

Senior Design Project Procedures

1. Terminology Used:

a) Project Team (PT)

A group of 5-8 students working together on the graduation project is called Project Team or PT.

b) Project Course Coordinator (PCC)

A faculty member appointed by the chairman of the department who is in charge of all Senior Design Project and ensures that the prescribed procedures are properly implemented for all projects. PCC's main duty is to ensure the following requirements in each Senior Design Project (SDP) proposal are satisfied:

- [a] Design problem has several possible solutions and realistic constraints
- [b] Project objectives are well defined and clearly stated without ambiguity
- [c] The project objectives are achievable within two semesters
- [d] The project can give the students opportunity to demonstrate the required SOs.
- [e] The project is based on the courses and is not a research project.

c) Main Project Advisor (MPA)

A faculty member, who coordinates a Senior Design Project, advises the project team and is responsible for reporting the assessment data.

d) Supporting Advisor (SA)

A person from within the faculty or outside who is assigned the job of advising the students on specialized aspects of the project.

e) External Examiner (EX)

A person not among the faculty of Industrial Engineering Department may serve as the External Examiner. He will advise the student when needed and will be present in the final project presentation to assess the abilities of the students.

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f) Project Advisory Team (PAT)

MPA, SA and an EX (a total of 3) make the Project Advisory Team.

2. Senior Design Project Duration:

The senior design project continues for two-semesters preceded by an orientation semester. Detailed description of each semester tasks is given later in this document.

3. Objective of Senior Design Project

The senior design project provides an opportunity for students to apply concepts, rules, methods and techniques learned in their undergraduate education toward a realistic industrial engineering project. The main objectives of the graduation project are:

1. To make the students understand and practice the basic concepts of engineering design for multidisciplinary industrial engineering project.
2. To expose the students to group learning and teamwork by working on a multidisciplinary project.
3. To improve the oral and written communication skills of the students
4. To make students capable of integrated project planning, scheduling, and cost analysis for industrial engineering project.
5. To let the students demonstrate their abilities in all Student Outcomes (SOs) as prescribed by the department.

These objectives of the GP are attained by attaining the prescribed Course Learning Outcomes (CLOs) of the Graduation Project given in the next section.

4. CLOs of Senior Design Project

The Course Learning Outcomes (CLOs) of Senior Design Project are pre-specified by the curriculum committee of the department. They are periodically reviewed and the recommendations of the faculty are considered in improving them. The prescribed CLOs are listed in Table 1. These CLOs are the focus of teaching for the faculty and the focus of learning for the students in going through the Senior Design Project. All these CLOs are oriented towards attaining the SOs specified by the industrial engineering department that the students must attain at the time of graduation

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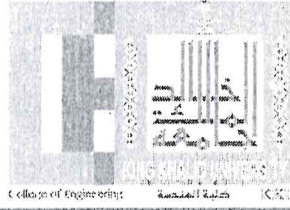


Table 1: Senior Design Project CLOs

CLO IDs	CLOs with SOs	SO
1	Analyze a project statement, brief, or proposal to identify the real problem and the most relevant needs and operational constraints (c,e,)	2
2	Identify potential customers, their needs, and their operational constraints (b,c)	2
3	Collect and identify related data such as technical information, regulations, standards, and operational experiences from credible literature resources (e, i,j)	1,2
4	Integrate previous knowledge from mathematics, basic sciences, engineering fundamentals, and disciplines related courses to address the problems (a)	1
5	Discuss all applicable realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (c,j)	4
6	Define design objectives and design constraints measures of design variability, and the evaluation criteria of the final project, and reformulate the problem based on collected data (c).	2
7	Generate possible solutions; compare alternatives, and select one alternative based on evaluation criteria and feasibility analysis (c,e,h)	2,6
8	Plan an effective design strategy and a project work plan, using standard project planning, techniques, to ensure project completion on time and within budget (c).	6
9	Implement a planned design strategy for an experimental design project, if applicable (f,k,i)	6
10	Demonstrate ability to achieve project objectives while acting as an effective member of a multidisciplinary team (j,c,d)	4,5
11	Communicate design details and express thoughts clearly and concisely, both orally and in writing, using necessary supporting materials, to achieve desired enhancement and impact (g).	3,7

5. CLO-SO Map of the Senior Design Project

The CLO-SO map is prescribed by the curriculum committee. For senior design n project all the SOs are significant. The students must demonstrate their abilities in all the 11 SOs from (a) to (k). The map is shown as follows:

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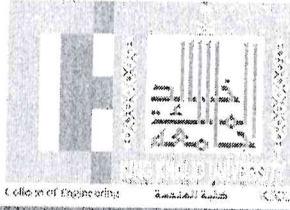
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CLO-SO Map

CLO IDs	SO IDs						
	1	2	3	4	5	6	7
1	0	1	0	0	0	0	0
2	0	1	0	0	0	0	0
3	1	1	0	0	0	0	0
4	1	0	0	0	0	0	0
5	0	0	0	1	0	0	0
6	0	1	0	0	0	0	0
7	0	1	0	0	0	1	0
8	0	0	0	0	0	1	0
9	0	0	0	0	0	1	0
10	0	0	0	1	1	0	0
11	0	0	1	0	0	0	1

Figure 1 Senior Design Project CLO-SO Mapping

6. Orientation Semester Events

1. Faculty members willing to act as MPAs fill the "Main Project Advisor Proposal form" (Form A) by the 10th week of the semester and submit them to the PCC (Project Course Coordinator) described next.
2. The faculty member appointed by the chairman as the Project Course Coordinator (PCC) holds a meeting of all MPAs and explains to them the procedures at 11th week.
3. Finalized proposals are announced, in a class lecture, to the students by the 12th week. During the lecture, each Main Project Advisor will present his project requirements including the number of disciplines involved (12th week).
4. Students select a project, form a team and fill the Graduation Project Team form (Form B) by the 14th week. Each team is typically composed of 5-8 students.

7. First Semester Tasks

During this semester, each student needs to conduct the following tasks:

1. Register 591IE-3 Senior Design Project through the academic advisor.
2. Meet with the PCC during the first Wednesday to finalize the teams' formation.

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3. Meet weekly with the MPA to report progress and fill the attendance sheet (Form C).
4. Meet MPA and the Supporting Advisors on weeks 5 & 7 to discuss progress.
5. Maintain a log of significant events, analysis, designs, laboratory test data (if any), telephone conversations, meeting minutes, and results.
6. Coordinate with the MPA as the client to identify project requirements.
7. Identify the permits needed and document the procedures to obtain the permits.
8. Prepare detailed problem definition that includes but not limited to:

Students understanding of the problem, Project objectives, a review of the fundamental background knowledge and principles related to the problem, Identification of the data and information needed to solve the problem as well as the appropriate data collection methods.

1. Suggest alternative solutions and identify the project realistic constraints.
2. Prepare cost estimate for the engineering design phase.
3. Prepare scheduling for the complete design phase.
4. Evaluate feasibility of alternatives (proposed solutions considering constraints).
5. Select the most feasible design alternatives.
6. Develop initial model.
7. Study impact of design and construction on the adjacent properties.
9. Identify Environmental/Social constraints
10. Identify applicable local/ national/ international standards/codes requirements.
11. Prepare a project proposal identifying scope, resources, budget, implementation schedule, and have it approved by the MPA and SA.

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8. First Semester Deliverables

Week 2: Each project team must submit project proposal listing the contribution of each team member to MPA.

Weeks 5 and 7: Project team must meet with the Main Project Advisor to present the project progress.

Week 11: Project team submits a written progress report summarizing the work completed by the team. The students need to list the tasks required to complete the project in the second semester (Form D1).

Week 14: First semester assessment Form D2.

Week 15: Project team should give a PowerPoint oral progress report presentation. Projects advisory team must attend these presentations (Form D3).

9. First Semester Assessment:

First semester assessment will be based on the abilities demonstrated by the students in the tasks listed in Table 2. The advisers will grade each tasks out of 100. CLOSO will calculate the grades based on the relative weight of each task as given in Column 3 of Table 2. Each student will be rewarded for his contribution in these tasks. The MPA will use forms D1, D2 and D3. The SA will be helping the MPA in making the assessments. The EX will not participate in the assessment of the first semester. The data of Table D3 will be used for input to the Graduation Project Template of CLOSO. CLOSO will calculate the final grade and the satisfaction of each CLO and SO.

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Table 2: First Semester Assessment Items

Task ID	Task Description	Weight	CLO
1	Coordination with a company	5	CLO5
2	Problem definition and constraint statements	10	CLO1
3	Literature review	5	CLO9
4	Statement of objectives	5	CLO2
5	Design quality evaluation criterion	5	CLO2
6	Codes/local laws and analyzing professional ethics	10	CLO6/7
7	Project schedule	5	CLO2
8	Feasibility of alternatives	5	CLO2
9	Conceptual design	5	CLO2
10	Design impact analysis	5	CLO4
11	Conceptual design	5	CLO2
12	Economical/environmental/safety impact assessment	5	CLO4
13	Design code requirements	5	CLO4
14	Teamwork	5	CLO5/10
15	Presentation Form D3	15	CLO8/11
16	Numerical/laboratory experimentation plan	5	CLO3
	Total Marks	100	

10. First Semester Grade:

First semester grade is based on the following rules:

1. Deliverables of this semester are mandatory. Failure to deliver them will result in (F) grade.
2. A student missing more than 25% of the weekly meetings will receive "DN" grade.
4. A Student who submits the deliverables and attains a minimum of 60% score based on the distribution given below will get an IP grade to continue with the project in the next semester.
5. The scores in form D3 are the input data for CLOSO. The MPA will use the CLOSO template file for this purpose for reporting the assessment grades.
6. The weight of First semester grade in the calculation of the Final grade is 30%.

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11. Second Semester Tasks

On the consent of the project advisory team, each project team can start the Second Semester tasks as follows:

1. Submit schedule of deliverables to the PAT by the end of the second week.
2. Meet weekly with the advisor to discuss the progress and fill Form C.
3. Maintain a log sheet of the weekly meetings.
4. Perform the required design with the constraints that were previously identified.
5. Prepare cost estimation and construction schedule.
6. Submit the final typed report at the specified due date in the required format.
7. Design notebook, project cost estimation, detailed time schedule for construction and detailed engineering drawings must be provided.
8. Prepare a poster describing the team project.
9. Give a group PowerPoint presentation.

12. Second Semester Deliverables

1. Week 2: Project team must submit schedule of deliverables.
2. Week 4: Project team must meet with the MPA and SA to present their design progress.
3. Weeks 11: Contribution of each team member should be clearly identified to the MPA in Form E1.
4. Week 14: Each project team need to submit the final project report and a project poster highlighting the main idea of the project. The report format is described in the end (Form E2)
5. Week 15: Each project team has to attend the final project oral exam. The students will give a 20-minute PowerPoint presentation followed by questions and answers from the examiners. (Form E3)

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13. Second Semester Assessment:

Each student will be graded for his contribution and abilities based on assessment of the following tasks using the forms E1, E2, and E3. Each examiner (MPA, SA and the 3rd examiner will fill in the forms and the average of the three will be entered as the final score and input to CLOSO. This will give two-third weight to the internal advisers and one third to the external examiner.

Table 3: Second Semester Assessment Items

Task ID	Task Description	Weight	CLO
1	Weekly meetings with advisor-team progress	2	CLO5
2	Schedule of project deliverables	3	CLO5
3	Team work abilities-log sheets	5	CLO5
4	Identify and formal ate problem	5	CLO1
5	Design with constraints	10	CLO2
6	Laboratory/Numerical Experiments, data collection and analysis	10	CLO3
7	Application of codes in design	5	CLO6
8	Consideration of local laws in design	5	CLO7
9	Economical-Environmental Impact and Contemporary issues	5	CLO4
10	Ethical decisions in design	5	CLO7
11	Data and information obtained from internet and Library	5	CLO9
12	Cost considerations in the project	5	CLO2
13	Project Schedule	5	CLO2
14	Final Report Form E2	15	CLO8
15	Poster summarizing the project	5	CLO8
16	Group presentation Form E3	10	CLO8
	Total Marks	100	

Notes:

1. Assessment will be performed using Forms E-1, E-2, E3 and E-4.
2. Failure to submit on time the project deliverables will result in an incomplete (IC) grade. Change of the incomplete grade (IC) to a letter grade will be performed by the 2nd week of the

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following semester after receiving the final revised project report. Students will receive an “F” grade if they fail to submit the revised project report.

3. Student missing 25% of the weekly meetings or not attending the oral exam presentation will receive an “F” grade.
4. A student missing any of the weekly progress meetings during the first and second semesters will be penalized by deducting 1% from his final course grade for each missed meeting.
5. Each student must maintain a minimum grade of 60% to pass the course.

The second semester assessment will be mainly based on the MPA’s assessment of the tasks completed by the students and the evaluation by SA and the External Examiner.

14. Final Grade for the Course

The final grade of each student will be calculated by giving a weight of 60% to the second semester marks (average of three examiners i.e. MPA, SA and EX) and 30% to the first semester marks. The final grade must be submitted by the MPA to the Chairman of the assessment committee for making sure the procedures for ABET accreditation have been met.

15. Graduation Project Final Report Format:

A. Most Important:

1. No plagiarism will be allowed.
2. If you copy any material from anywhere give the complete reference
3. Keep the report short. Put only material that you did as a student.

B. Graduation Project Final Report

1. Title Page
2. Table of Contents.
3. List of figures followed
4. List of tables.

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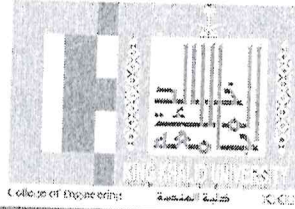
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5. Introduction with discussion of contemporary issues
6. Body text: include items as described in the Second semester tasks section from page 5
7. Conclusions/ Recommendations.
8. References

Note: Reference must follow the ASCE format

9. Appendix

C. Font, Style Paper size

1. Times New Roman Size 12 font will be used except for Headings and Titles
2. Headings and Titles will have a specified format based on the template provided to the students. (<https://engineering.kku.edu.sa/ar/content/1203>)

D. Required forms:

3. * Weekly Meetings Attendance Sheet (Form C - Second semester).
4. * Relative Contribution of Team Members (Form F).

E. The MPA will explain to the students the format required for the poster.

16. General Expectations from the Students

Each student in the project team must:

- 1) Attend all team meetings or work sessions.
- 2) List his contribution in the final report.
- 3) Be prepared for the group meetings with clearly formulated ideas.
- 4) Co-operate with others (outside his specialization).
- 5) Share credit for success and accountability for team results with others team members.
- 6) Share information with others and provide assistance to others.

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- 7) Demonstrate the ability to assume a designated role in the group.
- 8) Value alternative perspectives and encourage participation among all team members.
- 9) Remain non-judgmental when disagreeing with others and work on conflict resolution.
- 10) Be courteous to his fellow group members and respect their opinion.
- 11) Demonstrate knowledge and technical skills pertained to the disciplines of industrial engineering addressed by the project.

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