COURSE Project (15%)

Course Project Guidelines

ENGR 131: Transforming Ideas into Innovation I

Flash Floods in Kuwait

Semester: Summer 2021

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I. Introduction

Engineering projects help students to learn and acquire practical knowledge. Despite of theory concept they acquire, various industries also need to know their capacity to complete projects using their specific initiatives. Thus, we recommend students to realize engineering projects in their four years of engineering and try to present as many white papers as possible. Students who give importance to their course projects are expected to learn how to:

- Work in teams including multidisciplinary teams
- Build a major design experience based on the knowledge and skills acquired in the course work
- Build a major design experience incorporates appropriate engineering standards and multiple realistic constraints
- Apply both analysis and synthesis in the engineering design process, resulting in designs that meet the desired needs

In the design process, both creativity and criticism are essential. The followings are the seven steps that students should consider while designing their projects:

- Recognition of the need and identifying opportunities: Every project begins with recognition that needs improvement. These needs may be obvious or hidden to be revealed by investigation, surveys or research.
- Definition of the design problem: It is a major task requires gathering information about the problem.
- Definition of the design criteria and constraints: While the problem is being defined, the design criteria and constraints must be defined
  a. Design criteria are performance standards to be met by the design
  b. Design constraints are limitations placed on the designer, the final design or manufacturing process. *Examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.*
  c. Risk analysis
- The design loop: design is a repetitive process of:
  a. Synthesis (Brainstorming - Generating new ideas)
  b. Analysis (Breaking ideas – find expected results)
  c. Decision-making (Deciding the best alternative)
- Optimization: Design team must ask themselves if it is the optimum design. Optimum is the best design that can be achieved at reasonable cost. The proposed design is judged against the design criteria
- Evaluation: Design team should hold a design review to approve drawings and specifications before they are released. If an optimum design cannot be achieved, the design team might revise the problem definition, the design criteria or the constraints in order to achieve the optimal solution or prototype.

II. Project Description

The aim of this project is to demonstrate an understanding and application of Engineering Design Process (EDP) and Decision Making Matrix (DMM) to propose a practical solution to prevent flash floods in Kuwait.

This project assesses your understanding and evaluate your capabilities in order to develop an engineered solution to a given problem. This involves identifying and analyzing the requirements, writing a specification, designing, testing, implementing and evaluating a solution. The process has several stages and some investigation is required so you should plan the work carefully.

Working successfully as a team is a key requirement for working in industry, and for this project, you will be working in small groups of about 3 students.

You must develop the solution to the assignment mainly in your own time, however, some of the office hours will be set aside to enable you to seek clarification, elicit more details from your instructor, and receive feedback on your work.

Do not diverge from the project specification. If you do not conform to the project specifications, then you will lose marks.

Figure 1: Urban flooding in Kuwait

Flash floods present significant economic and social challenges in Kuwait and around the globe. The effects of climate change are causing more frequent extreme rainfall events and an increased risk of flooding in many cities around the world. Solving this problem is of critical importance for the protection of life and property. However, Climate change is one of many other drivers that must be considered (e.g. urbanization, aging infrastructure, population growth etc.). In Kuwait, flash floods after heavy rains have caused hundreds of millions of dollars' worth of damage in the country, wreaking havoc on roads, bridges and homes. Officials have estimated the damage at $328 million dollars, with roads and tunnels paralyzed.

Your target as a group is to propose a practical solution that will work on preventing flash floods in Kuwait. While developing your solution you have to consider the following:

1. The proposed solution should be based on a real and applicable study.
2. The proposed solution should deal with all the possible reasons behind these floods.
3. Your proposed solution should avoid heading back the floodwaters out to sea.
4. The proposed solution should guaranty a good use of floodwaters.
5. The proposed solution should be innovative, reasonably expensive and can be implemented in less than 3 years.

III. Learning Outcome

The aim of this project is to:

- To understand an engineering problem and define its boundaries.
- To work as a team member to achieve a practical solution to a defined problem through joint ownership, research and decision-making.
- To communicate the results of the work carried out in a short technical report.

IV. Project Management & Deliverables

Deliverable: (due date is Sunday August 1st 11:59 PM):

Introduce a technical report that includes the following steps of the Engineering Design Process

1. Introduction
2. **Definition of the problem**, **the criteria**, and the constraints
3. **Background research**
4. **Brainstorm** of possible solutions (at least 5 solutions) including different designs, materials used, and cost/weight structures.
5. Selection of the **best three** solutions following the engineering design process steps (10%)
6. Your final detailed solution after applying the **DMM**

V. Turnitin

Turnitin is a web-based solution that lets AUM faculty and AUM students check written work for improper citation or misappropriated content. You may be assigned a username and a password to be able to upload your assignments online, when and if requested. If you face any technical problem, please contact IT at AUM.

VI. APA Style

AUM adopts the APA writing style for all its academic programs. AUM students need to use this style for their assignments. The following web site is of value for students: http://owl.english.purdue.edu/owl/resource/560/01/. Students are also encouraged to visit the AUM Writing Lab to receive help and guidance on all APA-related questions.

VII. Academic Honesty and Integrity Assurance

One of the signs that the course material has been properly understood is honesty when accomplishing the assignments. Lack of academic integrity (e.g. plagiarism, copying another person's work, the use of unauthorized aids on examinations, cheating, facilitating acts of academic dishonesty by others) will not be tolerated. Therefore, if students include ideas, sentences, or other material that are not theirs in their work, they must properly quote the source(s). Students are encouraged to consult with the instructor if they have any questions on the issues of academic integrity or technical formatting of the references.

Upon suspicion and doubt of the authenticity of the work submitted, the Instructor has the right to ask the student to verify her/his work. This can be done through, but not limited to, repeating the work, oral examination or discussion, alternative or similar on spot class assignment, pop quiz, or any other action deemed necessary. If the student fails to prove the authenticity of the work, then the Instructor will apply the academic misconduct rules as mentioned in the AUM Student Handbook which may include awarding the work a zero grade.

Students are expected and encouraged to be honest and to maintain the highest standards of academic integrity in their academic work and assignments at the University. Any act of Academic Dishonesty may result in severe consequences for violations range from zero grades given for the assignments, failing the course, and suspension from the University. Students will refrain from any academic dishonesty or misconduct including, but not limited to:

- Upon suspicion and doubt of the authenticity of the work submitted, the Instructor has the right to ask the student to verify her/his work. This can be done through, but not limited to, oral examination or discussion, or any other action deemed necessary. If the student fails to prove the authenticity of the work, then the Instructor will apply the academic misconduct rules as mentioned in the AUM Student Handbook
- A zero grade will be given to all students that share exactly the same results: You will also be held responsible if someone else copies your work - unless you can demonstrate that you have taken reasonable precautions against copying.
- Any violation of the AUM standards will be taken as a violation to AUM policy and can lead to penalties. If you wonder whether a course of action violates this policy, simply ask in advance and please refer to the undergraduate AUM Student Handbook.

For a detailed description of academic misconduct, please refer to the AUM Student Handbook.

VIII. Copyrights

Students are expected to adhere to copyright practices, **refer to the undergraduate AUM Student Handbook.**

IX. Project and team-based work

The Project component of the course, if exist, is essential to passing this course. The project shows competency in understanding and applying the course objectives and achieving the learning outcomes. The project should allow the student to investigate, apply, research, and practice real-life business situations. It is expected that each student to fully and actively participate in the project as an effective team member. A project document will be distributed later in the semester with details about the project.

For all group related work, the **entire team is responsible for the team outcome and the deliverables**, except for the specific parts of the project that may be graded individually depending on the project's requirement and as communicated in the project document.

X. Marking Scheme

1. Introduction 5%
2. **Definition of the problem**, **criteria**, and constraints (15%)
3. **Background research** (10%)
4. **Brainstorm** of possible solutions (at least 5 solutions) including different designs, materials used, and cost/weight structures. (15%)
5. Selection of the **best three** solutions following the engineering design process steps (10%)
6. Your final detailed solution after applying the **DMM** (20%)
7. Report Formatting (grammar…etc) 15%
8. Conclusion 5%
9. References 5%

XI. Student Assessment Rubric

Deliverables	Bare pass mark (60%-69%)	C classification (70%-79%)	B classification (80%-87%)	A classification (>87%)
Final report **Weighting 15%**	• The report is succinct and to the point. The maximum size of the report is met. • The report includes only brief analysis. • Brief conclusion and discussion. • The writing of the report includes some mistakes.	• The report gives clear details on all of the components of the research. • The report includes some analysis. • The conclusion/discussion on the application partially relevant. • The writing of the report does not include mistakes.	• The report gives clear details on all of the components of the research. • The report includes detailed analysis. • The conclusion/discussions on the application are relevant. • The writing of the report does not include mistakes.	• The report gives clear details on all of the components of the research. • The report includes detailed analysis. • The conclusion/discussions on the application are relevant. • The report is well structured and it does not include mistakes.