is an emerging economy that has survived many wars over the last 20 years. In periods of conflicts the environment is not a priority and has been largely ignored during the last decades. As the standards of living are improving, Lebanon will be witnessing an environmental revolution in the next few years. The people are becoming more aware and they understand the importance of the natural Environment and the need to preserve it. The old approach of contaminating atmosphere, soils and waterway without any penalties is no longer possible. The European Union has financed many environmental projects in Lebanon in order to help the country in understanding the extent of pollution and developing means to manage the pollution, sustainable environmental practices and further reduce the degradation of our existing natural capital.

LAU's environmental core mission, vision and values include:

1. A commitment to excellence in education in a new field;
2. A continuous commitment to improve the overall quality of teaching, research, writing and educational service.
3. A commitment to introducing green curricula to meet the university culture that promotes environmental sustainability (pillar V, strategic plan 2011-16)

It is well documented that the major challenge of the next decades will be the sustainability of resources and the problems related to climate change. Thus, it is important to provide the future labor force with the necessary knowledge regarding the various aspects of sustainability, which will enhance the employment potential and status of LAU graduates. The intent of the University is thus to advance an academic understanding of contemporary environmental problems, including climate change and address its complexities.

The proposed CLIMASP Minor assists in forming environmental graduates who will be able to tackle the many challenges ahead. CLIMASP will graduate environmental experts who will work in Lebanon and internationally in tackling climate change and sustainability issues. This will be achieved through developing environmental skills that meet European Union requirements, hence the facilitation of mobility of CLIMASP graduates through recognition of their CLIMASP endorsed certificates.

THE CLIMASP CASE DESCRIPTION

The CLIMASP project/experience was a pleasant one. It helped us as individuals in working together with other partner institutions in developing a common vision for the minor. The LAU implementation of CLIMASP was quite successful. The regional meetings were also a great way to network with other colleagues in partner universities and develop the contents of the CLIMASP minor with a common vision for all stakeholders involved in the project.

The outcomes of the CLIMASP project at LAU included:

1. CLIMASP minor courses offered during the spring semester
2. Information about the student interest in the CLIMASP minor,

3. The way students are informed about the option for taking the minor, what effect has the CLIMASP minor on each faculty and the university as a whole.

Below is an explanation of the different issues related to CLIMASP including mission, need and curriculum.

1. Centrality to LAU Role and Mission

The Interdisciplinary Minor on Climate Change and Sustainability Policy- CLIMASP supports the LAU's core mission, vision and values by a commitment to excellence in education in a new field with a continuous commitment to improve the overall quality of teaching, research, writing and educational service. The intent of the minor is thus to advance an academic understanding of contemporary climate change and sustainability issues and address their complexities. The CLIMASP curriculum is designed to enhance students' interests in climate change and enrich their skills in adaptation policies and planning.

2. Rationale

It is well documented that the major challenge of the next decades will be the sustainability of resources and the problems related to climate change. Thus, it is important to provide the future labor force with the necessary knowledge regarding the various aspects of sustainability, which will enhance the employment potential and status of our graduates.

The development of this minor is a result of a funded project through a CONSORTIUM AGREEMENT ON THE IMPLEMENTATION OF TEMPUS PROJECT "Development of an Interdisciplinary Minor Program on Climate Change and Sustainability Policy- CLIMASP" (Reference No 543879-TEMPUS-1-2013-1-GR-TEMPUS-JPCR) (Grant Agreement No. 2013-5043/001-001).

This TEMPUS project in accordance with the Grant Agreement signed by the *Education, Audiovisual and Culture Executive Agency* as the financer and the University of Crete as the Coordination Institution of the project, is designed and implemented across 10 universities in Jordan, Egypt and Lebanon (The Lebanese American University and Notre Dame University).

CLIMASP gives students the opportunity to earn a formal credential (Euro-Arab Pass Diploma) in climate change and sustainability policy in addition to the degree of their specialization granted by the university. This minor is expected to broaden their choice of further studies and career paths. Students from the Adnan Kassar School of Business (AKSOB), School of Architecture and Design (SArD), School of Arts and Science (SAS), and the School of Engineering (SOE) may choose to enroll in the CLIMASP minor.

3. Need and Demand

The increased complexity of the climate change and sustainability policy challenges drives us into preparing our students to become inquirers, problem solvers, critical and creative thinkers. The CLIMASP minor provides our students with improved strategies to help them deal with these very complex situations. Problem-based learning is one such strategy that is employed throughout most of CLIMASP curriculum and teaching methods. CLIMASP minor prepares students to comprehend and further explore the intersections of science, ethics, values,

economics, engineering, architecture, and climate change and sustainability policy. Transformative learning in a climate change context involves climate risk negotiation, identification of vulnerabilities, and both proactive and reactive adaptation. CLIMASP minor prepares students to learn how to transformatively adapt to the climate change vulnerabilities. CLIMASP curriculum blends classroom learning with experiential, argumentation, community service, civic engagement and practicum placements. It adopts a critical pedagogy of sustainability that involves inter- and transdisciplinary engagement with students and community members in an effort to involve students in the process of sustainable thinking and action.

CLIMASP offers students a unique inter/multidisciplinary understanding of climate change. It provides a shift from a strict disciplinary orientation focused on natural sciences to other issues related to science, engineering, education, economics, sociology, architecture, etc. In fact, choosing a minor combined with a major enables students to pursue an area of interest with considerable employment possibilities by acquiring the necessary knowledge and skills.

There are many advantages to choosing this minor as it primarily:

- Opens up significant career opportunities.
- Provides the student with more hands-on experience.
- Helps the student shape his/her future path.
- Enriches the student's major study program.
- Adds depth and breadth to the student's studies.

Comment [JC1]:

CLIMASP minor is aimed to provide interested undergraduate students the possibility to acquire knowledge of climate change issues and their effects on policymaking and explore strategic planning to mitigate the consequences of climate change. In particular, the CLIMASP curriculum is designed to provide undergraduate students from different majors with the flexibility to select courses that enhance their interests in climate change and reinforce their major field of study with professional skills in climate change adaptation policies and planning.

The inter/multidisciplinary CLIMASP courses will consist of core courses, elective courses, and a required capstone course in the three concentration areas, namely:

- Climate Change, Environment and Society;
- Climate Change, Economics and Public Policy; and
- Climate Change, Science and Technology.

4. Program Curriculum

The CLIMASP minor consists of core courses, elective courses and the required capstone course in the three concentration areas mentioned previously. As these courses are form an integral part of the participating disciplines curricula, the CLIMASP minor is invaluable to students seeking a meaningful and rewarding complement to their main field of study. Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma provided they fulfill 45 to 60 relevant European Credit Transfer System (ECTS) credits. **The CLIMASP minor program is administrated by the Euro-Arab Center for Interdisciplinary Studies**??

The student shall be aware of the undergraduate Rules and Procedures document.

4.1 Program Mission Statement

The mission is to provide a quality education in Climate Change and Sustainability Policy that combines theory and practice for undergraduate students and to satisfy industry demand for graduates with special education in sustainability that helps them enter the market force or pursue graduate studies.

4.2 Project Objectives

- Develop capacity-building workshops for building interdisciplinary and multi-stakeholder driven climate change curricula responsive to societal needs;
- Develop an undergraduate interdisciplinary program on climate change and sustainability policy in each partner country university;
- Integrate, implement and assess the CLIMASP program as an integral part to existing undergraduate academic degrees and;
- Contextualize the Europass supplement diploma in the partner universities and the region.
-

4.3 Learning Outcomes

Student Outcomes (SO) describe what students are expected to know and be able to do by the time they graduate. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the minor. CLIMASP aims at:

1. Solving climate change and sustainability policy problems using knowledge of applied mathematics, science, and economics, etc.
2. Acquiring analyzing, and using technical data to design for climate change and sustainability policy.
3. Integrating professional, ethical, social, and environmental considerations into climate change and sustainability policy design and problem solving.
4. Developing the ability to communicate results effectively and providing experience in team efforts.
5. Acquiring the habit of continuous learning to maintain technical competence and keep abreast of contemporary issues.

4.4 Minor Requirements

Upon completion of the minor along with their major, students will be granted the Euro-Arab Pass diploma provided they fulfill 45 to 60 relevant European Credit Transfer System (ECTS) credits.

- To obtain this minor, the student is required to complete a minimum of 30 ECTS (18 credits). The minor consists of: (i) 3 core courses (9 credits representing one course from each concentration area), (ii) at least 1 course from CA 1, (iii) at least 1 course from CA 2, (iv) at least 1 course from CA 3.
- To obtain the Euro Arab Pass with this minor, the student is required to complete a minimum of 45 – 60 ECTS (27 – 36 credits). In this case, the Minor will consist of: (i) 3 core courses (9 credits representing one course from each concentration area), (ii) at least 1 course from CA 1, (iii) at least 1 course from CA 2, (iv) at least 1 course from CA 3, (v) in addition to the capstone and internship (15 ECTS or 9 credits).

- As for the capstone and internship (15 ECTS or 9 credits), the student is expected to pay for 3 credits for the capstone and 1 credit for the internship.
- To receive this minor, the student must achieve a CGPA of at least 2.0 in the courses related to the Minor.
- Some of these courses may count towards fulfilling the requirements and technical elective components of a student's program of study. As a result, the student is expected to complete less than the actual minor requirements.

4.4 Minor Eligibility

The CLIMASP minor is interdisciplinary. There are no special admission requirements for SOE, SAS, SArD, or AKSOB students. Students can enroll in this minor in their second year of study.

5. Assessment

Coursework, exams, homework, presentations, projects, among others.

5.1 Typical Course Offering

Subsequent to the deliberations of the partners during different workshops and meetings, it was agreed that the structure of the minor shall be as follows: students from CA1 have to take at least 2 courses from CA2 and 2 courses from CA3, according to their preferences (electives); the capstone course will be equivalent to 15 ECTS that will focus on an independent study/internship (9 credits). The capstone can be a combination of an internship and directed studies project.

CLIMASP MINOR (18 Credits Option)	
CA1: Climate Change, Environment and Society	One core course and one elective course
CA2: Climate Change, Economics and Public Policy	One core course and one elective course
CA3: Climate Change, Science and Technology	One core course and one elective course

CLIMASP MINOR (27 Credits: Euro-Arab Pass Option)		
CA1: Climate Change, Environment and Society		One core course and one elective course
CA2: Climate Change, Economics and Public Policy		One core course and one elective course
CA3: Climate Change, Science and Technology		One core course and one elective course
Capstone 15 ECTS	Capstone	Any CA (preferably CA 1)
	Internship	

CLIMASP RECOMMENDED STRUCTURE						
CLIMASP Orientations	***CA***	***Course ID***	***Course title***	***ECTS****	***Department***	***School***
Core Courses	1	CIE 522	Environmental Impact Assessment	5	Civil Engineering	SOE
	2	ECO320	Environmental, Resource and Energy Economics	5	Economics	AKSOB
	3	ENV230*	Sustainability in Practice	5	Natural Science	SAS
Elective Courses	At least 1 Course from CA 1					
	At least 1 Course from CA 2					
	At least 1 Course from CA 3					
Capstone Project	Equivalent to 15 ECTS: has to be selected properly to meet the minimum concentration area requirements, if needed.					
* ENV200 will be used until ENV230 is approved						

CA 1: Climate Change, Environment and Society				
Course No.	***Course title***	***ECTS***	***Department***	***School***
ENV 210	Climate Change Risks to Ecosystems and Biodiversity	5	Natural Science	SAS
ENV 211	Conserving Biodiversity in a changing Climate	5	Natural Science	SAS
ENV 222	Social Aspects of Renewable Energy for Rural Development	5	Natural Science	SAS
CIE434	Civil Engineering Profession	3	Civil Engineering	SOE

CIE 522	Environmental Impact Assessment	5	Civil Engineering	SOE
EDU xxx	Curriculum Design	5	Education	SAS

CA 2: Climate Change, Economics and Public Policy				
Course No.	***Course title***	***ECTS***	***Department***	***School***
ENV 223	Financing Renewable Energy	5	Natural Science	SAS
ECO 311	Development Economics	5	Economics	AKSOB
ECO 320	Environmental, Resource and Energy Economics	5	Economics	AKSOB
ECO xxx	Challenges of Sustainable Development	5	Economics	AKSOB
CIE525	Environmental Policy and Management	5	Civil Engineering	SOE

CA 3: Climate Change, Science, and Technology				
Course No.	***Course title***	***ECTS***	***Department***	***School***
BIO 203*	Introduction to Ecology	5	Natural Science	SAS
BIO 331*	Ecology	5	Natural Science	SAS
ENV 200	Introduction to Environmental Sciences	5	Natural Science	SAS
ENV 220	Renewable Energy for Sustainable Development	5	Natural Science	SAS
ENV 224	World Ocean Solutions	5	Natural Science	SAS
ENV 225	Energy In Buildings	5	Natural Science	SAS
ENV 230	Sustainability in Practice	5	Natural Science	SAS
ENV 423	Environmental Microbiology	5	Natural Science	SAS
DES 523	Environmental Systems I	5	Architecture	SArD

DES 524	Environmental Systems II	5	Architecture	SArD
MEE401	Energy Systems & Sustainable Environments	5	Mechanical Eng.	SOE
MEE599	Advanced Power Trains	5	Mechanical Eng.	SOE
MEE599J	Energy Audit	5	Mechanical Eng.	SOE
CIE424	Water Distribution and Treatment	5	Civil Engineering	SOE
CIE426	Wastewater Collection and Treatment	5	Civil Engineering	SOE
CIE 427	Environmental Engineering – SOFT	2	Civil Engineering	SOE
CIE520	Solid Wastewater Management	5	Civil Engineering	SOE
CIE521	Hydrology	5	Civil Engineering	SOE
CIE526	Environmental Remediation	5	Civil Engineering	SOE
CIE 563	Transportation Planning and Land Use	5	Civil Engineering	SOE
CIE582	Infrastructures Management	5	Civil Engineering	SOE
CIE600H	Groundwater Hydrology and Pollution	5	Civil Engineering	SOE
CIE724	Air Quality Management	5	Civil Engineering	SOE
CIE725	Geo-Environmental Engineering	5	Civil Engineering	SOE
CIE730	Irrigation nd Drainage Engineering	5	Civil Engineering	SOE
CIE 788	Fundamentals of GIS and Remote Sensing	5	Civil Engineering	SOE

* Student may not take both BIO 203 and BIO 331 for credit (either one).

5.2 CLIMASP Courses during Spring 2016

CA1: Climate Change, Environment and Society						
Course #	***Course title***	***ECTS***	***Department***	***School***	***Sections***	***Students***
ENV 210	Climate Change Risks to Ecosystems and Biodiversity	5	Natural Science	SAS	0	0
ENV 211	Conserving Biodiversity in a Changing Climate	5	Natural Science	SAS	0	0
ENV 222	Social Aspects of Renewable Energy for Rural Development	5	Natural Science	SAS	0	0
CIE 434	Civil Engineering Profession	3	Civil Engineering	SOE	**1**	**31**
CIE 522	Environmental Impact Assessment	5	Civil Engineering	SOE	0	0
EDU xxx	Curriculum Design	5	Education	SAS	**1**	**15**

CA2: Climate Change, Economics and Public Policy						
Course #	***Course title***	***ECTS***	***Department***	***School***	***Sections***	***Students***
ENV 223	Financing Renewable Energy	5	Natural Science	SAS	0	0
ECO 311	Development Economics	5	Economics	AKSOB	**2**	**81**
ECO 320	Environmental, Resource and Energy Economics	5	Economics	AKSOB	**2**	**62**
ECO xxx	Challenges of Sustainable Development	5	Economics	AKSOB	0	0
CIE 525	Environmental Policy and Management	5	Civil Engineering	SOE	**1**	**24**

CA3: Climate Change, Science and Technology

Course #	*Course title*	*ECTS*	*Department*	*School*	*Sections*	*Students*
BIO 203*	Introduction to Ecology	5	Natural Science	SAS	0	0
BIO 331*	Ecology	5	Natural Science	SAS	**4**	**108**
ENV 200	Introduction to Environmental Sciences	5	Natural Science	SAS	**9**	**290**
ENV 220	Renewable Energy for Sustainable Development	5	Natural Science	SAS	0	0
ENV 224	World Ocean Solutions	5	Natural Science	SAS	0	0
ENV 225	Energy in Buildings	5	Natural Science	SAS	0	0
ENV 230	Sustainability in Practice	5	Natural Science	SAS	0	0
ENV 423	Environmental Microbiology	5	Natural Science	SAS	0	0
DES 523	Environmental Systems I	5	Architecture	SArD	**1**	**29**
DES 524	Environmental Systems II	5	Architecture	SArD	**2**	**65**
MEE 401	Energy Systems & Sustainable Environments	5	Mechanical Engineering	SOE	**1**	**20**
MEE 599	Advanced Power Trains	5	Mechanical Engineering	SOE	**1**	**21**
MEE 599J	Energy Audit	5	Mechanical Engineering	SOE	0	0

CA3: Climate Change, Science and Technology

Course #	*Course title*	*ECTS*	*Department*	*School*	*Section*	*Students*
CIE 424	Water Distribution and Treatment	5	Civil Engineering	SOE	**1**	**44**
CIE 426	Wastewater Collection and Treatment	5	Civil Engineering	SOE	**2**	**73**
CIE 427	Environmental Engineering– SOFT	2	Civil Engineering	SOE	**4**	**79**
CIE 520	Solid Wastewater Management	5	Civil Engineering	SOE	**1**	**40**
CIE 521	Hydrology	5	Civil Engineering	SOE	0	0
CIE 526	Environmental Remediation	5	Civil Engineering	SOE	0	0
CIE 563	Transportation Planning and Land Use	5	Civil Engineering	SOE	**1**	**17**
CIE 582	Infrastructures Management	5	Civil Engineering	SOE	0	0
CIE 600H	Groundwater Hydrology and Pollution	5	Civil Engineering	SOE	**1**	**42**
CIE 724	Air Quality Management	5	Civil Engineering	SOE	0	0
CIE 725	Geo-Environmental Engineering	5	Civil Engineering	SOE	0	0
CIE 730	Irrigation and Drainage Engineering	5	Civil Engineering	SOE	0	0
CIE 788	Fundamentals of GIS and Remote Sensing	5	Civil Engineering	SOE	**1**	**29**

5.3 CLIMASP Courses Breakdown and Data during Spring 2016

CA 1: Climate Change, Environment and Society
- 2 Courses were offered (one section each)
- Total of 46 students were registered
- Does not mean that all are interested in the CLIMASP Minor.

CA 2: Climate Change, Economics and Public Policy
- 3 Courses were offered.
- 5 sections in total.
- Total of 167 students were registered.
- Does not mean that all are interested in the CLIMASP Minor.

CA 3: Climate Change, Science and Technology
- 13 Courses were offered.
- 29 sections in total.
- Total of 857 students were registered.
- Does not mean that all are interested in the CLIMASP Minor.

As a general summary for the Spring 2016 offering:
- Overall: 3 Concentration Areas
- 18 Courses were offered.
- 36 sections in total.
- Total of 1070 students were registered.
- Does not mean that all are interested in the CLIMASP Minor.

5.4 Typical Student Sample Work and Outcome Assessment
- Although the survey was not completed, however, in some courses assessment of achieving the outcomes related to climate change was done in specific courses through graded/corrected student work in the form of: Project(s) and/or Graded exam questions.

LAU Lebanese American University	Department of Civil Engineering Project	School of Engineering
CIE426 Wastewater Collection and Treatment		
Instructor: Jean Chatila, Ph.D	Semester: Fall 2015	

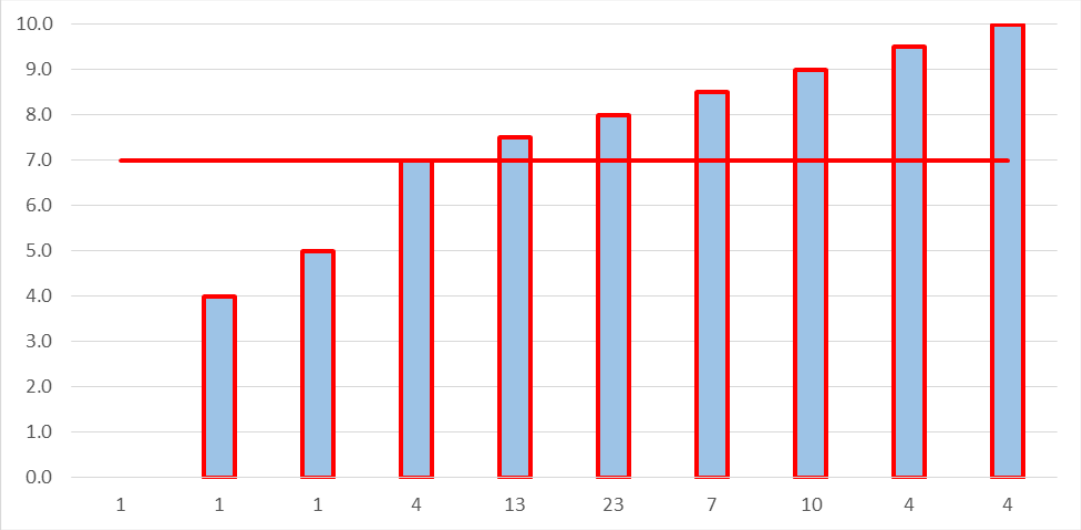
Due Date: December 03, 2015

This work will be submitted based on group effort (Teams of 2 students). It is the responsibility of each student or group member to contribute to his/her report and effort and to be knowledgeable of the contents of the work. A meeting may be assigned to question each student of his/her contribution to the work. You are requested to submit a well-documented technical report for the contemporary issue at hand.

Question

One of the current contemporary issues in environmental engineering deals with the use of vacuum sewer networks and their consequences on the environment, water resources …etc. You are asked to tackle the vacuum sewer issue in the following context:

1- Define vacuum sewer networks
2- Discuss the operational issues of these sewers
3- Discuss the advantages and disadvantages of this system as compared to a traditional gravity system.
4- Discuss, briefly, the effect of vacuum sewers on the environment in general
5- Does this system have any effect on wastewater treatment processes?
6- Discuss the impact of this engineering solution on the society, economy, environment, …etc.



- Based on the collected data in this course, one can easily see that the Course Learning Outcome: *"Define climate change and describe its impact on wastewater treatment"* has been highly achieved.

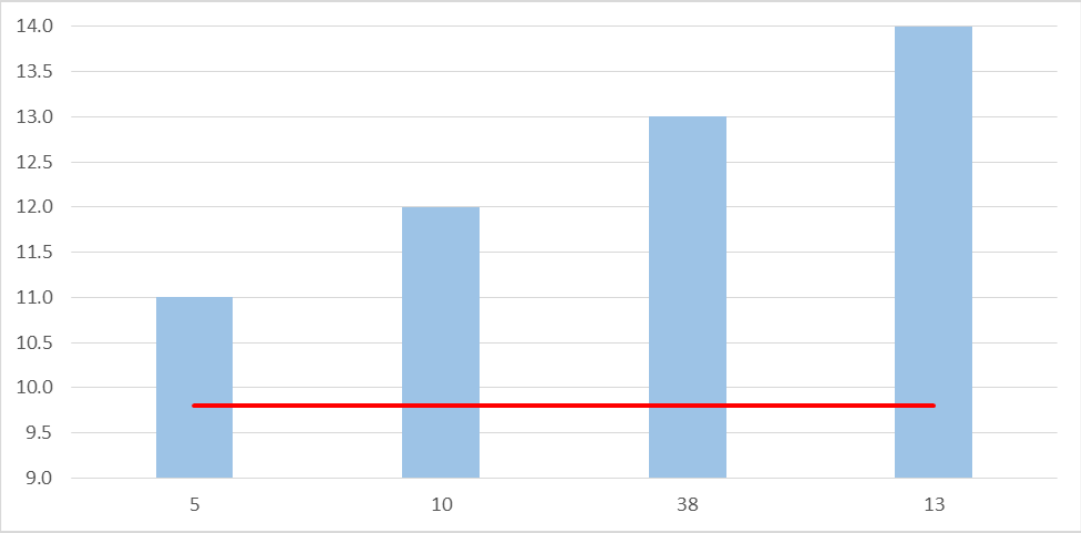
True or False Questions

Answer	*Statement*
	Climate refers to the state of the atmosphere in a particular place and time and occurs over short time periods.
	Weather is the average weather at a given point and time of year, over a long period.
	Global warming refers to the recent and ongoing rise in global average temperature near Earth's surface.

	Global warming itself represents only one aspect of climate change.
	The buildup of greenhouse gases (GHG) does not affect the climate and may result in decreasing the temperature of the Earth's surface
	Levels of GHG have dramatically increased, to levels higher than those experienced for maybe millions of years.
	Many places have seen changes in rainfall, resulting in more floods, droughts, or intense rain, as well as more frequent and severe heat waves.
	Oceans and glaciers have experienced some big changes (oceans are warming and becoming more acidic, ice caps are melting, and sea levels
	Humans are not largely responsible for recent climate change.
	Some changes to the climate are unavoidable
	We cannot reduce the risks we will face from climate change as we cannot make choices that reduce greenhouse gas pollution.
	The majority of greenhouse gases come from burning fossil fuels to produce energy, although deforestation, industrial processes, and some agricultural practices also emit gases into the atmosphere.
	Climate Change does not have impact on the design of water, wastewater, and Storm water infrastructure
	GHG act like a blanket around Earth, trapping energy in the atmosphere and causing it to warm.

Answer	***Statement***
	Ethics is the system or code of morals of a particular person, religion, group or profession.
	Engineering profession does not have its code of Ethics.
	A code of Ethics is a list of regulations and not a set of guidelines
	Waste discharge and wastewater treatment are not sources of GHG emissions.

	Reduced water usage decreases water that flows into the wastewater transmission and treatment systems of the community thereby decreasing the overall water volume but
	Climate change in drought areas will likely reduce the stream and river base flows.
	As the base flow decreases, effluent requirements will become less stringent
	Predicting climate change relies on using global climate models that have been calibrated using information from the
	Engineers must show caution in using the conclusions of the studies of the climate and climatic extremes in general.
	Trends and predicted changes do not impact the parameters used by engineers in the design of water infrastructure.
	Direct impacts associated with climate change are mainly associated with the increase frequency of intense rainfall.
	Indirect impacts associated with climate change are primarily attributed to impacts associated with water
	The frequency and intensity of heat spells will increase while the frequency and intensity of cold spells will
	Water supply will be reduced in regions that rely upon snow melt for water.



The graph shows the grade distribution of students in the final exam of CIE426 Wastewater Collection and Treatment. This question was given the worth of 14 grades in the final exam. A student shall score 70% to pass which means that the passing grade is 9.8. The passing grade is represented by the red line. It is worth mentioning that all students taking the course scored above the passing grade. Actually, 5 students scored 11/14, 10 scored 12/14, 38 scored 13/14 and 13 scored 14/14. During Spring 2016, 68 students out of 68 scored above the passing grade in the final exam on Climate Change issues.

Local Field Trips to assess natural impacts of climate change



PROJECT STRENGTHS AND ACHIEVEMENTS

- The project is relevant to the needs for the country and those of the region based on the NTW, surveys, and discussions with relevant people in some companies, academic institutions, etc.
- A good progress was made during the first year of its implementation. There could be some delays in few tasks at some point in time but did not affect the progress and deliverables.
- CLIMASP had already made good impact on the curriculum in the university. Although it is still in its early phases of implementation, it is expected to achieve sustainability after it is finished due to the commitment of the Administration of each partner institution manifested in changes in existing curricula. Thus, it is crucial that partners continue making efforts in this direction.
- CLIMASP is properly managed at the general level and the specific level, (grant holder and local partners).
- There is good communication and coordination among the partners, and with Dr. Vassilios Makrakis.
- There is great interest in the theme of the project, shown in the good ownership and commitment of the partner institutions in the project and its activities.

- The involvement of a large numbers of faculty members from LAU in the project activities and the fact that quite a large numbers of courses exceeding the required have been updated to incorporate principles and concepts of climate change and sustainability policy in different disciplines.

1. Monitoring and Quality Assurance

- Evaluation is integrated into CLIMASP before implementation, and integrated during and after implementation.
- Before implementation includes design and development stages of capturing stakeholders' expectations, competences needed, validating/accrediting course modules.
- Close monitoring from project coordinator and local coordinators noticed during accomplished project stages:
    - Templates were developed to be used in all tasks
    - CLIMASP Toolkit used in revising mapped courses.
    - OCoP which will be used for further work on the internal peer-reviewing before the external review started.
- Evaluation during implementation enables progressively review of strategies according to changing circumstances to attain desired outcomes and objectives.
- Evaluation after project implementation will involve faculty, students, and other stakeholders to demonstrate whether aims and objectives are achieved.
- Conduct systematic evaluation of various aspects to ensure quality standards are met, objectives are achieved within given time as planned.
- Developed syllabi and course modules were sent to HUSD to be reviewed by another internal entity.
- Following HUSD review, peer-reviewed courses are modified according to comments received before implementation.
- These modified courses are sent to an external reviewer for review and comments.
- Comments received were incorporated, once possible, by faculty into these courses. We did not receive comments on all our courses.
- Currently, we are in the process of finalizing conducting external reviews of the syllabi.
- Currently, we are in the process of finalizing conducting external reviews of the syllabi.
- Analysis is done by the Coordinator and evaluation will be conducted by the steering committee.
- Based on evaluation of results, adjustments will be implemented if needed and this is a continuous improvement process (circle the wagon).
- Crucial to note importance of ongoing evaluation and fine-tuning in response to evolving student needs, teacher abilities, goals and objectives, etc.
- Online Community of Practice (OCoP) provides an interactive environment for its members to exchange, discuss and share ideas, suggestions, solutions, tools and methodologies focusing on the core areas.
- Serves as a repository online environment to support capacity-building initiatives and revise courses towards meeting objectives.

2. Sustainability

- Minor is relevant to country and regional needs based on NTW, surveys, and discussions
- A good progress was made during the first year of implementation.
- CLIMASP had already made good impact on the curriculum at LAU.
- CLIMASP is properly managed at the general level and the specific level.
- Good communication and coordination among partners.
- Involvement of a large numbers of faculty members from LAU in activities.
- At LAU and NDU, discussions are in progress related to the structure of the minor and the process of formalizing it through proper university channels.
- This shows the commitment of faculty and institutions to the success of program.
- Once approved, this CLIMASP Minor will be sustainable provided enrolment is sufficient.
- Crucial that we advertise Minor properly and explain its merits to current LAU students.
- Another issue that was taken into consideration to ensure its interdisciplinary nature and sustainability and ensure participation from different schools is that courses were selected carefully.
- Most Minor courses do not require any pre-requisites that could limit enrolment of students.
- Thus, students have a variety of courses to select from.
- Principle of equal opportunity in regards to gender among other issues is taken into careful consideration in development and implementation of project.
- Encouraged the participation of women at decision making as members of steering committee, in development and delivery of courses where some teachers are females, and in attending these courses.
- Many students enrolled in these courses are females.
- Look forward to have more involvement of women on all levels to achieve a more balanced percentage share of females among the teachers.
- Since LAU is an equal opportunity university and employer it is expected that there is no gender discrimination.
-

3. External Review Outcome

In this section, some discussions of sample external review outcome of two courses addressing some questions. Considering EDU 730 the reviewer evaluated the course as follows responding to the question:

1. *Does the work include selected concepts and methods from two or more disciplinary traditions relevant to the purpose of the work?* Level 3-4: I am reluctant to award a level 4. It must be the conservative Irish in me but this certainly comes close! There is a strong emphasis on the theoretical and philosophical underpinnings of the aspects of curriculum design, curriculum theory, curriculum history, curriculum evaluation and the design of a curriculum round current issues on climate change and sustainability. I would include some of the theory and philosophy underpinning both of these two concepts and readings related to same as well as seminal documents to give context to the students. UNESCo, Eco UNENESCO, Earth Charter, etc.

2. *Is there an integrative device or strategy (e.g., a model, metaphor, or analogy)?* Level 3: Curriculum, Society and Culture: This metaphor is clearly evident throughout the Course descriptor and the individual modules. There is a really good progression of thought from theory to practice with clearly challenging questions in between on who, what and why impact on curriculum design and delivery. Clear and unambiguous so well done!
3. *Is there a sense of balance with regard to how disciplinary perspectives are brought together to advance the purpose of the work?* Level4: Balance is there throughout and there is a logical progression in evidence. Take note though of the readings in the field of sustainability and climate change and all that has been written on curriculum in these areas including previous research by your co-researchers on CLIMASP.
4. *Do the conclusions drawn from the work indicate that understanding has been advanced by the integration of disciplinary views?* Level 3: The work takes advantage of almost all opportunities to advance disciplinary insights, in particular through the use of innovative and challenging pedagogies and assessment types. Great to see challenges around hidden curriculum raised and an argument approach to societal and cultural influences. Debate on whether society and the corporate world dictates curriculum too much is also one that could be pursued more.
5. *Does the student exhibit awareness of the limitations and benefits of the contributing disciplines?* Level 4: I would expect Level 4 outcomes but hard to judge without seeing final assignments. Would advise sharing them on the CLIMASP platform with co-researchers.

Considering CIE424, the reviewer evaluated the course as follows responding to the question:

1. *Does the work include selected concepts and methods from two or more disciplinary traditions relevant to the purpose of the work?* Level 4: The marriage between water distribution and treatment and, climate change and ethics and the environment is a good one, even if it is three fold! As the course descriptor states:…etc.

2. *Is there an integrative device or strategy (e.g., a model, metaphor, or analogy)?* Level 3. The integrative device here is simply "Water". It's elementary! It could be drawn out more clearly by adapting some kind of symbol or device to represent it to students. If you want an international example of the impact of water on society look to Ireland. We have an antiquated water system where 50% of water is leaking into the ground/ Lead and copper piping is causing contamination so we frequently have boil water notices. The Government has moved to charge for water. This has led to demonstrations in the streets and is in danger of bringing down the government. All talk of conservation has been lost in the argument. Such attitudes do highlight the need for scientific and academic input into such debates.
3. *Is there a sense of balance with regard to how disciplinary perspectives are brought together to advance the purpose of the work?* Level 3: Very well balanced. One slight criticism. I note that the discussion on these topics delivered in seminar format come very late in the process. Would advise putting some in throughout the modules for better effect and greater insights from students.
4.
5. *Do the conclusions drawn from the work indicate that understanding has been advanced by the integration of disciplinary views?* Level 3: Conclusions drawn point to valid integration and greater understanding on the part of the students. If you take

note of what I have suggested above, this could be advanced even further. Take elements of Modules 6 and 7 and integrate them into earlier modules.

6. *Does the student exhibit awareness of the limitations and benefits of the contributing disciplines?* Hard to measure without evidence from the assignments, post course evaluation by students, etc.

All other course reviews are available.

4. Challenges faced during the CLIMASP project

No major or tangible obstacles were experienced. There could be some hurdles in the path but these did not tangibly affect development or implementation of the tasks. Many challenges were faced during development and implementation of CLIMASP. These were tackled as they appears. Several answers/solutions were sought after during the National Training Workshops and regional Training Workshops with the collective wisdom of the attendees.

On July 16, 2014 the second NTW was held with target group being faculty functioning as design teams from at least three disciplines, who are going to form working groups (WGs) in each of the three strands of CLIMASP program. During this NTW, the following controversial topics were discussed and clarified.

- **Discussion of processes and practices for stakeholders' involvement in CLIMASP:** Review the instruments to be used for stakeholders' involvement in the construction of required competences and Plan stakeholders' involvement in each partner country (surveys).
- **Distinction between goals, objectives, outcomes, and competences:** went over the TOOLKIT document and clarified different concepts.
- **Core Courses in Minor:**
  - Take 3 core courses from the 1st Concentration Area (CA).
  - Such courses should be oriented to social, environmental, economic and cultural aspects of climate change.
  - Increase involvement of more departments in course development and concentrate on courses that relates to Ethics, Environmental Laws, Education, etc.
  - Consider having an Ethics course in the Core.
- **Courses in Minor**:
  - Brainstorming on initial mapping of courses directly and/or indirectly related to CLIMASP.
  - Classify and Map courses to CAs
  - Students from 1st CA have to take at least 2 courses from 2nd CA and 2 courses from the 3rd CA, according to their preferences (electives).
  - Capstone course will be equivalent to 15 ECTS that will focus on an independent study/internship (9 credits).
  - Capstone can be a combination of Internship and Independent study.
- **Computer Lab and equipment:**
  - Review specifications for purchase of equipment and plan establishment of Centers of Integrative and Interdisciplinary Studies with the ICT labs.

- ICT laboratories may be equipped with Web Server, Camera equipment, hardware and software for teleconferencing, Video Data displays, Whiteboard equipment, Monitors, Projector, communication equipment such as routers, furniture, 20 to 25 Personal Computers, Laser Printer, and Scanner. Software for supporting CLIMASP courses such as GIS and other GEO/Spatial tools.

- **Surveys:** collected surveys analyzed and results used during design and development stages of courses in minor to cater for stakeholders' needs and input.

- **Other items:**
  - About 25 Syllabi and course modules are to be prepared (LAU prepared 35)
  - ECTS versus Credit hours
  - EURO-ARAB PASS Diploma: credit requirements
  - Co-financing issues
  - Regional workshop date: discussed and held in Jordan on October 26, 2014.
  - Concern was raised on the number of credits taken in the minor and whether that will affect enrollment.

During the third NTW held on October 26-28, 2015 at LAU Byblos Campus, and following the presentations, fruitful discussions were held concentrating on the problems associated with integrating sustainability into university courses in each partner university as well as the difficulties that the students may face related to the extra courses to be taken for the Minor. Discussions on the lessons learnt in each partner institution were helpful in addressing some of the problems and challenges faced and possible solutions were presented. During this NTW, fruitful discussions were held concentrating on the Capstone Design project as well as other relevant issues, and the involvement of civil society. Also, round table discussion was held concentrating on strategies for the CLIMASP minor promotion and dissemination followed by reflection from LAU and NDU on organizing the CLIMASP capstone course and Euro-Arab Pass in LAU & NDU. Involving external stakeholders and dissemination were important issues. As a result, and during the third NTW, the Ministry of Environment was involved through the presentation of Mr. Youssef Naddaf on the role of the Ministry of Environment and their contribution to CLIMASP capstone and training. It was evident that MOE are willing to provide ideas and contribute to the minor delivery and specifically to the capstone and training. In the same line, Dr. Nadim Farajallah from AUB presented adaptation of the waters sector to climate change. As we believe the importance of involving the civil society, Mr. Ziad El Sayegh who is the CEO of the Civic Influence Hub (CIH) presented the role of Civil Society and its contribution to the CLIMASP Capstone course. Following these presentations, fruitful discussions were held concentrating on different relevant issues. The presentation was helpful in clarifying many concepts related to interdisciplinary teaching issues.

As one of the challenges faced was related to finance and managerial issues, these were discussed in detail during the third day of this third NTW. Many ideas were discussed and many related questions were answered by Dr. Makrakis.

The presentations and discussions of the participants as well as the feedback and guidance of Dr. Makrakis offered the participants the opportunity to elaborate deeper on the processes and practices of the CLIMASP project and for revision and development of courses and modules and for the adoption of the proper ways to disseminate this project to the related stakeholders before its implementation. Similar feedback was obtained related to challenges was sought for and obtained during the second RTW held in Cyprus May 4-8, 2016.

One of the challenges that we are still working on finding a solution for relates to the ability of the student to double count the credits taken towards the fulfillment of the Minor as part of the student's credits for graduation requirements. The Council of Deans has recently reaffirmed in its June 30, 2016 meeting (see highlighted item 7 of the CD MM) the current academic policy regarding Minors at LAU. The current policy, which is stated in the LAU Academic Catalog and posted online states the following: "Students can work for a minor by completing, with a minimum GPA of 2.00, the minor's requirements. These requirements should be completed before a student earns his/her bachelor's degree. No more than nine credits of transferable courses may be counted towards a minor." This essentially means that a students enrolled in CLIMASP (once approved) have to take a minimum of 3 additional courses (9 credits) beyond the requirements of the B.S. B.E. degree in order to be awarded the Minor. Furthermore, students aiming to receive the Euro-Arab Pass need to complete an extra 18 credits beyond the graduation requirements. This will be prohibitive given that a credits is about $700. Students may tend to complete a Masters degree and receive a degree instead of receiving a certificate with almost the same credits/time. We are still looking for a solution for this expected problem that will affect enrollment in the CLIMASP Minor. A similar problem exists at NDU.

Additional challenges faced during development/implementation could relate to ensuring efficient involvement and commitment at the administrative level of the institution and expediting bureaucratic procedures especially when introducing new courses (lengthy process of approval). Also, ensuring the full engagement of faculty members involved in CLIMASP to safeguard the project sustainability after the funding period. But these challenges were easy to overcome.

The questionnaire provided by Dr. Makrakis was used during Spring 2015 pilot phase of the project. Some questions and reservations were raised during the third national workshop in Byblos on the relevance of this survey. During last week of Spring 2016, we were asked to complete the survey. However, we were during the last few days of classes, which was not possible.

5. Internship Course (10 ECTS, equivalent to 6 credits)

Professional Experience [0-6, 6 cr.] Professional experience through training in the execution of real-life climate change and sustainability policy problems and projects. Prerequisite: Consent of Instructor.

Capstone Course (5 ECTS, [0-3, 3 cr.]) This course covers selected project using acquired technical knowledge, formal report, and presentation. The capstone project enables students to apply and synthesize the material learned in other courses, develop

expertise in a specific topic related to the student concentration; work closely with experts in the field of study; and advance professional recommendations and solutions for implementation of climate change and sustainability policy. This course provides students with a design experience that is as close as possible to real life projects. Prerequisite: Consent of Instructor.

At the completion of the project, students will gain a fundamental understanding of alternative climate change and sustainability policy in their area of concentration and will be able to:

- Develop a case study of climate change and/or sustainable policy.
- Integrate knowledge and use various streams of knowledge and skills acquired in various courses, and concentrations.
- Describe the business requirements and success; and/or
- Critique past and current policies and codes.

Capstone Course rules:
Project topics can be faculty or student initiated. Faculty can post project topics for students to select from or receive project proposals from students. The project work can be individual or group project as approved by project advisor and program coordinator.

In the semester prior to conducting the project, students must identify a project topic and faculty advisor who is both familiar with the chosen topic and willing to guide and oversee the project. The student can also have a co-advisor from the student's place of work or any expert with appropriate credentials.

Formal proposals must be submitted at least two weeks prior to the start of the semester in which the project is to be completed. The proposal must be approved by the minor coordinator prior to enrollment in the course. The project takes place over the course of one-semester and requires many hours of individual/group work (normally 6-8 hours per week). A faculty member can supervise no more than five projects in any one semester.

Deliverable 1 (Week 2):	Communicate with instructor to define project topic.
Deliverable 2 (Week 6):	Interim report
Deliverable 3 (Week 13):	Presentation
Deliverable 4 (Week 14):	Final report

Grading

Project Proposal:	10%
Interim report:	30%
Final Report:	30%
Presentation:	30%

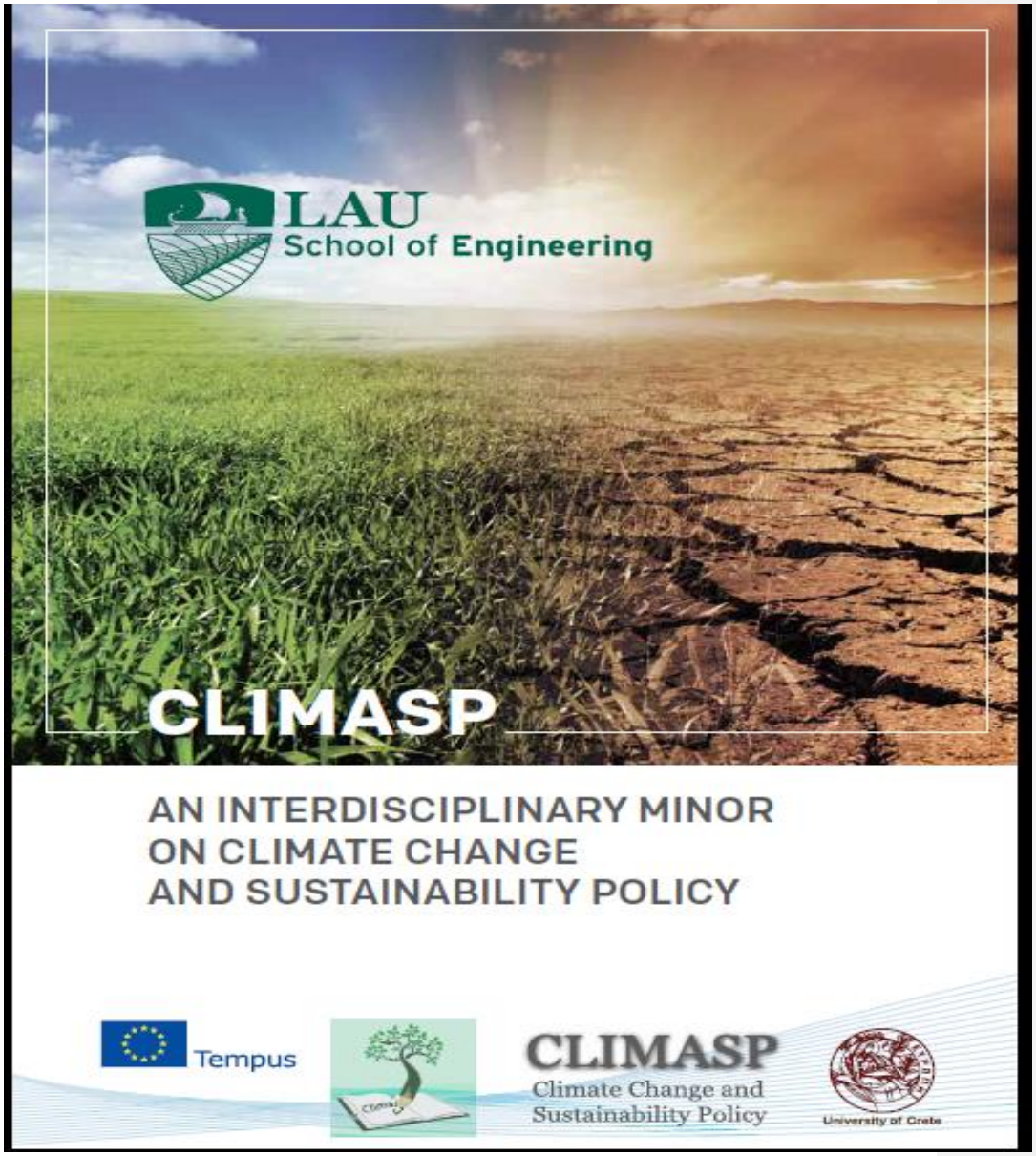
6. Exploitation and Dissemination

As for dissemination, we have done a great deal of work in marketing the Minor even during development through involvement of people from different ministries, civic society, academic institutions, among other venues. Examples include:

- We have met with the students several times in open discussion forums and informed them that we are in the process of initiating the CLIMASP Minor.
- Also, students taking courses that are pertinent to the Minor are aware of the changes that occurred to these courses to align them with the Minor requirements.
- Part-time instructors teaching courses in Minor are well aware of the development of CLIMASP Minor and thus they were asked to disseminate CLIMASP information to their companies (full-time employees).
- During the first NTW held at NDU, we invited many stakeholders and they were informed about Minor and we asked them for their involvement, opinion and recommendations.
- During the third NTW held at LAU, we had presenters from the civic society, Ministry of Environment, and the American University of Beirut. This is another venue for the dissemination of CLIMASP to other faculty and interested entities.
- In my meeting in March 2016 with the President of the Lebanese Order of Engineers and Architects, I have informed him about the CLIMASP Minor and agreed that we will send them brochures and leaflets once printed for distribution to interested people.
- We are in the process of printing the Brochure (pending approval) and a leaflet for Minor.

Below is the first 2 pages of the brochure and one page of the leaflet.

CLIMASP BROCHURE



The CLIMASP Interdisciplinary Program

It is well documented that the major challenge of the next decades will be the sustainability of resources and the problems related to climate change. Thus, it is important to provide the future labor force with the necessary knowledge regarding the various aspects of sustainability, which will enhance the employment potential and status of our graduates.

The development of this minor is a result of a funded project through a CONSORTIUM AGREEMENT ON THE IMPLEMENTATION OF TEMPUS PROJECT "***Development of an Interdisciplinary Minor Program on Climate Change and Sustainability Policy–CLIMASP***" (Reference No. -543879TEMPUS-1-2013-1-GR-TEMPUS-JPCR) (Grant Agreement No. 001-001/5043-2013).

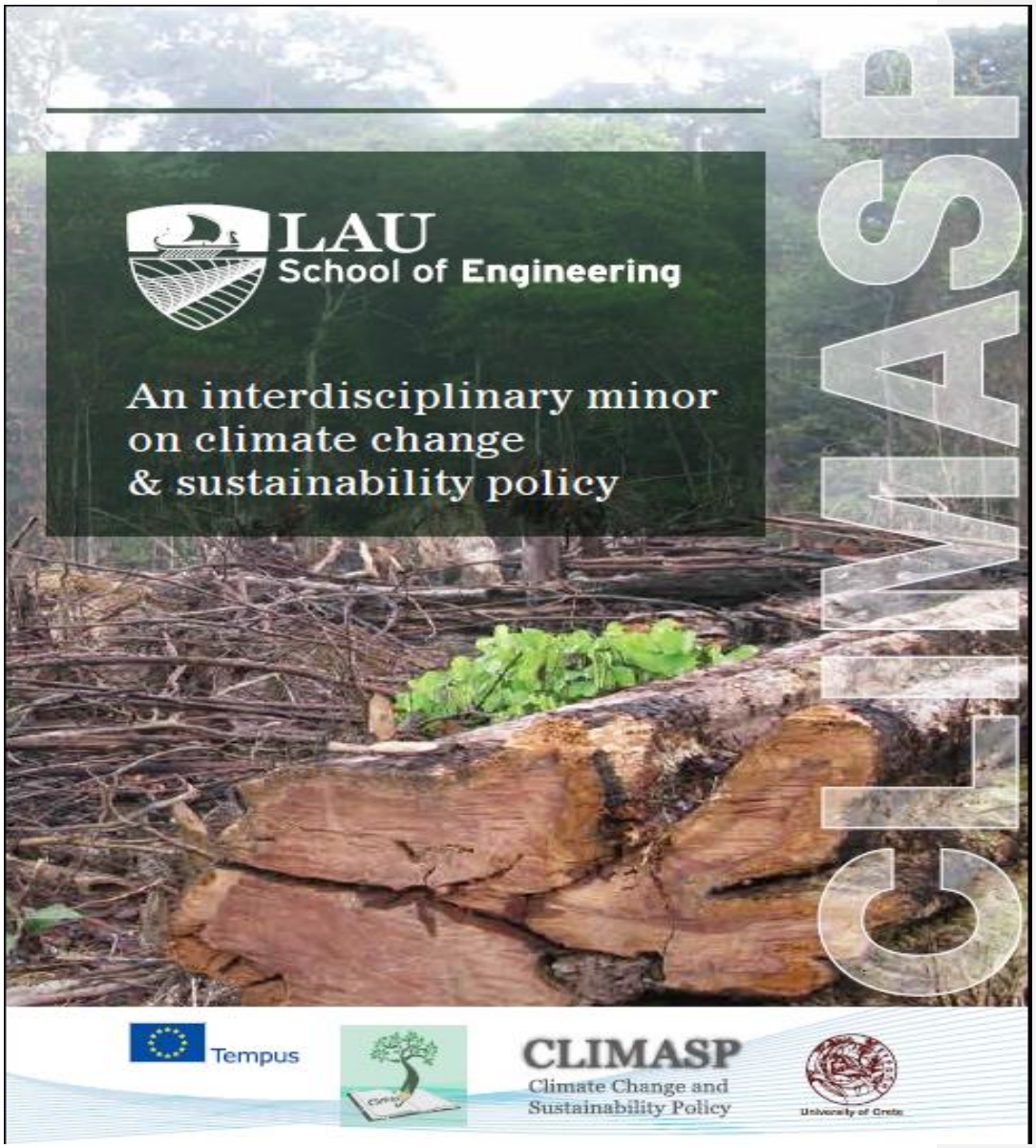
This TEMPUS project, in accordance with the Grant Agreement signed by the Education, Audiovisual and Culture Executive Agency as the financer and the University of Crete as the Coordination Institution of the project, is designed and implemented across 10 universities in Jordan, Egypt and Lebanon (The Lebanese American University and Notre Dame University).

CLIMASP gives students the opportunity to earn a formal credential (Euro-Arab Pass Diploma) in climate change and sustainability policy in addition to the degree of their specialization granted by the university.



Lebanese American University | CLIMASP

CLIMASP LEAFLET



CONCLUSION

The CLIMASP project/experience was a pleasant one. It helped us as individuals in working together with other partner institutions in developing a common vision for

the minor. The LAU pilot implementation of CLIMASP was quite successful. The regional meetings were also a great way to network with other colleagues in partner universities and develop the contents of the CLIMASP minor with a common vision for all stakeholders involved in the project.

Acknowledgement

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REFERENCES

CLIMASP TOOLKIT
REGIONALTRAINING MEETINGS
NATIONAL TRAINING MEETINGS
SHARED DOCUMENTS AND REPORT

COURSE DESCRIPTION

v. Required Course listing and description

Core Courses Description

CIE522 Environmental Impact Assessment [3-0, 3 cr.]
This course is the study and evaluation of the impacts of large scale projects on the quality of the physical, biological, and socio-economic environment taking into account environmental laws and regulations and EIA guidelines, identification of impacts, quantification methods, mitigation measures, and monitoring plans. Case study involving the preparation of an EIA report including sustainability impact assessment and effects of climate change.

ECO320 Environmental, Resource, and Energy Economics [3-0, 3 cr.]
This course introduces students to the basics of environmental and natural resource economics and the fundamentals of environmental policymaking. The first part of the course will discuss environmental pollution and policy solutions, the second part will discuss natural resource exploitation, sustainability and keys issues in energy economics. The course also highlights scientific facts that shape environmental policy debates.

ENV 230 Sustainability in Practice [3-0, 3 cr.]
This course tackles sustainability from its practical perspective, and studies human actions and capabilities to handle global change, climatic deterioration, ecosystem degradation, and resource depletion. It covers the millennium development goals and the factors directly linked to achieving them. Factors such as growing population, energy demand, water scarcity, climate change, and environmental economics will be discussed.

vi. Elective Course listing and description

Elective Courses in CA 1

ENV 210 Climate Change Risks to Ecosystems and Biodiversity [3-0, 3 cr.]
This course explores methods and tools for assessing climate impacts to ecosystems, species and human livelihoods. Course topics include the climate system and greenhouse effect; changes in palaeoclimate and their impacts on ecosystems and species distributions; mechanisms by which climate affects ecosystems; projections, models and social science methods are used to predict climate change, potential impacts on ecosystems, and human consequences of ecosystem changes and biodiversity losses.

ENV 211 Conserving Biodiversity in a Changing Climate [3-0, 3 cr.]
Current conservation strategies effectiveness in addressing risks under a changing climate and new strategies will be analyzed to address these risks. Ecosystem responses to climate variability will be assessed to develop new conservation strategies. Students will design a conservation plan that is sensitive to changing risks in a changing climate for a selected region.

ENV 222 Social Aspects of Renewable Energy for Rural Development [3-0, 3 cr.]

The course analyses the role renewable energy plays in sustainable rural development, cleaner technology incorporation and the potential for mitigating climate change impacts on the poor. Various renewable energy applications that can be utilized at low cost for improved social standing will be studied to satisfy the energy demand and requirements in rural regions.

CIE 434 The Civil Engineering Profession [2-0, 2 cr.]

Introduction to the history and heritage of civil engineering; specialized sub disciplines; professionalism and professional registration and societies; continuing education; impact of historical and contemporary issues on the identification, formulation, and solution of engineering problems, impact of engineering solutions on the economy, environment, political landscape, and society. The course involves teamwork researching topics related to the impact of contemporary engineering solutions including climate change. Prerequisites: fifth year standing.

EDUXXX Curriculum Design [3-0, 3 cr.]

The aim of the course is to review the history of curriculum development, analyse current curricular issues and develop a comprehensive curriculum based on climate change. The course introduces students to elements of curriculum theory and practice, in classical and contemporary approaches. It emphasizes the main issues related to curriculum design and models as reflected by research and the analysis of current curricular issues. Students are expected to reflect on ways various curriculum orientations may resolve modern issues or problems. They will evaluate curricula in terms of structural elements, tools, and assumptions regarding subject matter and learning. They are expected to design a comprehensive curriculum that incorporates the changes in the climate and the importance of educating youth accordingly.

Elective Courses in CA 2

ENV 223 Financing Renewable Energy [3-0, 3 cr.]

This course presents the different financing methods being applied and discusses some case studies from the developing world.

ECO 311 Development Economics [3-0, 3 cr.]

Theories of economic development. Plans, policies, programs and projects. Building institutional mechanism to achieve development.

ECO xxx Challenges of Sustainable Development [3-0, 3 cr.]

This course provides an introduction to the interdisciplinary field of sustainable development, drawing on the most recent developments in social and physical sciences. The course describes the interactions between physical ecology and economic development, and it stresses the ways in which they impact each other. Ecological constraints (climate, disease ecology, physical resources such as soils and energy sources, topography and transport conditions) significantly shape the patterns of economic development, demography, and wealth and poverty. At the same time, anthropogenic activities (farming, resource depletion, demographic stresses, and energy use) change the physical environment. The course offers a rigorous treatment

of the field and aims to provide students with an understanding of economic development and its relation to nature's processes.

CIE 525 Environmental Policy & Management [3-0, 3 cr.]
Explores human made problems in the environment parallel with concepts in environmental ethics, management and policies so as solutions are provided concerning preservation of the environment. Topics covered are toxic and solid wastes, pollution of air, water, food and soil, climate change; international and national environmental ethics, management and policies; Prerequisites: senior standing.

Elective Courses in CA 3

BIO203 Introduction to Ecology [3-0, 3 cr.]
This course introduces the organization of individual organisms into populations, communities, and ecosystems. It focuses on the interactions between living organisms and their physical environment. Concepts such as diversity, competition, natural selection, adaptation, climate changes, migration, extinction and deforestation are covered. Additionally, the course tackles concepts of environmental microbiology in relation to pollution, remediation and recycling of liquid and solid wastes.

BIO331 Ecology [3-3, 4 cr.]
This course covers the study of the relationships between living organisms and their environment. Major concepts related to the structure, function, organization, and regulation, at various levels (population community, ecosystems, and biomes), are covered via theory, laboratory work, and field trips. Prerequisites: BIO201 General Biology I and ENG203.

CHM340 Environmental Chemistry
This course is a study of natural and non-natural chemical substances in the environment and their chemical transformations. It involves chemistry of energy resources, atmosphere, hydrosphere, biosphere and lithosphere (natural and in polluted environment). Principles of chemical reactions, chemical equilibrium and reaction kinetics are applied in this course.

ENV 200: Introduction to Environmental Science [3-0, 3 cr.]
This is an introduction to the environmental problems and challenges facing mankind. Global problems will be directly related to issues facing the regional, and local environment. The course covers environmental problems and their causes, ecosystems and how they work, deforestation, loss of biodiversity, species extinction, air pollution, global warming, ozone depletion, solid waste disposal, renewable energy technologies, and applications to alleviate environmental problems. Case studies will be presented, and potential solutions will be attempted. The course includes field trips.

ENV 220 Renewable Energy for Sustainable Development [3-0, 3 cr.]

This course looks at renewable energy solutions as key component to developing economies and strenthening the capabilities of developing nations. It is designed to intriduce students to the issues of energy in the 21st century and their effects on the

economy covering energy production and use from different perspectives including biology, engineering, economics, climate science, and socio-economic science.

ENV 224 World Ocean Solutions [3-0, 3 cr.]

This course explores untapped potential within the world ocean (oceans and seas) and studies its capacity in providing human basic needs to reduce food, water, and energy supply stress. The impact on biodiversity and climate deterioration will also be studied.

ENV 225 Energy in Buildings [3-0, 3 cr.]

The course presents the concept of energy conservation in buildings and the role it plays in reducing greenhouse gas emissions. It illustrates the different green building design systems and shows the economic and environmental benefits behind efficient building design and operation.

ENV423 Environmental Microbiology [3-0, 3 cr.]
This ecologically based course discusses the relationship of microorganisms with one another and with their environment. It stresses the three major domains of life – Eucaryota, Archaea and Bacteria and studies their diversity, interactions and physiology in their natural environments. Biodegradation of organic matter, bio-geo-cycling of minerals and waste bio-treatment are emphasized. The course also deals with metagenomic, metaproteomic techniques and applications as well as the use of microarrays in Microbial Ecology.

DES523 / Environmental Systems I [3-0, 3 cr.]
This course covers the study and design of plumbing systems in addition to heating, ventilation and air-conditioning systems, with a survey of the different systems and their properties, cost analysis, and environmental factors including a survey of environmentally sound alternatives such as solar energy and heating, insulated walls, and alternative materials.

DES524 / Environmental Systems II [3-0, 3 cr.]
This course deals with two subjects: lighting and electrical circuits, and acoustics. The first part addresses the analysis of basic electric circuits, with emphasis on energy management, electric ratings and capacity, wiring and lighting systems and different lighting equipment, and the methods for building electrical systems. The second part is a survey of basic acoustical systems, theories, the acoustic properties of different materials used in buildings and their consequences on noise reduction, as well as a study of the properties of acoustical spaces, such as theaters or concert halls.

MEE401/PRGR 620 Energy Systems & Sustainable Environments [2-0, 2 cr.]
This course introduces students to the concept of sustainability in the context of energy use. It stresses on the different aspects involved in our daily-life use of energy: environmental, societal, political, financial, etc. It covers technologies and means used in improving the sustainability of current fossil-fuel (coal, oil and gas) based energy systems, electric and nuclear systems by reducing their environmental and societal impacts. Finally, it introduces different renewable (‘clean’) energy technologies that can be used as alternatives to traditional (‘dirty’) energy systems

MEE 599 Advanced Powertrains [3-0, 3 cr.]

Fundamentals, design and modeling of conventional and advanced hybrid electric powertrains for a sustainable mobility.

MEE 599J Energy Audit [3-0, 3 cr.]
This course covers the survey of energy sources, cost analysis, alternatives, environmental issue, audit techniques, and technical reporting.

CIE424 Water Distribution and Treatment [3-0, 3cr.]
Physical, chemical and biological water quality parameters and standards; water quantity, population estimation and use factors; methods of distribution and design criteria and periods; stresses in pipes and pipe materials, distribution system relate appurtenances; water treatment techniques: purpose, sedimentation, thickening, coagulation/flocculation processes and basin design, filtration, disinfection; effect of climate change on water supply. Prerequisites: CIE322 Hydraulics.

CIE426 Wastewater Collection and Treatment [3-0, 3 cr.]
Design of sanitary and storm sewers and related appurtenances, mass balances and hydraulic flow regimes; reaction order and rates, analysis of experimental data, attached and suspended growth biological wastewater treatment systems including: activated sludge and its variations, aerated lagoons, SBR, trickling filters, RBC; basic nitrification-denitrification processes; oxygen requirements; introduction to sludge treatment and disposal; effect of climate change on wastewater treatment. Prerequisites: CIE424 Water Distribution and Treatment. Pre-requisite: CIE427: Environmental Engineering-SOFT.

CIE427 Environmental Engineering – Soft [0-2, 1 cr.]
Analysis and design of wastewater treatment plants using commercially available software: sizing of tanks; and effluent concentration. Results visualizations and assessment; effect of climate change on wastewater treatment. Co-requisites: CIE426 Wastewater Collection and Treatment.

CIE520 Solid Waste Management [3-0, 3 cr.]
Quantity and quality of municipal and industrial solid wastes, collection, transfer, disposal, treatment and recovery of solid wastes, hazardous and non-hazardous residues, solid waste management principles and processes, environmental impact assessment, environmental legislation and risk, and pollution control management; effect of climate change on solid waste management.

CIE 521 Hydrology [3-0, 3 cr.]
Occurrence of water, precipitation, interception, depression storage, infiltration, evaporation, transpiration, snow melt, well hydraulics, stream flow, data sources, instrumentation, runoff and hydrographs, hydrograph routing, probability in hydrologic design and frequency analysis, and introduction to hydrologic modelling; effect of climate change on hydrology. Prerequisites: 4th year standing.

CIE526 Environmental Remediation [3-0, 3 cr.]
This course deals with processes employing microorganisms, fungi, plants or their enzymes to return contaminated environments, such as polluted waters and soils, to their natural conditions. The control, optimization and monitoring of bioremediation

is discussed as well as the environmental factors and microbial populations involved. In-situ, ex-situ applications and genetic engineering approaches are emphasized as well as effects of climate change. Pre-requisite: senior standing.

CIE563 Transportation Planning and Land Use [3-0, 3 cr.]
Interaction between transportation and land use variables, including modelling requirements, impacts, and data needs within the context of good community planning and economic development; transportation management, administration, finance, system evaluation, implementation, and integration. Prerequisites CIE465 Transportation Systems Engineering and GNE 331 Probability and Statistics.

CIE582 Infrastructures Management [3-0, 3 cr.]
General methods of engineering systems management and the different types of infrastructure. Application of different methods for the planning and analysis of complex infrastructure projects considering possible financing alternatives, engineering solutions, and overall management issues during the life cycle of the project. Review of selected case studies from the Arab Gulf countries; climate change and global environmental issues. Prerequisites: CIE485 Construction Management.

CIE600H? Groundwater Hydrology and Pollution [3-0, 3cr.] The objective of this course is to provide students with a thorough understanding of the subsurface environment as it pertains to the distribution and movement of groundwater and the movement and interactions of contaminants. Pre-requisite: CIE322 Hydraulics.

CIE730 Irrigation and Drainage [3-0, 3 cr.]
This course covers the irrigation practices application systems, soil-plant-water relationships, irrigation system types, scheduling, effluent reuse, case studies, quantity and quality of stream flow generated in a drainage basin, and surface, and subsurface, drainage systems. Prerequisite: CIE322 Hydraulics.

CIE724 Air Quality Management [3-0, 3 cr.]
This course covers the analysis of air pollution sources and methods for controlling emissions, with a focus on transportation-related air pollution. The course also encompasses a summary of fundamental chemical and physical processes governing pollutant behavior, and a quantitative overview of the characterization and control of air pollution problems. The analysis of key elements of the air pollution system such as the sources and control techniques, atmospheric transformations, atmospheric transport and modeling are discussed along with the effects of climate change. Pre-requisites: CIE320 Fluid Mechanics and CHM201 Chemical Principles.

CIE725 Geo-environmental Engineering [3-0, 3 cr.]
~~G~~eotechnical practice in environmental protection and restoration. The characterization of contaminated sites, preliminary site assessment, site investigation techniques and site cleanup and remediation technologies, mitigation of the effects of climate change, as well as the monitoring requirements, are discussed. The course also covers the methods of soil and site characterization for siting of waste repositories, the design of waste containment systems, including landfills, slurry walls and soil stabilization, as well as the applicability and use of geosynthetics; Prerequisites: CIE444 Soil Mechanics

CIE788 GIS and Remote Sensing [3-0, 3 cr.]
This course covers the fundamentals of sensing earth resources, data acquisition and analysis, aircraft and satellite images, digital image processing, pattern recognition, feature extraction, and the geographic information systems in various applications, using GIS software of GIS and remote sensing in mapping the effects of climate change Prerequisites: CIE361 Surveying.





Developing and Implementing the CLIMASP Minor at Notre Dame University-Louaize NDU

Prepared by:

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23-26 Seprember, 2016 Athens

I- UNIVERSITY BACKGROUND

Notre Dame University-Louaize (NDU) is a private, Lebanese non-profit Catholic institution of higher education, which adopts the American system of education. The establishment of Notre Dame University-Louaize has a long tradition that is deeply rooted in the pastoral mission of the Maronite church in general and the Maronite Order of the Holy Virgin Mary (MOHVM) specifically, to spread education and knowledge to the Lebanese community, irrespective of religion and creed. The Lebanese Synod of 1736 had a great role in organizing and improving education in Lebanon. It initiated compulsory, free education for boys and girls before the French revolution and established the fundamentals and guidelines for teachers to follow in their teaching. In order to promote the understanding of other cultures, this Synod also introduced the study of foreign languages. What follows is a brief history of the establishment of NDU.

NDU started in 1978 as a joint venture between the Order and Beirut University College (BUC), now known as the Lebanese American University, under the name of the Louaize College for Higher Education (LCHE) with English as the language of instruction. The earned degrees were granted by BUC, in addition to dual degrees in engineering where students continued their degrees with other American Universities. In a broader outline, BUC was responsible for academic matters and LCHE was responsible for administrative matters.

Due to the Lebanese Civil War (1975-1990), the country was divided between Muslim and Christian regions with travel between these regions being both difficult and dangerous. Therefore, one of the reasons behind the establishment of LCHE was to provide access to higher education with English as the language of instruction in the Christian areas located north and east of Beirut. An increasing number of youth preferred to pursue their education in institutions following the American system of education or in the U.S.A., but the majority of English teaching institutions were located in the predominately Muslim area of west Beirut. Due to the high cost of education abroad and at times the security risks involved, the MOHVM in collaboration with BUC agreed to establish the LCHE in 1978 in a section of NDL. The ultimate goal of this cooperation was for the MOHVM to take full control of the established institution with the help of BUC and especially Catholic universities in the USA. The newly established institution moved after two years to a rented campus near NDL in January 1980.

From the beginning the founder of LCHE, Father Bechara Rai (now Patriarch of the Maronite Church), sought to have an administrator from an American Catholic University in order to develop the academic programs so that the degrees granted by LCHE would be accepted by American institutions of higher education. So the idea of accreditation by an American institution is not new. In 1987, the President of the Lebanese Republic granted the Order the right to operate an independent University and thus Notre Dame University-Louaize was born in Zouk Mosbeh, Lebanon. In 1998, on land owned by and adjacent to the Louaize Monastery, a new, modern campus was inaugurated. In addition to the Main campus in Zouk Mosbeh, NDU operates two other campuses, one in Barsa, North Lebanon (established in Chekka, North Lebanon in 1994 and moved to Barsa in 1999) and the second in the Shouf region in the town of Deir El Kamar (established in 2001). Notre Dame University-

Louaize (NDU) has been granted Candidate for Accreditation status by the New England Association of Schools and Colleges, Inc. through its Commission on Institutions of Higher Education. In addition, the Faculty of Engineering undergraduate degree programs have been officially and fully accredited by the Engineering Accreditation Commission of ABET, the global accreditor of college and university programs in applied science, computing, engineering, and engineering technology.

II- Establishing the CLIMAP Minor at NDU

After the successful implementation of the Tempus Project "Reorient University Curricula to Address Sustainability (RUCAS)" at NDU (2010-2013) where faculty members from various disciplines embedded Education for Sustainable Development into the curricula and teaching methodologies, NDU was successful in getting a European fund for a new project on Climate change and Sustainability Policy (CLIMASP). This project may be viewed as a continuation to the efforts in RUCAS. Towards the end of 2013, NDU was informed of the selection process following the last Tempus call for proposals that has been published by the Education, Audiovisual and Culture Executive Agency, Brussels. Accordingly, NDU is partner in the CLIMASP project which also involves the Lebanese American University (LAU) as a partner from Lebanon, as well as other partners from Greece, Germany, Cyprus, Egypt and Jordan.

It is widely recognized that the Earth is getting warmer and it will continue to do so in the future, creating a wide range of impacts that include sea-level rise, extreme weather conditions, seasonal changes, droughts, and heat waves. The key question that is often posed is: *how fast and how severe the impacts will be and whether we can adopt policies for mitigating and adapting to these impacts?*

Despite minor controversies, climate change is the greatest long-term challenge facing human development. It is one of the most pressing issues affecting all mankind and natural environment in today's world and it needs to be addressed at every level and in all sectors of society. It is not just our biggest environmental, economic and social challenge; it is also a cultural challenge that raises ethical questions. Much of the discussion around climate change is about reducing carbon dioxide emissions, but preparing for the effects of climate change is just as critical. Accordingly, all kind of specialists in sectors such as education (formal and non-formal), engineering, economics/business, health, agro-forestry, law and politics, need to be ready to tackle the climate change challenges. This will necessitate being equipped with climate change and sustainability policy knowledge, skills, attributes and competences to minimize threats and maximize opportunities for climate change adaptation. With recent projections suggesting that climate impacts could be even more severe than previously predicted, it is urgent for policy makers, planners and managers in the public and private sectors, as well as the civil society to understand and assess potential climate impacts in policy and decision making.

In all the Partner Countries involved in this project, environmental protection- including climate change- is prioritized. Climate change is an interdisciplinary field that fits into various academic disciplines nationally and regionally. Through multi-stakeholder driven climate change curricula responsive to societal needs; involvement

of university staff and other stakeholders in the development of an interdisciplinary program in each partner university, the CLIMASP minor plays an integral part to existing undergraduate academic degrees in disciplines like education sciences, applied sciences, engineering, social sciences and economics/business sciences. The focus of the interdisciplinary minor is that it addresses the issue of climate change and sustainability policy from an environmental, social, economic, cultural and political perspective, with national, regional and global references.

In order to tackle the urgency of the climate change impacts, the higher education institutions (HEIs) in the partner countries realize that developing interdisciplinary learning, curricula and student-centered approach to teaching is a priority. The wider objectives of the of the CLIMASP project are *to transform current unsustainable practices with respect to interdisciplinary collaboration and promote interdisciplinary climate change curricula in the partners' countries universities*. The specific objectives are to:

1) Develop and implement capacity-building workshops for building interdisciplinary and multi-stakeholder driven climate change curricula responsive to societal needs;
2) Develop an undergraduate interdisciplinary program on climate change and sustainability policy (CLIMASP) in each partner country university;
3) Involve university staff and other key stakeholders (e.g., students, professionals) in the development of the program in each partner country university;
4) Integrate, implement and assess the CLIMASP program as an integral part to existing undergraduate academic degrees in disciplines like education sciences, applied sciences, technical sciences, economics/business sciences, humanities and social sciences; and
5) Contextualize the Euro-pass supplement diploma in the partner countries' universities and the Arab region.
6) Develop a Center for Integrative and Interdisciplinary Studies with an ICT Laboratory in each of the 10 partner Universities to support CLIMASP and promote interdisciplinary curricula as well as the establishment of an International Network of CLIMASP Studies.

III- CLIMASP PROJECT IN RELATION TO NDU MISSION

The Interdisciplinary Minor on Climate Change and Sustainability Policy (CLIMASP) supports the NDU mission by a commitment "*to provide comprehensive quality education that fosters excellence in scholarship, lifelong learning, enlightened citizenship, human solidarity, moral integrity, and belief in God. In designing its curricula, NDU is committed to the philosophy and standards of the American model of liberal arts education. Conceiving itself as an authentic academic community, NDU promotes diversity, respect for human dignity and rights, and concern for the common good. Its profound aspiration is to prepare its students to be future leaders who can exercise reason upon knowledge and shape a world of truth, justice, love and freedom*".

Higher Education plays a critical role in contributing to sustainable societies. The concept of green campuses as well as green cities is on the rise and taking a good path. This is line with the role of the university that prepares professionals who

develop, lead, manage, teach, work in, and influence society's institutions. As the Arab region is one of the most vulnerable regions to the impacts of climate change, HEIs recognize the urgency for preparing students to tackle these impacts. The CLIMASP minor aims to integrate and implement an interdisciplinary course of study as an integral part to existing undergraduate academic degrees in disciplines such as economics, business, natural and applied sciences, engineering, education, and social sciences.

The intent of the minor is to advance an academic understanding of contemporary climate change and sustainability issues and address their complexities. Faculty members, students and civil society groups will be able to share knowledge, explore links between climate change research in different academic disciplines, as well as develop an understanding of how research and curriculum improvement could create synergies that help addressing societal challenges in the Arab region. The NDU mission clearly states that the University promotes *concern for the common good.*

Climate impacts are "common" impacts to Lebanon, to the region and even to the world; thus the CLIMASP minor is vital to social development, as well as economic and environmental sustainability. Through the structure of the minor, students and academics from the different disciplines will come together to reinforce mutually beneficial dialogues and knowledge. The curriculum of the CLIMASP minor is designed to enhance students' interests in climate change and enrich their skills in adaptation and planning policies at the national, regional and global levels.

In addition, the minor gives the students the opportunity to earn a formal credential (Euro-Arab Pass Diploma) in climate change and sustainability policy in addition to the Bachelor's degree granted by the university. The minor consists of core courses, elective courses and a required capstone course in three concentration areas:

- Climate Change, Environment and Society;
- Climate Change, Economics and Public Policy; and
- Climate Change, Science and Technology.

The courses included in the minor are an integral part of the participating disciplines curricula. It is, thus, an advantage for students seeking a meaningful and rewarding complement to their main field of study.

IV- SETTING THE CONTEXT (After RUCAS / Before CLIMASP)

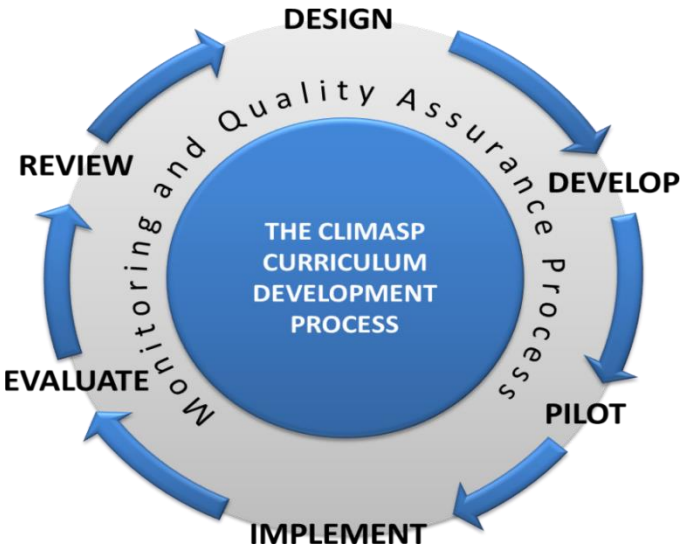
Actions	*Description*	*Objectives/Activities*
Advocacy and communication (ESD publications, brochures, media and dedicated webpages…)	NDU Chronicle and NDU Spirit: articles to describe the achievements of ESD activities	Detail the achievements of ESD at NDU and disseminate the results to the NDU community Discuss and reflect on the revised syllabi Dissemination to the NDU community
Consultations, seminars, workshops, meetings, conferences on ESD	• Training workshops in Lebanon, Egypt and Jordan • Conference in Crete on ESD • Exchange of expertise with various European and Arab partners	Train faculty members on infusing sustainability issues in courses Introduce faculty members to the teaching methods, concepts, principles, processes and practices in ESD and Curriculum Design and Revision for Higher Education. Initiate the RUCAS Community of Practice as a tool for communication, resource and support in the process of curriculum revision and design.
Partnerships and networks on ESD	Partnerships with other European and Arab institutions to Address Sustainability	Exchange of ideas and training staff members on ESD
Research, Development and Innovation (research programs, projects and centers)	• Peer-reviewed research articles on ESD were written by faculty members • Submission of new proposal to the EU on establishing an undergraduate degree with a minor on ESD	• Establishing the virtual center as a platform for Curriculum Reform and Professional Development to communicate on ESD with other universities. • The university administration at NDU is considering initiating a center / institute for sustainability at the university
Capacity-building and training, including development of ESD resources and educational materials (programme, degrees, scholarships)	• Undergraduate program in Environmental Science (Faculty of Sciences) • Development of an interdisciplinary Master degree in Sustainable environmental Management	The programs provide students with solid education in advanced theoretical and empirical fields related to life sciences, engineering, economics and political science. A qualitative instrument was used to identify the ways that university teachers understand sustainability within their own disciplines Many university teaching staff were involved in capacity building. This activity provides a reliable basis for curriculum reform to follow-up. University teachers' perceptions of and readiness to embrace sustainability within their respective disciplines was studied. This outlines the knowledge, skills, attitudes and competences required (in terms of ongoing professional development undertaken by university teachers) to enable the integration of ESD in HE curricula.

Student engagement	Survey students on ESD competences, attitudes and actions towards ESD Practicum assignment where students engage in community service work Many students were involved in the survey to engage them in ESD	Carried out a curriculum analysis to examine how and to what extent sustainability problems and principles of ESD are represented in the guidelines and study programs at NDU Practicum experiences were designed by faculty members and provided to students participating in the revised courses so that coursework and experience are integrated for skill development. The practicum can be seen as short-term supervised work experience, offered as part of the revised curriculum and carried out during the implementation of the course. Coursework related practicum experiences are infused in coursework adopting project-based methodologies in which skills taught are applied in field experiences. The overriding goal is to provide students the opportunity to acquire, apply, and consolidate the revised course competencies using project-based and service learning approaches
Monitoring and Evaluation, including indicator for progressing SD your institution	Student survey to assess ESD competences Qualitative instrument to study the readiness of faculty members to address ESD issues Research papers related to ESD	The curricula were evaluated with respect to the kind and the extent to which the following aspects are specified: (1) sustainability themes (reflecting the four SD dimensions-environmental, social, cultural and economic); (2) goals of education for sustainable development; (3) competencies to be developed, (4) teaching methods (e.g., interdisciplinary approaches; reflection of values; action oriented education), and (5) forms of evaluation.
Other , please specify: 1.ESD curriculum design Toolkit 2.Strategic Plan for Sustainability	1. The ESD-CD Toolkit is developed to train and support academic staff in infusing ESD in their teaching practice and courses. It has an e-learning modular structure to address disciplinary, inter-disciplinary and multi-disciplinary curriculum reform. It reflects the validated framework of ESD competences for students as well as the research results from staffs' readiness to address sustainability. It also reflects the ESD contextual issues faced in the Arab region as well as the global ESD issues shared with the EU. Among these issues are: climate change, water management and conservation, energy, human rights, health and general environmental issues 2. The RUCAS Strategic Plan for Sustainability aims to promote the institutionalisation of sustainability in the university. It aspires to act as a guide and resource to its partner institutions in their efforts to contribute to social and economic justice; ecological integrity; and the well-being of all living systems on the planet. A Strategic Plan for Campus Sustainability is a decisive step towards the transformation to a sustainable university. 3. Review the actions to be taken at the policy level to integrate sustainability into the university mission, faculties and other university structures. NDU set up goals and objectives across all the seven key areas of campus sustainability: • Policy & Planning/Incentives & Rewards • Education, Outreach & Service to Society • Energy, Waste and Water • Buildings, Land & Transportation • Food & Dining, Purchasing & Procurement • Widening Access, Health & Wellbeing • Good Governance and Accountability	

V- THE CLIMASP CASE AT NDU

V-1. Developing CLIMASP Curriculum

The curriculum development process for the interdisciplinary CLIMASP programme incorporated six stages: 1) design, 2) develop, 3) pilot, 4) implement, 5) evaluate and 6) review through a cyclical and interlined process. The conceptual and methodological framework applied throughout the process is depicted in the figure below.



The Design Stage

One of the main objectives of the first CLIMASP National Workshop held on17-18 March 2014 at NDU campus in Zouk-Mosbeh was to engage various stakeholders from different interests and perspectives and involve them in identifying the competencies needed to address climate change challenges. Building interdisciplinary and multi-stakeholder steered climate change curricula help address the societal needs due to the climate change problem. The workshop involved participants to discuss the processes and practices for the stakeholders' involvement in the CLIMASP program and to identify and analyze the barriers and drivers of stakeholders' inputs to interdisciplinary curriculum development. The workshop aims to promote the interdisciplinary nature of climate change.

The networking event brought together industry professionals with researchers, academics and civic society to reinforce mutually beneficial partnerships through a dialogue among stakeholders in different thematic areas of expertise. The stakeholders included academics and university teaching staff- invited from both NDU and the Lebanese American University (LAU), government officials such as : Ministry of Environment of Lebanon/ UNDP, Lebanese Agricultural Research Institute (LARI); civil society groups e.g. the Civic Influence Hub, as well as NGOs, students, and other associations that have environmental and socio-economic interests. Also, a trainer from Frederick University in Cyprus attended the workshop.

Participants shared their knowledge, explored links between climate change research in different academic disciplines, as well as developed an understanding of how research and curriculum improvement could create synergies that help addressing societal challenges in Lebanon and in the region. This is vital to social development, as well as economic and environmental sustainability. Stakeholders became part of the curriculum design process in investigating the capabilities and conflicts of interests related to climate change. Thus, stakeholders were interviewed using a *Survey Reporting Template* based on a thorough literature review of studies on climate change with special reference to the MENA region. The questions collect information about the interdisciplinary perspectives of the climate change impacts in Lebanon, and the specific needs of the country's economy, governance, and education. The survey template included the main issues and key training needs suggested by the interviewers to tackle the climate change problem. They were asked to identify the competencies, barriers and drivers of their inputs. This process has led to the development of a list of competencies and guidelines for strengthening stakeholders' inputs in the CLIMASP curriculum development.

Activities carried out during this stage are*:*

- ✓ Identify and analyze barriers and drivers of stakeholders inputs to interdisciplinary CLIMASP curriculum development
- ✓ Complete stakeholders' survey for CLIMASP competences. Relevant stakeholders for CLIMASP have been identified, strategies have been developed on how to engage stakeholders, and identify climate change threats and opportunities related to different sectors as well as required competences of CLIMASP students.
- ✓ Develop guidelines for strengthening stakeholders' inputs in the CLIMASP curriculum development and implementation.

The survey included various thematic areas mainly related to climate change adaptation, mitigation, and cross-cutting interventions. The survey questions dealt with the stakeholders' responsibilities and involvement in policies and in their perceptions of the role of higher education institutions. Survey questions targeted different priority areas and identified training needs to tackle the issues identified in each thematic area**.** *They attempt to answer the questions of:*

- ✓ how can we cope with the impacts of climate change (adaptation),
- ✓ how can we limit future climate change (mitigation).

Data collection of the survey on stakeholders involvement was done during the first national workshop (held on 17-18 March 2014 in NDU main campus in Zouk-Mosbeh, Lebanon). *The main objectives were:* to engage various stakeholders and involve them in identifying competences needed to: 1)address the climate change programs; 2) to present the key points of the survey and how the results contribute to the development of the CLIMASP curricula. Involving stakeholders help gather information and spot trends that may impact the project activities. It improves transparency and builds trust among individuals and groups whose support is critical to the project success. Strengthening the involvement of various stakeholders help establish innovation and organizational change needed to meet new challenges and opportunities.

Participants agree that climate change is a complex topic that requires interdisciplinary perspectives from teams of different expertise and interests. Thus, during this workshop, the stakeholders' participation is a promise that they will actively contribute to the project. Their participation promotes sustainable decisions by communicating the needs and interests of participants, including decision-makers. It facilitates the involvement of those potentially affected by or interested in the decisions. Their participation also provides other participants with information they need to participate meaningfully and communicates to them how their input may affect the project.

Main questions discussed with stakeholders:

- ✓ Why climate is a cross-cutting issue?
- ✓ What is their field of expertise and how that can relate to climate change?
- ✓ How their discipline can benefit other disciplines?
- ✓ Why a business student (for instance) would take the option to attend a course on climate change offered by the Faculty of engineering (or vice versa)?
- ✓ What kind of competences students from engineering, business, sciences, and policy need?
- ✓ How can academics, civil society groups, NGOs and government agencies work together to meet the needs of the market?

Each individual representing an organization was asked to answer the questions either through interviewing or by E-mail.

Analysis of Stakeholders' Survey: Major Priority Issues: Climate Change Adaptation

- ✓ Lack of awareness of the main causes and consequences of climate change
- ✓ Poor research related to local knowledge to develop climate adaptation strategies
- ✓ Difficulty in estimating GHG emissions and inaccuracies in anticipating the impacts of climate change
- ✓ Lack of communication between academic institutions, government agencies and NGOs
- ✓ Lack of public involvement in risk management strategies
- ✓ Weak link between biodiversity conservation, ecosystem services and climate change at local level
- ✓ Poor water resource management and lack of management of renewable energy resources
- ✓ Lack of knowledge at the local level for farmers, especially in the rural areas, to make proper planning decisions in response to climate change
- ✓ Poor waste and pollution management
- ✓ Marine and Coastal environment: corruption that leads to privatization of coastal zone
- ✓ Absence of urban planning and proper EIA for built infrastructure
- ✓ Non availability of local GIS data for public use and educational purposes

Analysis of Stakeholders' Survey: Major Priority Issues: Climate Change Mitigation

- ✓ Deforestation and forest degradation is a major source of GHG emissions
- ✓ Waste and pollution Management: Considerable emissions during transportation and treatment of waste and wastewater
- ✓ Hydrology and water resources monitoring: Lack of systematic data to depict statistically significant patterns in water quantity and/or quality

- ✓ Reluctance of research institutes to share their data with the public
- ✓ Carbon footprint analysis: Lack of awareness
- ✓ Abundance of incompetent/corrupt environmental consultants.
- ✓ Lack of high-tech monitoring expertise – especially in air pollution control.
- ✓ Poor implementation and environmental compliance

Key training needs suggested by stakeholders to address climate change:

- ✓ Design activities and course material that aim to mainstream issues related to climate change and sustainability into University curricula.
- ✓ Include local knowledge in the training material to help solve problems.
- ✓ Need to collect knowledge gained about climate change to be used in classrooms.
- ✓ Strengthen the cooperation between stakeholders to address the issue of the impact of climate change on biodiversity and conservation
- ✓ Research is needed to identify key problems and solutions related to the effect of climate change on the livelihoods of farmers, especially those living in rural areas.
- ✓ Encourage the sustainable use of forests
- ✓ Incorporating climate change into policies, strategic plans, laws, budgets, and project planning
- ✓ Estimate climatic impacts on the physical, biological and socio-economic environments
- ✓ Research projects on risk assessment and management, acquire analytical skills, Remote sensing and GIS, statistics with computer skills for modelling climate change impacts
- ✓ Manage water resources and wastewater treatment
- ✓ Energy efficiency and renewable energy resources
- ✓ Risk assessment of loss of marine biodiversity due to pollution and coastal erosion
- ✓ Integrated coastal zone management
- ✓ Infrastructure and built environment: Research and design related to green roof, bio-retention cells, and various approaches to reduce runoff and possibly recharge the groundwater
- ✓ Waste Pollution and Management: Anaerobic treatment methods with biogas recovery and Zero-waste concept and applications
- ✓ EIA and Environmental compliance: Ethical obligations
- ✓ Assessment of the cost of environmental degradation
- ✓ Raise public awareness
- ✓ Explore the institutional context in which the community operates and identify appropriate institutional partners for adaptation

The Development Stage

Interdisciplinary courses were developed by the NDU CLIMASP team during that stage. The Design team worked on mapping the interdisciplinary courses according to CLIMASP three concentration areas: Climate Change, Environment and Society / Climate Change, Economics and Public Policy / Climate Change, Science and Technology. Courses were structured into core courses, capstone course, and electives. The syllabi and modules were developed and revised according to the CLIMASP Toolkit designed by the project coordinator. When revising and reviewing the courses, the team adopted the CLIMASP approach through establishing relevance, bridging course content to current climate change issues and showing the relevance of the course to other disciplines. Internal and external peer-reviewing as

well as inter-institutional cooperation were made to provide feedback and suggestions to the authors of the courses' syllabi and modules at NDU for improvement. Course revision was carried out applying the course syllabus and course module review templates provided by the project coordinator. As such, 24 syllabi (some new) and modules were developed by the NDU team and were revised by faculty members from faculty members from Jordan. Also, NDU team peer reviewed course syllabi by Aswan University. The courses received were distributed to the faculty members at NDU according to the subject of the courses, and the professors' specialty. The peer-reviews were presented at the First Regional Training Workshop. The framework of course mapping and the structure of the minor were discussed during the first regional workshop.

The Piloting Stage

The results of the peer analysis with regard to the courses content and pedagogical approach were presented and discussed during the First Regional Workshop held in Jordan on October 25-27, 2014, and hosted by The University of Madaba, The University of Jerash, The University of Jordan, and The Hashemite University. Staff members from the partner universities from Jordan, Egypt, Lebanon, University of Crete, Germany, and Cyprus, together with representatives from the consortium members: JES, EFE, and EBWA attended the workshop. University staff from all partner institutions presented the results of reviewed courses' syllabi and modules that were developed by their partner faculty members. NDU faculty members of the CLIMASP project at NDU participated actively in the workshop.

Pre-test and post-test surveys were administered to students. Data analysis to monitor the quality of the course content and the pedagogical approach was done. In addition, clear guidelines and templates that describes the objectives and the expected outcomes of national and Regional Workshops organizations we used. Indicators of progress have been developed, including: appropriate and timely feedback; whole-institution approach to sustainability; use of assessment surveys; number of the teaching staff trained; number of syllabi developed and implemented, etc. In addition, internal and external assessments have been carried out. The internal assessment was based mainly on peer-reviews carried out by experts from the CLIMASP consortium. The external reviews were carried out by an international expert from Dublin City University.

The piloted courses were taught during the second semester of the academic year 2014/2015. In order to investigate the perceptions of the students toward interdisciplinary teaching and learning the CLIMASP courses, a survey questionnaire of Likert-type scale was administered to about 160 students at the beginning of the semester as pre-test and at the end of the semester, as a post-test. The results which revealed improvement in students' performance were discussed during the Third National Workshop held on Oct 26-28, 2015 in Lebanon.

The Implementation Stage

The main aim of this stage carried during the second semester 2015/2016 was to demonstrate the effective use of interdisciplinary learning and teaching, and allow

CLIMASP participating faculty members to observe and reflect on the teaching processes, methods and practices applied. About 15 courses were implemented.

To investigate the perceptions of the NDU students toward interdisciplinary teaching and learning of the CLIMASP courses, a survey questionnaire of the Likert-type scale was administered at the beginning of the second semester of the academic year 2014/2015, as a Pre-Test. The same questionnaire was administered to the same students at the end of the semester, as a Post-Test. The process was discussed during the Second Regional Workshop held in Nicosia, Cyprus on May 5-7, 2016. The survey questionnaire applied is an assessment instrument developed by Makrakis & Kostoulas-Makrakis (2015) based on experiential, constructivist and transformative approaches to sustainability education.

The Evaluation Stage

Evaluation was open before, during and after the implementation of the CLIMASP courses at different stages of the project. Thorough interventions during each stage helped improve the courses content and methodology. The courses' syllabi and modules were developed by the NDU team. The structure of CLIMASP minor syllabi and modules were initially revised by the CLIMASP team of University of Jordan, based on the developed peer-reviewing template. The results were presented at the First Regional Workshop in Jordan and reviewers offered comments and suggestions. Thus, the course structure and courses were modified accordingly. The syllabi and modules were submitted for the first external evaluation to Dr. Carmel Mulcahy of Dublin City University who provided suggestions through utilizing the CLIMASP External Assessment Rubric for Interdisciplinary Learning. The second external evaluation was performed by Professor Michele Biasutti from the University of Padova, Italy who suggested comments to improve the process.

The Reviewing Stage

Proper revisions during the evaluation stage enhanced the content and methods applied to all the courses syllabi and modules. Both internal and external evaluation provided data to demonstrate how the CLIMASP interdisciplinary courses can achieve the project set objectives. The CLIMASP toolkit was very helpful in revising the courses.

V-2. ACHIEVEMENTS of CLIMASP MINOR

The CLIMASP minor aims at providing undergraduate students the possibility to acquire knowledge of climate change issues and their effects on policymaking and explore strategic planning to mitigate the consequences of climate change. The curriculum of the minor is designed to provide undergraduate students from different majors the flexibility to select courses to enhance their interests in climate change and to enrich their major field of study with professional skills in climate change adaptation policies and planning. There are many reasons for a student to choose the CLIMASP Minor. These include:

- Could open significant career opportunities to student in any discipline,
- Provide student with more hands-on experiences,

- Could help student shape the future path,
- Enrich the student's major study programmes,
- Add depth and breadth to student's course of study.

NDU Faculties cooperated to prepare an interdisciplinary minor to give the opportunity for students to learn about climate change. *After completing the CLIMASP minor, students can:*

- Play a leadership role in climate change adaptation in their profession
- Demonstrate their understanding of the basic concepts, principles and debates related to climate change adaptation
- Acquire familiarity with a range of adaptation planning tools and be able to select the appropriate mix of tools in response to particular adaptation scenarios
- Be aware of the ethical framework and shared set of values that govern their everyday actions
- Develop core adaptation planning competencies and have an appreciation of climate change requirements associated with a number of sectoral/regional vulnerability themes
- Assess what local/national governments do in practice concerning CLIMASP and how this varies over time and between jurisdictions, what they ought to do and ought not to do, and what principles should guide decision making
- Explore and connect climate change issues with other issues such as poverty, social exclusion, gender equity, food and water security, migration, and human rights
- Adopt an intergenerational focus when dealing with climate change and sustainability policy issues
- Build people's voice in decision-making which affects their lives, social awareness and a sense of social solidarity, capacity to consider risks and consequences of climate change, and role as active citizens
- Demonstrate high-level capacity for critical enquiry in order to comprehend the complexity of climate change adaptation challenges; and demonstrate familiarity with systems-based approaches to climate change adaptation
- Integrate diverse bodies of scientific knowledge in climate change and sustainability policy, translate and communicate these to a diverse range of stakeholders
- Recognize, explain and connect the basic principles, concepts, theories, pertaining to the global climate change debate using appropriate scientific language
- Develop appropriate problem solving and service learning strategies for climate change adaptation and mitigation

The CLIMASP minor promotes five **key learning processes and outcomes**

1. Extends beyond the 4 Cs for 21st Century Success

A 21st century classroom must engage and energize all students to actively participate in building a more sustainable society. Thus, the CLIMASP minor goes beyond mastering the 4 C's - creativity, critical thinking, communication, and collaboration. Students will be prepared to grasp the skills of connectivity, critical consciousness, critical reflection, cross/inter-cultural competence, co-responsibility and constructing knowledge. All these skills are being highly recognized as the skills that CLIMASP

students should be prepared for tackling the complexity of climate change and sustainability policy.

2. Applies Problem-Based Learning To Teach 21st Century Skills

The increased complexity of the climate change and sustainability policy challenges drives us in preparing students to become inquirers, problem solvers, critical and creative thinkers. The CLIMASP minor provides students with improved strategies to help them deal with these very complex situations. Problem-based learning (PBL) is one such strategy that is employed throughout the CLIMASP curriculum and teaching methods.

3. Valuing Climate Change and Sustainability Policy

Every aspect of climate change is shaped by ethical dispute and covers an array of fields: moral philosophy, science, economics, public policy, global justice, energy, and human rights, among others. Applying a values-based and PBL approach, the CLIMASP minor prepares students to comprehend and further explore the intersections of science, ethics, values, as well as climate change and sustainability policy.

4. Learning how to "Transformatively" Adapt

Transformative learning in a climate change context involves climate risk negotiation, identification of vulnerabilities, and both proactive and reactive adaptation. The CLIMASP minor prepares students to learn how to transformatively adapt to the climate change vulnerabilities by seeking out relationships that will help them deconstruct their frames of reference, habits of mind, and unsustainable practices.

5. Merging Theory with Praxis

The CLIMASP curriculum blends classroom learning with experiential, constructivist and transformative practices, incorporating critical self-reflection, argumentation, community service, civic engagement and practicum placements. It adopts a critical pedagogy of sustainability that involves inter- and transdisciplinary engagement with students and community members in an effort to involve students in the process of sustainable thinking and action. In that way, it helps students experience the synergies of the 3Hs- head (cognition), heart (ethics and sentiment) and hand (praxis).

V-3. NDU Suggested CLIMASP Minor Requirements and Structure

Minor Requirements

To satisfy the requirements for the CLIMAP minor, the student must complete a minimum of 45 – 60 ECTS (27 – 36 credits), including 15 ECTS (9 credits) of a capstone course. The capstone course provides the necessary background and research experience to students planning to work in national and regional environmental management initiatives and ventures or pursue graduate degrees and indulge in scientific research.

The interdisciplinary CLIMASP courses will consist of core courses, elective courses, and the required capstone course in the three Concentration Areas, namely:

- CA1: Climate Change, Environment and Society
- CA2: Climate Change, Economics and Public Policy
- CA3: Climate Change, Science and Technology

The number of courses to be taken by undergraduate students choosing the CLIMASP minor, including the capstone course could be weighted between 45-60 ECTS[1] (1125-1350 and 1500-1800 Student Learning Hours, respectively). The individual courses will range between 3-5 ECTS, but in some universities it may reach up to 10 ECTS.

Students are required to take 3 core courses from the 1st Concentration Area (CA). Such courses should be oriented to social, environmental, economic and cultural aspects of climate change. Students from the 1st CA have to take at least 2 courses from the 2nd CA and 2 courses from the 3rd CA, according to their preferences (electives). The capstone course will be equivalent of 15 ECTS (9 credits) that will focus on an independent study/internship. Students will choose the concentration area upon which they want to work for an independent study/internship that merges theory with praxis, applying problem-based learning and service learning methodologies.

Climate Change, Environment and Society	Any 3 courses from CA1
Climate Change, Economics and Public Policy	Any 2 courses from CA2
Climate Change, Science and Technology	Any 2 courses from CA3
Capstone course	15 ECTS (9 credits)

Upon completion of the minor along with their major, students will be granted **the Euro-Arab Pass Diploma** provided they complete from 45-60 ECTS in relevant topics. It *is suggested that courses taken for the Bachelor degree of the student may count towards fulfilling the CLIMASP components of their programs of study.*

Minor Eligibility

The CLIMASP minor is interdisciplinary. There are no special admission requirements for NDU students except for a satisfactory GPA (as per NDU regulations). Students can enrol in the minor during their second year of study. Though four faculties (Faculty of Business Administration and Economics, Faculty of Natural and Applied Sciences, Faculty of Engineering, and Faculty of Law and Political Science) participated in the CLIMASP project, the minor is open to any student from any NDU faculty.

[1] 2 Credit Hours per week = 3 ECTS
- 3 Credit Hours per week = 5 ECTS

- 3 ECTS Course (75-90 Student Learning Hours): 20-30 hours of class sessions; 45-70 hours of learning activities outside of class.
- 5 ECTS Course (125-150 Student Learning Hours): 30-40 hours of class sessions; 85-120 hours of learning activities outside of class.

Suggested Structure and Courses

After thorough the deliberations of the project partners during different national and regional workshops and meetings, it is suggested that the structure of the CLIMASP Minor at NDU shall be according to the following:

Core Courses (Required)

Course Code	Title	Nb. of Credits	Department	Faculty	Concentration Area
ENS 201	Introduction to Environmental Science	3 cr.	Environmental Science	FNAS	Climate Change, Environment and Society
ENS 205	Environment, Society and Ethics	3 cr.	Environmental Science	FNAS	Climate Change, Economics and Public Policy
BAD 431	Ethics in Business	3 cr.	Management and marketing	FBAE	Climate Change, Economics and Public Policy

Courses in Concentration Area 1

Course Code	Title	Nb. of Credits	Department	Faculty
PAD 421	Fiscal and Budgetary Policies of Lebanon	3 cr.	Government and International Relations	FLPS
BAD 429	Operations Management	3 cr.	Management and Marketing	FBAE
ECN 439	Economics of Developing Countries	3 cr.	Accounting, Finance and Economics	FBAE
IAF 239	Elements of Globalization	3 cr.	Government and International Relations	FLPS
TTM 326	Domestic Travel and Tourism Development	3 cr.	Hospitality and Tourism Management	FBAE

Courses in Concentration Area 2

Course Code	Title	Nb. of Credits	Department	Faculty
BAD 428	Global Logistics, Supply Chain Strategies and Sustainability	3 cr.	Management and Marketing	FBAE
ECN 333	Managerial economics	3 cr.	Accounting, Finance and Economics	FBAE
ECN 434	Environmental and Natural Resource Economics	3 cr.	Accounting, Finance and Economics	FBAE
ECN 444*	Climate Change Economics and Sustainability Policy	3 cr.	Accounting, Finance and Economics	FBAE
LAW 264	Environmental Law	2 cr.	Law	FLPS
IAF 401	Public International Law	3 cr.	Government and International Relations	FLPS
POS 201	Introduction to Political Science	3 cr.	Government and International Relations	FLPS
PAD 312	Regulatory Politics	3 cr.	Government and International Relations	FLPS

Courses in Concentration Area 3

Course Code	Title	Nb. of Credits	Department	Faculty
BIO 324	BIO 314 Ecology	3 cr.	Sciences	FNAS
BIO 314	Plant Physiology	3 cr.	Sciences	FNAS
CEN 461	Water Pollution control and treatment	3 cr.	Civil and Environmental Engineering	FE
CEN 462	Environmental Engineering	3 cr.	Civil and Environmental Engineering	FE
CEN 560	Air Pollution Engineering	3 cr.	Civil and Environmental Engineering	FE
CEN 262*	Environmental Remote Sensing and GIS	3 cr.	Civil and Environmental Engineering	FE
CEN 466*	Environmental Pollution and Control	3 cr.	Civil and Environmental Engineering	FE
MEN 518	Renewable Energy Systems	3 cr.	Mechanical Engineering	FE

*New courses that will be submitted for approval

Note: All these courses have been revised by the CLIMASP team at NDU and they have undergone two external reviews during the years 2015-16 (The first review was done by an expert from Dublin City University in Ireland, and the second by an expert from the University of Padova in Italy).

Courses Description

Core Courses

ENS 201 Introduction to Environmental Science (3.0); 3 cr. Introduction to the basic environmental global problems facing the Earth with emphasis on pollution and the use of energy resources. *Prerequisite:* Sophomore Standing.

ENS 205 Environment, Society and Ethics (3.0); 3 cr. Introduction to the environmental goods and services. Impacts of population growth and economic development on the environment, the evolution of societies, community organizations and the quality of life are presented. Special focus is given to the value types and existing moral relationships between human beings and their environment, environmental ethics views, their evolution and effects on the environment and wildlife protection. Sustainability principles and the impacts of international policies, environmental management worldviews and legally binding agreements on natural resources, societies and the world's economic balance are emphasized.

BAD 431 Ethics in Business (3.0); 3 cr. A practical rather than philosophical approach to the ethical dimension of business actions. The course deals with the ethical problem and dilemmas of individuals, managers, and organizations. *Prerequisite:* Senior Standing.

Courses in Concentration Area 1

PAD 421 Fiscal and Budgetary Policies of Lebanon (3.0); 3 cr. A study of the budgetary process from a legal and economic perspective. Topics include, among others, the public debt, taxation, and financial policy.

BAD 429 Operations Management (3.0); 3 cr. Introduction to the concepts, techniques and methodology of modern operations management. Topics covered include: forecasting; production planning and scheduling; facility location and layout; quality control; productivity; inventory systems; process design; maintenance and reliability. Prerequisite: Senior Standing

ECN 439 Economics of Developing Countries (3.0); 3 cr. A study of the economics of developing countries. Topics covered include: meaning of underdevelopment; historical patterns of economic change in the developing countries; population problems; obstacles to development; role of industry and agriculture; inequality of income and wealth distribution; economic planning; foreign aid and indebtedness. Prerequisites: ECN 211, ECN 212

IAF 239 Elements of Globalization (3.0); 3 cr. This course analyzes the multitude of factors that have increasingly been leading to the phenomenon of globalization in the international system: political, economic, technological, communication, cultural, organizational, financial, legal, and structural/ political among others. The course focuses on case studies in the various dimensions of globalization worldwide, and on directed individual and group research.

TTM 326 Domestic Travel and Tourism Development (2.2); 3 cr. The course provides a complete description and geography of domestic tourism from the view-point of the traveler and the travel/tourism entrepreneur. Students will gain a solid practical understanding of local travel and tourism development, and potentials from a specific destination and potentials. Field trips and projects are part of this course. *Junior Standing*.

Courses in Concentration Area 2

BAD 428 Global Logistics, Supply Chain Strategies and Sustainability (3.0); 3 cr. The main objective of this course is to explore how companies define and manage supply chain strategies in globally networked economies by relying on a network of suppliers and customers to provide products and services. Just-In-Time Delivery (JITD), Build-To-Order (BTO) business models, Vendor-Managed Inventory (VMI), and outsourcing strategies are pervasive in current economies thus presenting complex problems that require new tools and novel approaches to address them. This course combines a study of concepts and tools with case studies culminating in a project whereby students will address a business problem related to logistics efficiency for a company of their choice. This course will address issues facing global supply networks and the transition from product suppliers to service suppliers including the concept of sustainability and its role in Supply Chain Management. Case studies will cover multiple industries such as electronics and high tech (EHT), pharmaceuticals, apparel, consumer packaged goods (CPG), fast moving consumer goods (FMCG), and retail. The classes involve discussions emphasizing issues in

logistics and supply networks and how to Make a business case for sustainable SCM using typical concepts and practical examples.

ECN 333 Managerial Economics (3.0); 3 cr. Application of economic analysis to business problems. Topics covered include: risk analysis; theory of consumer choice; estimation and analysis of demand, production and cost functions; forms of competition; pricing techniques; profits; game theory. Prerequisites: ECN 211, STA 206 or STA 210.

ECN 434 Environmental and Natural Resource Economics (3.0); 3 cr. An introduction to the natural resource and environmental economics, and sustainable development. Topics covered include: introduction to resource and environmental economics; ethical foundations of environmental economics; economic concepts and analysis for examining natural resource use; the valuation of environmental resources; the population problem; sustainability and sustainable development; depletable, recyclable, non-recyclable, replenishable, storable, renewable and reproducible resources; the efficient and optimal use of environmental resources; the economics of pollution and pollution control policy; international and global environmental pollution problems. Prerequisites: ECN 211.

ECN 444 Climate Change Economics and Sustainability Policy (3.0); 3 cr. Introduction to the complex world of climate change economics and sustainability policy. Environmental issues are inter-related in complex ways and have important ethical, political, economic, social and technical dimensions. This course examines how human decisions affect the quality of the environment; how human values and institutions shape our demands for quality improvement; and, how to design effective economic and development policies to bring about these improvements.

LAW 264 Environmental Law (2.0); 2cr. This course examines Lebanese and Comparative Environmental Law and serves as a useful introduction both to the particular complexities of Environmental Law and to the skills necessary in mastering any complex area of regulation. The first part of the court considers the character of environmental disputes, the problems inherent in fashioning legal rules for their resolution, and the history of the emergence of modern comparative Environmental Law. The second part of the course reviews several specific Lebanese and comparative environmental statues. All the statues serve as illustrations of the different regulatory approaches to environmental problems: "command and control," information disclosure, and market-based instruments.

IAF 401 Public International Law (3.0); 3 cr. A study of the sources of Public International Law and its application in interstate relations.

POS 201 Introduction to Political Science (3.0); 3 cr. Covers the basic concepts in political science. *Prerequisite:* ENL 107

PAD 312 Regulatory Politics (3.0); 3 cr. Studies the development and implementation of governmental policies regulating business activities, consumer and labor.

Courses in Concentration Area 3

BIO 314 Ecology (3.0); 3 cr. Principles of ecosystems; the interaction of organisms & their environment. Food web, energy flow & nutrient cycling in ecosystems. Factors which affect the distribution & abundance of species: Wildlife resources & extinction. *Prerequisite:* BIO 212, also listed as ENS 303.

BIO 324 Plant Physiology (3.2); 4 cr. Basic principles of plant physiology; the physiological processes of green plants and the effect of the environment on these processes. *Prerequisites:* BIO 212, BIO 227.

CEN 461 Water Pollution control and treatment (3.0); 3 cr. Fundamental principles and engineering application of physical, chemical, and biological processes (like sedimentation, filtration, coagulation, flocculation, membranes, aerobic, anaerobic biological processes) are discussed. *Prerequisite:* CEN 462 or instructor's approval.

CEN 462 Environmental Engineering (3.0); 3 cr. Quantitative evaluation of the environmental, economic, and technical problems involved in control of pollutants of the air, water, and land. Prerequisite: MEN 215.

CEN 560 Air pollution Engineering (3.0); 3 cr. Characterization of sources, emissions, transport, transformation, effects, and control of air pollutants. *Prerequisite:* CEN 462, or instructor's approval.

CEN 262 Environmental Remote Sensing and GIS (3.0); 3 cr. Introducing the concepts, science, and theory of geographic information systems (GIS) and remote sensing (RS) technology with their various environmental applications while having a hands-on computer experience to stress the critical concepts.

CEN 466 Environmental Pollution and Control (3.0); 3 cr. Concepts and principles to identify and control water, air and noise pollution. This course also provides knowledge on solid waste and hazardous waste management, and the effects of pollution to general health.

MEN 518 Renewable Energy Systems (3.0); 3 cr. Renewable energy resources and systems: Solar energy, wind energy, geothermal energy, biomass, etc. Applications in buildings and power generation. *Prerequisite:* MEN 310.

Capstone Course (15 ECTS)

The capstone course enables students to apply and synthesize the material learned in other courses, develop expertise on a specific topic related to the student concentration; work closely with experts in the field of study; and advance professional recommendations and solutions for implementation of climate change and sustainability policy. In the semester prior to conducting the capstone course, students must identify a project topic and a faculty advisor who is both familiar with the selected topic and willing to guide and oversee the project. The student can also have a co-advisor from the student's place of work or any expert with appropriate credentials. Course topics can be faculty or student initiated. Faculty members can

post project topics for students to select from or receive project proposals from students. The project work can be individual or group project as approved by project advisor and program coordinator. Formal proposals must be submitted at least two weeks prior to the start of the semester in which the project is to be completed. The proposal must be approved by the program coordinator prior to enrolment in the course. Students working to complete the Euro-Arab pass diploma need to complete a 15-ECTS project (Internship). The project takes place over the course of one-semester.

The relevance of the capstone course can be established both at the level of designing the capstone course and during its implementation. Through the review of the CLIMASP partner institutions, six essential strategies for establishing relevance were formulated:

1. Using real life examples (CLIMASP issues) drawn from the local environment and applying theory to practice, especially through problem-based learning and service learning methods (contextualisation).
2. Balancing, weighing and accommodating a variety of disciplinary perspectives (Curriculum integration/ interdisciplinarity).
3. Involving students in the process of setting objectives and learning outcomes (student-centered learning).
4. Aligning the instructional requirements/methods and curriculum standards with goals/objectives, students' learning styles, personal interests and experiences (aligning teaching, learning and curriculum).
5. Perceiving students as agents of change through enhancing their abilities to make a difference in their community and take a full role in society, locally and globally (active citizenship).
6. Involving key stakeholders in curriculum design, development and evaluation (participatory curriculum design).

By the completion of the capstone course, students will gain a fundamental understanding of alternative green technologies in their area of concentration and will be able to:

- Develop a case study of climate change and sustainable policy
- Integrate knowledge and use various streams of knowledge and skills acquired in various courses, and concentrations
- Describe the business requirements and success; and/or
- Critique past and current policy and codes.

The capstone course could include an internship component or professional experience through training in the execution of real-life climate change and sustainable policy problems and projects.

Milestone I (Week 2): Communicate with instructor to define project topic.
Milestone II (Week 6): Interim report
Milestone III (Week 10): Final report
Milestone IV (Week 11): Presentation

<u>Suggested grading</u>

Project Proposal	10%
Interim report	20%

Final Report	20%
Presentation	20%
Internship	30%

V-4. Specific Resources Needed

The CLIMASP Minor was initiated in the Fall 2016 semester and sufficient resources were made available for proper operation and implementation. These include:

Equipment: A Center for Integrative and Interdisciplinary Studies with an ICT Laboratory has been already established at NDU (*The Euro-Arab Center for Interdisciplinary Studies)*. This center will be the driver force for the institutionalization of the CLIMASP program and at the same time play a key role in promoting interdisciplinary teaching, learning and curricula. The Center will also be responsible for issuing the Euro-Arab Pass Diploma for the CLIMASP minor. *It is suggested that the CLIMASP minor program to be administered by the Center.*

Software: Necessary software should be ordered for case study modeling, projects, etc. when needed.

V-5. Strengths and Opportunities of the CLIMASP Minor

Contextualizing Teaching and Learning

Curriculum is an ongoing social process comprised of interactions among students, instructors, and with the environment where they live. The consideration of context in curriculum revision is related to using real life examples, drawing cases from current climate change issues, and local materials/examples. Contextualizing learning may help to break down the barriers between the different learning environments (university-community), creating a more conducive context to learning. Exploring current case studies, discussing local climate change and sustainability policy events through peer interaction, debate and dialogue are of critical importance to contextualizing teaching and learning towards CLIMASP. Such a practice can bring theory to real world, and provide the motivation necessary to inspire deep learning.

Curriculum Integration

A clear characteristic of a disciplinary-oriented curriculum is the focus on a strict interpretation of the concerned discipline and that no attempts are made for integrating other perspectives from different disciplines. On the contrary, an interdisciplinary-oriented curriculum deliberately brings together perspectives from a range of disciplines. Educational experiences are more authentic and of greater value to students when the curricula reflects real life, which is multi-faceted rather than being compartmentalized into neat subject-matter packages. In their view, real-world problems are complex, so no single discipline can adequately describe and resolve these issues. Inter-disciplinary analysis examines an issue from multiple perspectives, leading to a systematic effort to integrate the alternative perspectives into a unified or coherent framework of analysis.

A suggested strategy for curriculum integration in the case of the CLIMASP minor is to adopt a "*theme-based approach*" unit as a vehicle for teaching a range of skills and

content by integrating curriculum areas around a theme/topic. This method of teaching links curriculum strands and capitalizes on student's interests and life experiences, young people's attitudes, skills and knowledge are developed in meaningful ways. Inter/cross disciplinary approaches are adopted in planning the integrated curriculum giving more emphasis to the processes involved rather than the outcomes. Interdisciplinary instruction helps students understand that there are *ethical dimensions* to most climate change issues of concern. Ethical considerations entail *moral concerns*, which mean accounting for perceptions of right vs. wrong, good vs. bad, and the provision of justice. This strategy necessitates the transition from teacher-directed to more student-directed learning.

Making a Place for CLIMASP in Existing NDU Courses

Bringing climate change and sustainability into relevant existing courses at NDU offers a wide range of benefits to student learning, such as establishing relevance, bridging course content to current climate change themes, and connecting the course to other disciplines. The topic of a course is of critical importance in the process to incorporate climate change and sustainability as well as the suitable pedagogies to deliver instruction. There are certain courses that naturally deal with climate change and sustainability concepts, so tying the threads together into a coherent theme is more easily done. There are other courses that provide more of a challenge to incorporating climate change and sustainability concepts. Integrating climate change and sustainability into courses from various academic fields such as education, economics, engineering, social sciences, applied sciences may require additional planning and can involve reshaping the teaching approach. Giving students the opportunity to encounter climate change and sustainability concepts across the whole study program or curriculum of a discipline is a powerful way of giving them the knowledge and skills they will need to tackle the challenges of climate change.

Building Interdisciplinary Perspectives into the Courses

Climate change and sustainability is an inherently interdisciplinary concept covering the interplay of various kinds of systems. Getting students to understand the extent of that interdisciplinarity requires that they be exposed to the various perspectives involved and building interdisciplinary teaching into the course is of paramount importance. Incorporating interdisciplinarity requires teaching strategies, such as Problem-based learning and Service learning.

Providing Student-Centered Learning

Learning and instruction is often presented through a dual approach of either student-centered learning or teacher-centered learning. In reality, however, these two are seen as a continuum where the direction depends on both the nature of the subject and instructor's epistemological conventions. Problem-Based Learning (PBL) and Service Learning allow students to set some of their own learning objectives/outcomes, and be active in the learning process.

Student-centered learning activities establish relevance through:

- Discussing how theory can be applied in practice and making a link to local cases,
- Emphasizing active rather than passive learning,
- Emphasizing deep learning than surface learning,
- Encouraging increased learner autonomy,
- Applying reflective and reflexive teaching and learning processes.

Aligning Teaching, Learning and Curriculum

Alignment of teaching, learning and curriculum demands that:

1) Learning activities are consistent with course goals, student learning styles, personal interests and experiences as well as the needs of society;

2) Teaching methods used and the assessment tasks are aligned to the learning activities assumed in the intended outcomes;

3) Problem-based learning (PBL) and Service Learning integration into the learning process.

Encouraging Active Citizenship

Citizenship is about the relationship between an individual and the community in which he or she lives as well as with the global community. As such, the CLIMASP courses should take into consideration the following points:

- Develop assignments that encourage students to participate positively in community-based CLIMASP issues.
- Integrate problem-based learning and service learning into the offered CLIMASP courses.
- Encourage students to take greater individual and group responsibility for their learning.
- Provide opportunities for students to reflect on moral, ethical, spiritual, social and cultural dimensions related to CLIMASP.
- Develop learning assignments/activities that give students a greater sense of personal responsibility and capacity to play an active role in society at local and global level.
- Provide challenged opportunities for students to explore sustainable climate futures in their community.

Developing Participatory Curriculum Design

Curriculum development benefits from a close involvement of key stakeholders, not just in evaluating the curriculum but taking part across all curriculum design processes. Of particular interest in the current climate is the involvement of students, instructors and other key stakeholders, internally (University) and externally (Community, Ministries, civic societies, employers and professional bodies). It becomes easier to work in partnership with a range of stakeholders, whose input to curriculum design and development may be of critical importance. Stakeholder engagement should make use of various mechanisms and methods. In the context of CLIMASP, specific methodologies and templates have been developed to identify key stakeholders, mapping their inputs to the curriculum design of the minor as well as along all the subsequent stages of the project and during the implementation phase.

Making Ethics and Values Explicit

Climate change poses historically unprecedented challenges and profound ethical questions – but also new opportunities for global innovation and cooperation. Throughout the world, at all levels of government, decision makers are facing unprecedented challenges in developing appropriate climate strategies for their constituents. Their decisions raise profound economic and ethical concerns.

Who bears responsibility for protecting vulnerable communities whose basic rights are threatened by climate change? What constitutes an ethically justifiable response?

Should developing countries be required to "balance" development with climate-change mitigation, given that rapid economic and social development? What constitutes a reasonable and ethically responsible climate/development "balance" for poorer countries? What about for industrialized nations? Now and in future generations, who is responsible for responding to the unavoidable consequences of climate change? These are just a few of the urgent questions raised by climate change.

Climate change raises a wide range of ethical issues due to the anthropogenic emissions of greenhouse gases that directly cause this global challenge. Some people are already losing their homes, their livelihoods, and even their lives as a result of the climate change "we" are causing. Any action on climate change confronts serious ethical issues of fairness and responsibility across individuals, nations, generations, and the rest of nature. In that sense, sustainability without ethics is an empty husk. Thus, climate change poses an 'ethical problem' for humanity to respond.

Although, ethics is difficult to define precisely, in a general sense, it is the code of moral principles and values that governs people's behaviors with respect to what is right or wrong. Values related to sustainable development that are largely discussed in the international literature include:

- Equity,
- Environmental justice,
- Intergenerational equity,
- Stewardship.

Climate change and sustainability raises the question of how one ought to live within the threefold relationship with current and future generations, as well as nature. What way of acting and living would adequately respect the rights of contemporaries, future generations, and nature? What would be "just" in this threefold relationship? What kind of responsibilities do we have? Etc.

It is also suggested for faculty members teaching CLIMASP to use the Earth Charter, an inspiring declaration of shared ethical principles, namely:

1. Respect Earth and life in all its diversity.
2. Care for the community of life with understanding, compassion, and love.
3. Build democratic societies that are just, participatory, sustainable, and peaceful.
4. Secure Earth's bounty and beauty for present and future generations.

An adequate recognition and analysis of the ethical meaning of the concept of climate change and sustainability is necessary in order to generate encompassing and adequate analyses and solutions of climate change issues. In this context, culture has always played a role in informing human practices connected with climate change. The anthropogenic cause of climate change implies that learning to clarify one's own values is a very critical learning process. When examining climate change through a 'cultural lens', rather than through an environmental, economic, social or political lens, a number of specific questions come to mind. Here are a few of them:

- How do values, including non-material values, affect decisions and actions about climate change?
- What role does culture play in strategies for adapting to climate change, and in overcoming barriers to change?

- How might climate change impact on aspects of cultural rights within the debate of the impact of climate change on broader human rights issues?
- What do the irreversible losses of cultural and natural heritage caused by climate change mean to societies?
- How does the impact of climate change on the culture of a society differ from other impacts and changes (technological, demographic, and social)?
- What can cultural practitioners, such as artists, designers and architects, contribute to the search for creative solutions to the negative impacts of climate change?
- Can art offer a way of communicating more powerfully the effects of climate change, and is the role of art and artists wider than communication?
- What might alliances between scientists, political leaders, economists and artists achieve that none of these groups would be able to achieve individually?
- What are the opportunities for working across the boundaries of culture, education, identity and geography to create alliances and collaborations?

Determining CLIMASP Competences

Competence development in sustainability and climate change adaptation is essential. Development of competences associated with CLIMASP focus on generic and disciplinary ones. With competence, we mean the integrated set of knowledge, skills and attitudes which are conditional for effective performance. Establishing relevant CLIMASP competences for a course is an important step on the route to writing learning objectives, outcomes and selecting learning experiences, content and methods. We need to identify exactly what a successful CLIMASP competent graduate will be able to do as a result of offered courses.

V-6. Challenges faced during the CLIMASP project

Administering a new interdisciplinary project at NDU faced some challenges; namely: administrative measures (some institutional problems never encountered, i.e who would administer the minor? who would sign the degree? Etc.), harmonization between the different grading systems (number of credits required by the minor, problem of cost/return, problem of equivalence and the legal value of the euro-pass).

Challenges that can be highlighted during the CLIMASP project are listed:

- Bureaucratic difficulties especially when introducing new courses. adaptability between new courses that have to go through a lengthy process of approval by many university committees.
- Number of credits as per the minor in the American System is less than those required by CLIMASP. The minor includes 9 credits of core courses, 12 credits of free electives and 9 credits of Capstone course. This makes a total of 30 credits. Furthermore, only a maximum of six transfer credits are allowed. This is roughly equivalent to getting a master program at NDU. From the perspective of the students they would rather get a master's degree rather than a CLIMASP minor for the same number of credits. Incentives such as Euro-Arab diploma might be attracting students to take the CLIMASP minor even though it has more credits. This is an innovation of the project, as this pass will grant holders more credibility and open more venues for them in regard to employment. But it was not clear the logistics of granting this pass.

- Delay in submitting work by some faculty members. Difficulties to meet deadlines. Some faculty members expressed some kind of concern due to different priorities and other commitments. This was resolved by constant follow-up of the institutional coordinator with the group through meetings, electronic and phone communication as well as providing opportunities for publication of the results achieved, which could contribute to their professional development.
- The tasks (mainly administrative and managerial tasks) demanded considerable time that did not correspond with financial rewards. This has created a kind of disappointment, despite the awareness that the benefits of the project are not only financial but more at a professional development aspect. The incentives provided through publications in journals and conference proceedings were good incentives.
- Housing of the Minor and Minor degree granting
  At NDU every major and minor belongs to a specific department that belongs to a faculty. The CLIMASP minor is interdisciplinary and students from different faculties can join it. The question was where to house this minor? There is no precedence of interdisciplinary minor. The Administration initially indicated that the minor should be housed in a specific faculty. This will defeat the purpose of the minor being open to all majors at NDU through the selection of the three concentrations proposed.
- The Euro-Arab Center for Interdiscplinary Studies: Although, physically the center was established, there is the problem of operating the center by employing qualified director and staff.
- The Capstone Course: Initially there was a difficulty providing the right training for this course. Based on our experience with the RUCAS project we had difficulty allocating students to get their training at relevant NGOs and governmental agencies.

V-7. Solutions

The CLIMASP team at NDU tackled these challenges in dealing with the issues, controversies, or problems presented before.

- Most problems were solved after long debates especially concerning the courses to be offered as well as the role of each Faculty.
- It was agreed that the centre will coordinate the implementation of the minor and the issuance of the degree, rather than any participating faculty.
- The curricula were approved and location of the center was provided.
- Equipment were made accessible to everyone at NDU.

V-8. Exploitation and Dissemination

The exploitation and dissemination of the CLIMASP Minor at NDU was actively thought of, giving information about the functions of the Euro-Arab Center for Interdisciplinary Studies and CLIMASP, the ICT Lab, the EuroArab pass diploma and how it will be handled through the Center. Also, regular meetings with administrators and stakeholders gave insights about the future of the CLIMASP Minor and its impact on the university and the local society. Dissemination activities are listed below:

- E-Chronicle Spring 2014: Issue 21, June 2014.

http://www.ndu.edu.lb/library/files/chronicle/Issue21.pdf
By Dr. Nancy Kanbar, CLIMASP Institutional Coordinator

- Press Release written by Dr. Kanbar to National Tempus Office in March 2014
- CLIMASP website (under preparation on NDU website)
- Online Community of Practice
- Meetings with other institutions of higher education
- Workshops
- Brochures
- In different meetings with different colleagues in different departments
- In meetings with various colleagues and students outside NDU
- Discussed the prospects of students joining the minor with the deans of NDU
- In department meetings and at the administration of NDU
- In advising new masters students
- In advising theses
- In conferences organized by national organizations
- At the National School of Administration in Lebanon
- With the Civic Influence Hub (CIH)
- Promoting the minor in courses taught by faculty members engaged in CLIMASP,
- Emphasising the importance of the Euro-Pass
- Advertising outside the university

VI- MAIN CONCLUSIONS

CLIMASP is considered a great project because it encourages interactions between faculty, students and administrators. Participants deployed a lot of efforts to make the project a success. The progress of the project was in compliance with the proposed work plan and there are no major variations. Minor variations have been arranged but they do not affect the major milestones and expected deliverables as a whole taking into consideration bureaucratic local administrative procedures and regulations.

The project aims to develop an undergraduate interdisciplinary program on climate change and sustainability policy at 10 participating higher education institutions in Egypt, Jordan and Lebanon. As these countries will be strongly affected by climate change, it is of crucial importance to build capacity in climate change mitigation and adaptation strategies. In order to best meet the countries' needs, the project emphasizes the engagement of external stakeholders. The CLIMASP program presents an interdisciplinary study program as at least three different faculties at each university will be involved in the development, with a focus on the three areas "Climate Change, Environment and Society", "Climate Change, Economics and Public Policy", and "Climate Change, Science and Technology". Courses have been designed and developed, 25-35 in each of the 10 PCs institutions. The CLIMASP courses for the interdisciplinary minor have been peer-reviewed internally in each PC institution and among the PC institutions. This methodology proved critical in getting constructive feedback for the further improvement.

Through the establishment of each Euro-Arab Centre for Interdisciplinary Studies and Climate Change in each of the 10 PC institutions supported by ICT Laboratory, the CLIMASP project has a considerable impact in the policy and planning level of each

partner institution. It has helped the CLIMASP team in each institution to see the issue of curriculum revision within the context of a whole-institution policy for integrating sustainable development into the institution's functions.

The introduction of the Euro-Arab pass diploma is expected to generate significant developments towards the harmonisation of the institutions in line with the Bologna processes and practices. The establishment of the CLIMASP minor at the universities in Egypt, Jordan and Lebanon will enable the partners to further anchor the issue of climate change and sustainability policy. The interdisciplinary program will involve different faculties; opening further opportunities for networking and exchanging different perspectives for inter/cross-departmental cooperation. The program has the capacity to initiate closer collaboration between faculties and could serve as a role model for other undergraduate interdisciplinary minor programs.

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VIII- SELECTED REFERENCES

Makrakis, V., and Kostoulas-Makrakis, N. (2015). A Strategic Framework for developing Interdisciplinary Minors on Climate Change and Sustainability Policy: The CLIMASP-Tempus example. In W. LEAL Filho et al. (Eds.). Integrating Sustainability Thinking in Science and Engineering Curricula (pp. 103-114). Switzerland: Springer.

Makrakis, V., and Kostoulas-Makrakis, N. (2015). Piloting the CLIMASP-Tempus interdisciplinary minor in climate change and sustainability policy: Outcomes achieved. Paper presented at the Third European Conference on Sustainability, Energy and the Environment, July 9-12, 2015, The Thistle Brighton, UK.

The UNESCO Climate Change Initiative. (2010). Climate Change Education for Sustainable Development, UNESCO, Paris.