Prepared by Dr. Marc Haddad
School of Engineering, LAU

Pro-Green Diploma
PRGR 673 Research Skills Development

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Course Description:

This course introduces students to research methods, tools and techniques useful for tackling projects related to environmental science and engineering. Topics covered include need identification and problem definition, concept generation and evaluation, information search and literature review, managing the solution development process, team behavior and group dynamics, qualitative data collection with interviews, quantitative data collection with surveys, considering economic and other impacts, professional standards and codes, and communicating a technical solution.

Course Credits:

Elective, 2 credit hours

Delivery Format

This course will be delivered online through Moodle. Course content may be accessed by clicking on the following link: http://moodle.aub.edu.lb/ . Student assignments should also be submitted on Moodle.

Course Prerequisites

None

Course Goals

This course is designed to introduce students to the essential skills of research in engineering and environmental science. These are transferable skills which can be applied in any workplace environment and multiple work situations.

Course Objectives

Upon successful completion of this course, students will be able to:

1. Implement appropriate tools for successful need identification and problem definition in a research process.
2. Conduct an efficient information search and write a literature review.
3. Collect data with interviews and surveys.
4. Have a good exposure to methods of analysis for qualitative and quantitative data.
5. Have a good understanding of possible impacts from the proposed solution.
6. Have an appreciation for the possible ethical issues in research.
7. Use appropriate tools for managing a research process.
8. Successfully communicate a technical solution using a variety of approaches.

Topics Covered

Module 1: Problem Formulation and Literature Review

- Formulating the research question
- Mind-mapping and causal loop diagramming pathways to solutions
- Background research
- Literature Review

Module 2: Research Methods

- Data collection with interviews
- Analysis of qualitative data
- Data collection with surveys
- Analysis of quantitative data

Module 3: Considering research impacts

- Costs
- The –ilities (sustainability, feasibility, reliability…)
- Professional standards and codes
- Ethical implications

Module 4: Planning and Scheduling the Research Work

- Teamwork and team dynamics
- Project management tools

Module 5: Technical writing

- Guidelines for writing a technical report

- Guidelines for writing a scientific paper
- Guidelines for creating a technical poster

Texts and Supplementary Materials:

Optional Text:

- Textbooks and other resources (software and media) will be suggested as optional references at the end of the corresponding lectures

References:

- Readings will be assigned at the end of each module.

Technical Requirements:

- MS Office or equivalent
- Endnote or equivalent
- Online library access

Grading Policy

Grades are based on assignments and a quiz at the end of the course made up of multiple-choice questions covering the lectures and readings. The grade distribution is as follows:

Ice Breaker	5 pts
Mind-mapping	15 pts
Webinar Summary	10 pts
Presentation	20 pts
Exam	30 pts
Term Paper	20 pts
Total:	**100 pts**

Description of Course Requirements (assessments)

Literature Search (not graded)

You will search the scientific literature for peer-reviewed articles about an energy/environment topic. A list of topics will be posted for you to choose from, but students may also suggest an energy/environmental topic of their own, subject to instructor approval. Submission is by online text or email to the instructor.

Scenario Analysis (not graded)

You will perform a scenario analysis exercise to explore future alternatives for your chosen energy/environment topic. Your analysis should reflect the thought process that you went through using the literature search and problem formulation tools learned in previous lectures. No submission is due, but your analysis should be included in your research presentation assignment.

Presentation

There will be a presentation assignment on your chosen energy/environment topic. The presentation should demonstrate the use of the tools learned in the course to search for information, formulate the problem, collect data about the current state (optional – only if data is available or accessible), perform a scenario analysis, and provide recommendations. Your submission should be done in MS PowerPoint with voice narration. Due to the typical size of the results PPTX file, it should be uploaded to a virtual drive of your choice and the link sent by email to the instructor by the due date.

Webinar Summary

You will watch a webinar about an assigned contemporary energy/environmental issue and summarize the problems and solutions being researched and/or worked on in industry. Your submission should be done in MS Word and posted to Moodle by the due date.

Knowledge Checks

You will take one exam in the semester, delivered via Moodle. The exam includes multiple-choice questions and essay writing. The exam content will be largely based on video lectures and readings.

Term Paper

There will be one term paper assignment based on your chosen presentation topic, where you will elaborate your research further and additionally address the applicability and impacts of your topic in the Lebanese context, in a term paper format. Your submission should be done in MS Word and using one of the bibliographic software introduced in the course.

Internet Etiquette

Netiquette (short for "network etiquette" or "Internet etiquette") is a set of social conventions that facilitate interaction over networks.

General Rules

1. Make your messages easier to read by making your paragraphs short and to the point. You can use emoticons to enhance your online communication.
2. Messages in all lowercase or ALL UPPERCASE letters can be difficult to read, instead, use normal capitalization. *Asterisks* surrounding a word can be used to make a stronger point.
3. Never give your user ID or password to another person. System administrators that need to access your account for maintenance or to correct problems will have full privileges to your account.

Make-up Policy

Failure to submit an assignment or to take a quiz during the scheduled period will result in a grade of zero unless the student has personally contacted the instructor and received permission to miss the due date. An assignment or quiz missed due to a valid excuse must be made up within one week of the original assigned date. The student is responsible for arranging the make-up with the course instructor.

Tentative Schedule

Week	Topic	Activity	Due Date
Week 1	Introduction: Ice breaker & research topic selection	*Assignment*: answer questions about your experience and expectations and select a topic to research / present later	Ice breaker: Sat. June 10, 2017 (open until end of add/drop - June 17) Research topic selection: Sat. June 17, 2017
Week 2	Problem formulation & mind-mapping	*Assignment*: mind-map and/or causal-loop diagram your research topic	Sat. June 24, 2017
Week 3	Literature search & review	*Checkpoint*: start research on your chosen topic by finding one or more related articles in peer-reviewed journals	Sat. July 1, 2017 (Not graded)
Week 4	Research methods 1: data collection with interviews; analysis of qualitative data	*Assignment*: PowerPoint presentation with voice narration presenting your research on your chosen topic	Sat. July 22, 2017

Week 5	Research methods 2: data collection with surveys; analysis of quantitative data	*Checkpoint* (*no assignment)*: review presentation guidelines	*None*
Week 6	Scenario analysis	*Checkpoint* (*no assignment)*: perform a scenario analysis to explore possible futures for your chosen energy/environment issue	*None*
Week 7	Considering research impacts	*Assignment*: watch a webinar about a contemporary energy/environmental issue and summarize the key problems and solutions	Sat. July 29, 2017
Week 8	Professional standards, codes & ethical implications	*Assignment*: write a term paper to expand your research on your presentation topic	Sat. August 19, 2017
Week 9	Team dynamics: overview, planning & scheduling research	*No activity*	*Break*
Week 10	Technical Writing	*Checkpoint* (*no assignment)*: review term paper guidelines	*None*
Week 11	*No lecture*	*No activity*	*None* (Reminder: Deadline for term paper)
Week 12	Knowledge check *(no lecture)*	Exam: multiple choice and essay exam covering all course lectures and delivered on Moodle	Wed. August 23, 2017
Week 13	*No final exam*	*None*	*None*