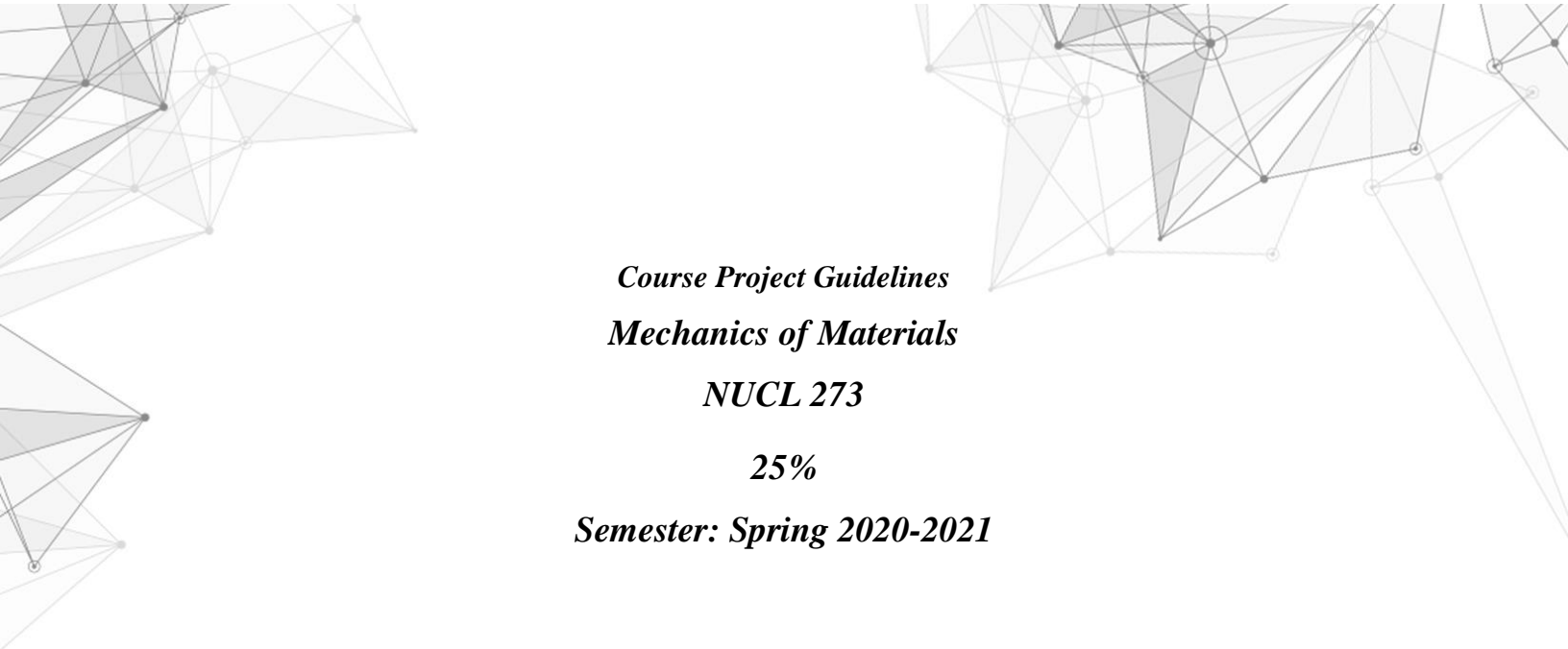




COURSE PROJECT

2020-2021



Course Project Guidelines
Mechanics of Materials
NUCL 273
25%
Semester: Spring 2020-2021

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I. Introduction

This project is intended to demonstrate students' ability to analyse all forms of stresses and deformations in a structure. They have to carry out analysis to determine the type of stress generated in different structure members and calculate the value of these stresses. They will also be able to select the suitable material for a given member under service. In addition to applying technical knowledge in a 'real world' project, this would demonstrate the students' ability to conduct group research, teamwork, technical data interpretation, software use, report writing and project management skills.

II. Learning Outcomes

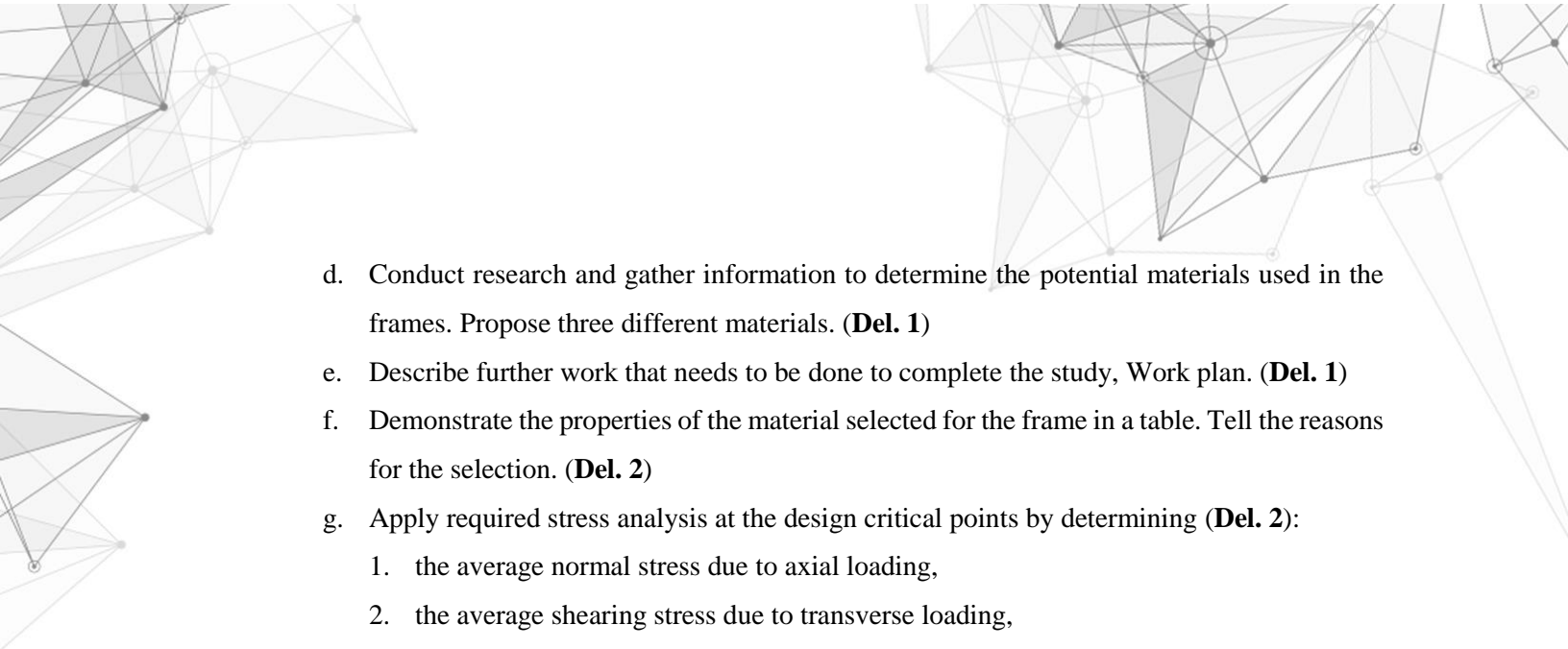
The project covers all learning outcomes described in the course syllabus (Refer to the syllabus for more details) and concentrate mainly in the application of the following experiences:

- Develop an understanding of structures subject to all type of loading (1)
- Foster effective mathematical and graphical communication skills (3)
- Function on teams (5)

III. Project Summary (Scenario)

The aim of the project is to study and analyze one of car parking. By applying stress and deformation analysis to the metallic frame, your objective is to calculate values of *all type of stresses* generated in it, define proper dimensions of the frame and based on the provided loading conditions, and determine whether frame is safe or not. To succeed in your mission, you should:

- a. Describe the problem without addressing any possible solutions - Problem definition (**Del. 1**)
- b. Inspect and note car parking with its overall dimensions (usage of online platforms for this purpose are also acceptable with citation of references) (**Del. 1**)
- c. Draw a scaled hand sketch using geometrical tools or using any relevant software (**Del. 1**)

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- d. Conduct research and gather information to determine the potential materials used in the frames. Propose three different materials. **(Del. 1)**
 - e. Describe further work that needs to be done to complete the study, Work plan. **(Del. 1)**
 - f. Demonstrate the properties of the material selected for the frame in a table. Tell the reasons for the selection. **(Del. 2)**
 - g. Apply required stress analysis at the design critical points by determining **(Del. 2)**:
 1. the average normal stress due to axial loading,
 2. the average shearing stress due to transverse loading,
 3. the bearing stress,
 4. the maximum shearing stress due to the torsional load,
 5. the maximum stresses due to the bending behavior.
 - h. Calculate the maximum deflection in the frame. **(Del. 2)**

While performing stress analysis consider following constraints:

- Assume that frame has a circular cross-section.
- Assume that frame is manufactured from the hollow tube with 6 mm wall thickness.
- Consider the top cover as HDPE mesh fabric
- Consider maximum force applied by the wind if maximum-recorded wind speed for Kuwait is $v=23$ m/s and air density is $\rho = 1.2$ kg/m³. Force exerted by the wind can be calculated from $(F=1/2 \rho v^2A)$, where A is surface area of the parking in m². (You may consider wind force applied only on the top part of the parking frame and ignore wind force applied to the vertical frame)
- During calculations, consider the basic details given in Figure 1.



Figure 1: A car parking with steel frame (6m (L) X 3m (w) X 3m (H))

IV. Deliverables & Project Management

Deliverables		Deadline	Method of Delivery	Grade Allocated
D1 (OCA 3A)	Groups of 3 students should be formed with one team leader and names submitted to the instructor. A short report includes abstract, introduction comprising a design with the choice of potential material types (3 to 4 pages).	April 1st 2021	Upload report on Moodle on the specified link	2.5%

D2 (OCA 3B)	Analysis of stresses and deformations taking place in the frame, highlighting the points of maximum stresses.	May 27th 2021	Upload the final report (typed in word document / handwritten equations) on Moodle on the specified link	12.5%
D3 (OCA 4)	A short PowerPoint presentation (5 minutes maximum) describing your work.	Jun 03st 2021	Upload the Power-Point presentation on Moodle and individual in class discussion during W14	10%
Total				25%

V. Plagiarism

- 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 which may include awarding the work a zero grade.
- You will also be held responsible if someone else copies your work - unless you can demonstrate that you have taken reasonable precautions against copying.
- For a detailed description of academic misconduct please refer to the undergraduate AUM Student Handbook.

VI. Marking Scheme

Deliverables	90-100%	80-90%	70-80%	60-70%
D1	Well written initial report includes all elements	Initial report includes all items but lacks clarity	Initial report lacks clarity and missing one element	Initial report lacks clarity and missing two items
	90-100%	90-80%	60-80%	
D2	Outstanding study and a full design report which includes all elements	Satisfactorily written report includes all elements	Poorly written report includes some of the elements	
	90-100%	90-80%	60-80%	
D3	Excellent presentation, answered all questions	Satisfactory presentation , answered most questions	Weak presentation, answered few/no questions	
Project Total	25% of course total			