

**Prince Sattam Bin Abdulaziz University**

**College of Engineering**

**Graduation Project Guidelines**

**Graduation Project Committee**

**2021**

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## **Abstract**

This guideline is intended for both students and supervisors mainly to give general rules, requirements, nature of the graduation project types as well as the evaluation process of graduation project at the college of engineering of Prince Sattam Bin Abdulaziz University. Also, it presents the different types of forms used at different stages of the graduation project.

## **ABET Criteria**

Throughout the two phases of the design project, students and supervisors should abide by the engineering design project definition as per the ABET accreditation which states:

“Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade- offs, for the purpose of obtaining a high-quality solution under the given circumstances. For illustrative purposes only, 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.”

## **Code of Ethics**

Students must be aware of the Saudi Code of Engineering Ethics and act according to the highest standards of integrity and ethics with all the submitted requirements of the project including but not limited to reports, obtained results and experimental work, presentation slides and crediting others for existing published work. The following is a related ethical code as an example however it is highly recommended to review the code of ethics according to the Saudi Council of Engineer at <https://www.saudieng.sa/English/EngineerCorner/Pages/CharterEngineer.aspx>

“Every engineer shall give proper credit for engineering works to those to whom credit is due, and shall recognize the proprietary rights of others. Every engineer shall name the person(s) responsible for designs, inventions or accomplishments wherever possible.”

## **Laboratory Safety:**

At the beginning of each semester an introductory session should be provided for new students enrolled in the graduation project course by the laboratory committee coordinator explaining and clarifying the main safety rules that should be followed when using the laboratories available at the college of engineering.

Students must read and follow the safety instructions of each lab when performing their experimental work. The graduation project supervisor should

supervise students during their practical work at all laboratories. Students should never use machines or any of the lab equipment without supervision.

Working at the Laboratories out of the normal working hours require an approval by the graduation project supervisor, department chairperson and the college of engineering dean. A letter must be sent to the security department with this regard.

In addition, a technician should be available to allow the students to enter the laboratory.

## **Graduation Project Types**

The graduation project at the College of Engineering, Prince Sattam Bin Abdulaziz University is intended to leverage all the skills, knowledge, and expertise that the students gain during the years of study at the college of engineering. The students, after successfully completing 129 credit hours, enroll in a two-phase graduation project spanning 8 months (two constitutive semesters).

During the first phase of the project, graduation project I, students focus on the literature review of the engineering design problem including prior art, problem definition, existing challenges and then propose a solution, utilizing recent scientific research papers and well-established books. In the second phase, graduation project II, students work on the solution of the design problem, experiment data, and survey outcomes. Students are also encouraged to perform a workable prototype, a code using simulation software and/or mathematical modeling of an engineering design

problem. The output and the results obtained are then documented and submitted in the form of a scientific report.

The students have the option to choose from various project types including:

1. Field specialized project
2. Capstone project
3. Industry based project, and
4. Student initiated project

*\*Note that a capstone project can be an industrial based project and vice versa.*

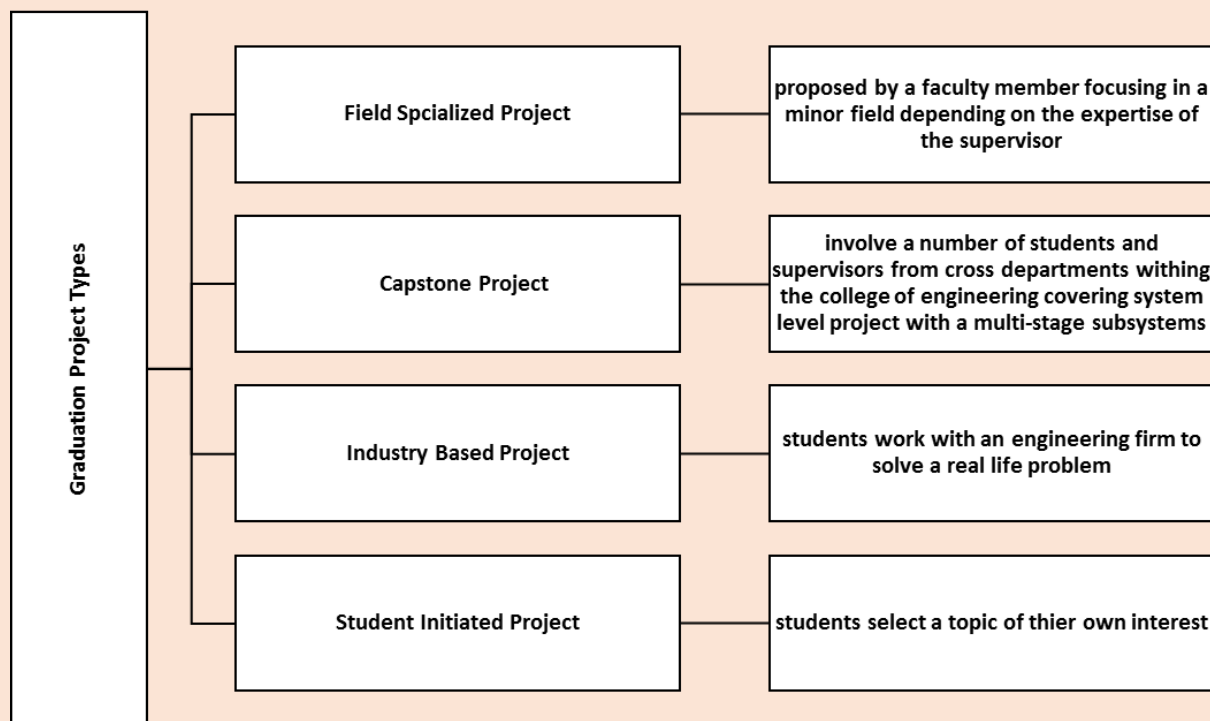
In the field specialized project, the supervisor proposes a topic in the field of his/her own expertise which he has high experience in and is able to guide the students enrolled in the project for a successful outcome.

A capstone project, however, is a project that lies under the umbrella of two or more engineering discipline/specialties forming a larger system where each subsystem is handled by a group of students within a department. In this type of project, more than one supervisor is involved to ensure a smooth transition among the students from different engineering departments.

An industry-based project is another type of project where the students work with an engineering firm to solve a real-life problem. The students choosing this project type must also work with a faculty member who will be following up with the

students and also coordinating the project between the students and the industrial firm.

Students can also choose their own project that they find interest in. The student-initiated project type allows the student to select a project and find a faculty member that has the expertise in the selected field. The student-initiated project is subjected to the approval of the supervisor and the graduation project committee within the department to ensure that the selected project can be accomplished within the 8-month period. The following chart (chart 1) summarizes the four types of projects highlighting the definition of each one.



**Chart 1:** A summary of the four project types.

## **Progress of the project**

### **Term I**

- The department council should discuss and approve graduation project proposals, then announce them to the students before the beginning of each semester
- Students should conduct weekly meetings with the supervisor. During the first meeting, the supervisor must clarify the project topic to the students and then recommends related literature (journal papers/books, etc.).
- The students should fully understand the existing literature through reading papers, books, online articles, etc. This is a critical practice to improve the students' ability to read and write academically
- Students must present a timeline showing the week-by-week workload (milestones). This must be submitted not later than the mid of the fourth week.
- Students must use a logbook that has to be signed weekly by one or both supervisor(s). The logbook should include all progress during the week. This includes new data, related journal papers, ideas, brain storming, simulations, or measurement results, etc.
- Students must deliver a short presentation at the 8th week which will be



presented to the committee members where the following is assessed (please refer to Form B):

1. Writing at least one chapter
  2. Understanding the project objectives
  3. Deliver a short presentation.
- The supervisor should encourage the students to utilize at least one modelling/simulation tool such as MATLAB or any related tool.
  - At the end of the first term, the students must submit a project report a poster of A1 portrait size (both in soft form) and also deliver a presentation that highlight clearly the literature review (by using journal papers/ scientific books/ online articles), the problem in hand, and the suggested solution.

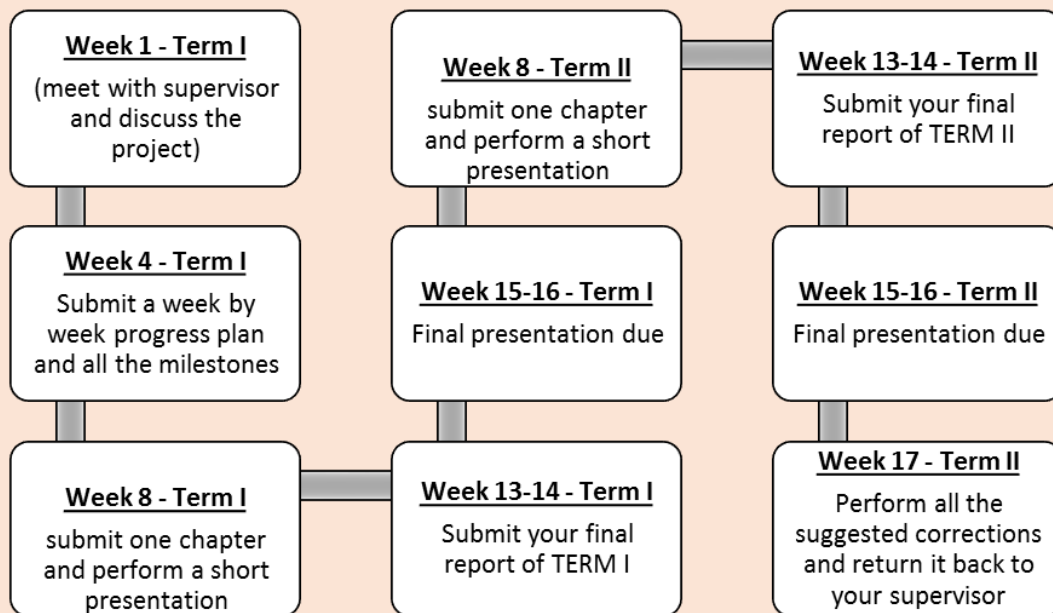
## **Term II**

- The rules listed in TERM I must be followed during the second semester as well.
- The main objective of the second semester is to work on the proposed solution to the problem presented in TERM I.
- The students must carry (implement) the solution to the existing problem presented in TERM I in the form of a prototype. This prototype could be a workable device or in terms of a code (mathematical modeling and simulation).
- A project report along with an A1 size poster must be submitted at the end of the project.

Table 1 below summarizes the general objectives required for Term I and II; while, chart 2 presents the flowchart of project I and II.

**Table 1: A summary of the general objectives of Term I and II**

<b>Term</b>	<b>Main Objective</b>
<b>I</b>	<ol style="list-style-type: none"> <li>1. Fully understand the problem in hand.</li> <li>2. Familiarize yourself with published work related to the topic (at least 2 papers).</li> <li>3. Propose a solution to the existing problem.</li> <li>4. Familiarize yourself with a simulation tool.</li> </ol>
<b>II</b>	<ol style="list-style-type: none"> <li>1. Implement the proposed solution by using a simulation tool or an algorithm</li> <li>2. Build a workable prototype in terms of a numerical simulation, 3D model, or a workable device to prove the concept</li> </ol>



**Chart 2:** A flow chart summarizing the project's milestones.

## Evaluation:

There are three forms, related to the evaluation of the project, which are used by the supervisor(s) and/or the committee members only. The evaluation of the project is divided into two evaluation periods to effectively assess the progress of the project. The first evaluation is usually conducted in the 8th week of each semester and worth a total of 10 marks (Form B). The rest of the 90 marks are granted at the end of the semester and after the final presentation and after submitting the final report; where 50 marks are granted by the supervisor (Form C) and 40 marks are evaluated by the committee members (Form D). For further clarification, the following are detailed explanation of each Form\*explanation of each Form\*

Evaluation Forms	Form A	Completed by: Supervisor
		<b>Main purpose:</b> 1) Identify the team members, 2) highlight the objectives of the project along the two Terms and, 3) ensure that the quality of the project satisfy the standarst of the department
		<b>Deadline:</b> the first week of Term 1
	Form B	<b>Completed by:</b> Defence committe excluding the supervisor
		<b>Main purpose:</b> ensuring that the sudents are on the right track with regards to the objectives
		<b>Deadline:</b> the 8 <sup>th</sup> week of each term
	Form C	<b>Completed by:</b> Supervisor
		<b>Main purpose:</b> To assess the sudents' skills, knowloge and the carrying out all the objectives set by the supervisor in Form A
		<b>Deadline:</b> The end of each term
	Form D	<b>Completed by:</b> Defence committe excluding the supervisor
		<b>Main purpose:</b> To assess the sudents' skills, knowloge and the carrying out all the objectives set by the supervisor in Form A
		<b>Deadline:</b> The end of each term

\* Note: the department and/or the college of engineering can modify or add new requirements to the guidelines of the graduation project as they see fit the program.

# Forms

Form A

Graduation Project Proposal

Year	Term	Department	Course Code	Supervisor Name
Project Title				
Project Description				
No	Objectives of Graduation Project (1)	Weight (%)	Duration of execution (Number of weeks)	
1				
2				
3				
4				
Total duration of Graduation Project (1) (weeks)				
No	Objectives of Graduation Project (2)	Weight (%)	Duration of execution (Number of weeks)	
1				
2				
3				
4				
Total duration of Graduation Project (2) (weeks)				
Expected Results				
Resource\Tools Required				
Project Supervisor				Signature
Decision of the Department Council		<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted		Signature

Form B

Graduation Project: Follow-up assessment by Defense Committee (Week 8) /(10 Marks)

Year	Term	Department	Date	Course code				
Project title								
Students Name	St1		IDs					
	St2							
	St3							
	St4							
No	Assessment criteria			Full mark	Students marks			
					St1	St2	St3	St4
1	Writing at least one chapter			3				
2	Understanding the project objectives and having a clear plan to achieve them within the timeline of the project			5				
3	Brief presentation (~ 5 minutes) and answers to questions			2				
<b>Total</b>				<b>10</b>				

- The supervisor should attend the presentation but should not be part of the assessment in Form B.**

Defense Committee		Signature	
		Signature	

Observations of the defense committee (if any):

Form C

Graduation Project: Student Assessment by Supervisor (50 Marks)

Project Title										
Student Name		St1	ID							
		St2								
		St3								
		St4								
GP2	GP1	Assessment Criteria			Full Mark		Student Mark			
<input type="checkbox"/>	<input type="checkbox"/>				GP 1	GP 2	St1	St2	St3	St4
1	1	Self-motivation of the student, Collection of data and information to achieve the tasks of the project.			3	2				
2	2	Using various approaches of self-learning during literature review and analysis and the assessment of constraints effect			10	2				
3	3	Analysis of the problem and its division into components.			8	5				
4	4	Project achievements compared to the defined objectives.			7	6				
5	5	Team work: shares in work, fulfill duties of team role, teammate listen to others, attends the team meetings and contributes to discussions			6	5				
6	6	Writing of the report: Appropriate use of graphics and tables, organization of the report and writing skills.			16	10				
7	-	Progress in the project work including analysis, survey, design and experiments, use of appropriate codes and standards, evaluate alternative engineering solutions considering environmental, social and economic aspects during the design process, successful components implementation			-	20				
<b>Total</b>					<b>50</b>	<b>50</b>				

<b>Supervisor's Name</b>		<b>Signature</b>	
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Observations Supervisor (if any):

Form D

Graduation Project: Final Assessment by Defense Committee (40 Marks)

Project Title										
Student Name		St1	ID							
		St2								
		St3								
		St4								
GP2	GP1	Assessment Criteria			Full Mark		Student Mark			
<input type="checkbox"/>	<input type="checkbox"/>				GP 1	GP 2	St1	St2	St3	St4
1	1	Final Report <sup>1</sup>	15	8						
2	2	Oral Presentation ~20 minutes ( including Poster Assessment ) <sup>2</sup>	10	8						
3	3	Team work <sup>3</sup>	5	2						
4	4	Understanding and achieving all objectives by acquiring and applying new knowledge as needed using appropriate learning strategies <sup>4</sup>	10	2						
5	-	Testing, experimentation, survey, interpretation and analysis <sup>5</sup>		10						
6	-	Design <sup>6</sup>		10						
Total			40	40						

- The supervisor should attend the presentation but should not be part of the assessment in Form D.

Defense Committee		Signature	
		Signature	

Observations of the defense committee (if any):



Assessment Criteria	Explanation
Final Report <sup>1</sup>	<ul style="list-style-type: none"> <li>• Writing a technical report,</li> <li>• Organization and structure of the report (Title, Table of Contents, Nomenclatures, List of Figures, List of Tables, Chapters, Conclusions, References etc. ),</li> <li>• Writing language,</li> <li>• Using technical terminology</li> <li>• Constraints and standards table</li> </ul>
Oral Presentation (including Poster Assessment ) <sup>2</sup>	<ul style="list-style-type: none"> <li>• Visual aids,</li> <li>• Body language,</li> <li>• Listening and responding to questions,</li> <li>• Utilization of allowable time,</li> <li>• Presentation quality,</li> <li>• Clarification of the adopted approach, fluency of speech and avoid reading directly from slides,</li> <li>• Presenting and participating in the poster day.</li> </ul>
Team work <sup>3</sup>	<ul style="list-style-type: none"> <li>• Research and collection of information,</li> <li>• Fulfill duties of team roles,</li> <li>• Shares in work of the team,</li> <li>• Communication (talking with the team about expectations, deadlines, and responsibilities),</li> <li>• Listening,</li> <li>• Collaboration,</li> <li>• Leadership</li> </ul>
Understanding and achieving all objectives by acquiring and applying new knowledge as needed using appropriate learning strategies <sup>4</sup>	<ul style="list-style-type: none"> <li>• Find information relevant to problem solution without guidance,</li> <li>• Ability to interpret and discuss any solution given in the literature,</li> <li>• Identify missing knowledge in seeking problem solution, then self-learning of the missing knowledge, achievement of project goals</li> </ul>
Testing, experimentation, survey, interpretation and analysis <sup>5</sup>	<ul style="list-style-type: none"> <li>• Component-based testing by including setting up of experiment and collecting measurements, and analyzing and interpreting the tabulated data and use engineering judgment to draw conclusions,</li> <li>• Evaluate and analyze environmental, social, and economic dimensions of the final product, successful components implementation,</li> <li>• Complete system testing by analyzing and interpreting the tabulated data and use engineering judgment to draw conclusions</li> </ul>
Design <sup>6</sup>	<ul style="list-style-type: none"> <li>• Apply modern tools, simulators, advanced techniques to design the target project,</li> <li>• Formulate the optimization problem,</li> <li>• Identify constraints on the design problem, and establish criteria for acceptability and desirability of the solution,</li> <li>• Use (Apply) appropriate codes and standards during the design process,</li> <li>• Consider the risk in the design process of the prototype,</li> <li>• Evaluate alternative engineering solutions considering environmental, social and economic during the design process,</li> <li>• Form the solution model, incorporate constraints and specifications when solving the project.</li> </ul>