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1. Overview

The senior design project (MEN 488 and MEN 499) for the mechanical engineering department is designed to improve the students' professional practice in addressing a real-life technical and/or social problem, researching the problem, developing practical for solving the problem, communication skills, and teamwork opportunities. In addition, the senior design project is emphasizes the society policy such as professional and ethical practice, conflicts of interest, safety, and social impacts.

In selecting a senior design project topic, the student should draw from experience, issues, and concerns found in natural resources, or from consultations with professionals in the field of study. Thus, the Internship, summer practice, and Coop experience opportunities often provide interesting topic areas for senior design projects.

In any case, the senior design project is an independent study using a faculty advisor for guidance. The outcome of the student's work effort should be a coherent, logically organized senior project. As part of the senior project skills, the students will have the chance to demonstrate their capability to: manage the senior project, recognize the objectives, conduct the literature survey, perform the experiments and the relevant analysis, write the final senior project report, and deliver the main results. The project delivery might take the form of a report, simulation, prototype, or other type of specialized output.

2. Senior Design Project Objectives:

The objectives of the senior design project are:

1. gain experience defining, designing and managing a project
2. learn how to design and properly document a project based on technical requirements,
3. develop innovative solutions to significant, real problems,
4. communicate the project orally and in writing, using necessary supporting materials.

3. Senior Project Outcomes

By the end of the senior project, the student should be able to:

1. prepare a project concept document
2. define the major problems that they may face during their practical work
3. generate the possible solutions and select one alternative solution based on criteria.
4. acquire the necessary skills to communicate, negotiate, and evaluate their strengths and weaknesses as members of a team
5. write a technical requirement document
6. create and maintain a project schedule

7. seek learning opportunities outside the classroom environment
8. develop detailed design documents
9. make oral presentations
10. maintain a project schedule
11. develop a test plan for a project
12. build a system component
13. test the operation of a system to prove it meets the requirements.

4. Steps to Assign a Senior Project

Students are expected to register for the senior project with a faculty member whose specialty and interests are compatible with the preferred topic of his project. Students may find a senior project supervisor by meeting with individual faculty members prior to the beginning of the term and receiving their approval as a supervisor. To assign a senior project, student(s)/faculty should go through the following steps:

1. Supervisor Submit the senior project proposal (*Form 1*).
2. Supervisor present the proposal to the department for approval.
3. The approved proposal present to the students for selection process.
4. Students may select one of the approved projects (*Form 2*).
5. Register the students with the selected faculty member.

5. Project Teams

One of the main project objectives is to develop the teamwork skills, which is very appreciated in most professional situations.

The formation of senior project teams (*Form 3*) is subject to the following requirements:

1. All senior projects must be conducted as teams.
2. Project teams can consist of a single discipline or multidisciplinary students.
3. The minimum of any team is two students. No more than five students will be permitted.

6. Senior Design Project Proposal

The senior project proposals may come from a number of different sources including students and faculty. The project proposals will be subject to a screening process and must meet the ABET minimum requirements of senior design project (*Form 4 and Form 5*) in order to be accepted as a senior project. The proposal should be almost one page and should include the following:

- A clear and concise declaration of the problem.
- A plan of the general domain of the project work and an interim schedule.
- A list of any facilities, Engineering standards, and constraints that will be required.

- A description of how the proposed project will satisfy ABET requirements for the senior project.

7. Senior Design Project Duration & Academic Level

Senior (Final year of study) students expected to graduate by the end of the academic year can take the senior design project course which spans a two-semester. The first semester start in the fall of an academic year. The senior project, MEN 499, builds upon work done in MEN 498, finishing with a professional review presentation.

The student registers in phase one of the project (course code: MEN 498; two-credit unit). The students are expected to discuss their progress in project work with their advisors in weekly meetings (*Form 6 and Form 7*). By the end of the project work, the students submit a written report, present and defend their results. After successful completion of the first part, the student registers in part two of the project (Course code: MEN 499; two-credit hour).

8. Project Supervision

A faculty member, will be assigned by the mechanical department to follow-up and guide the students in the development of the project. In the case of an external project (sponsored project) is co-supervised by a faculty member and an engineer from the host company. The assigned faculty member is responsible for direct communication and coordination with the sponsor company and the external supervisor. A senior project proposal should be submitted at the beginning of the course by the supervisor(s) for department approval. The supervisor is request to write a senior project status report (*Form 8*).

9. Senior Design Project Coordinator

The functions of the coordinator are outlined below:

- Arrange and conduct the weekly common meeting hour.
- Spread the prospective proposal received from the faculty members.
- Encourage the student to discuss the prospective proposals with the pertinent faculty.
- Organize a meeting at beginning of the semester with advisors to assign students to projects.
- Give lectures (*Senior Design Project I*) that cover the following topics:
 - Definition of the major problems that they may face during their practical work.
 - Brainstorming of alternative solutions of design problem.
 - Generating and maintaining a project schedule.

- Writing a technical report.
- Communication skills.
- Arrange or give at least four lectures (*Senior Design Project II*) to cover various relevant aspects that will provide students with:
 - Professional and ethical.
 - Contemporary issues.
 - Engage in life-long learning.
 - Understanding the impact of engineering solutions.
- Arrange meeting with the advisors to discuss the state of the senior projects.
- Coordinate the evaluation of the project written reports and the presenters by the review panel members and then calculate the average for each student.
- Assign of 10-20 points of the final score based on the student's activities during the mutual meeting.

10. Senior Design Project I

Students enrolled in *senior design project I* are to be committed to conduct the following sequence of tasks:

- All students registered in the senior design project I shall attend general lectures arranged by the project coordinator.
- Formation of senior project team. The project team is mandatory to develop a problem declaration and a plan of the project activities (Gantt Chart, *Form 9a*).
- A timetable of the general activities should be submitted to the project coordinator by the end of the 3rd week.
- By the end of the 1st semester, the students in each project are obligatory to submit a final report to the advisor and the project coordinator. The project coordinator will request changes in the report if it does not fulfill with the format provided. The submission dates for the design report and the system verification review are set by the coordinator

11. Senior Design Project II

Students enrolled in the in *senior design project II* are to be committed to conduct the following sequence of tasks:

- Teams should complete their projects that they started the previous semester by carrying out the “detailed design” for those projects that do not involve prototype. For those projects that involve prototype, the teams complete their work by implementing what they have designed, testing, and demonstration of the final product.
- A timetable of the tasks should be submitted to the project coordinator by the end

of the 2nd week (Gantt Chart, *Form 9b*).

- At the end of the 2nd semester, the students in each project are mandatory to submit a copy of a final design report to the advisor and the project coordinator. The submission dates for the final design report and the system verification review are set by the coordinator.
- The plagiarism includes uncited use of any statements or ideas will not be tolerated in the senior design project (Student Sign Off, *Form 10*).

12. Final Project Delivery (MEN 499)

Before posting the final grade of MEN 499, each group of students should submit the following to the Mechanical Department coordinator:

- 2 copies of the corrected final report.
- The original copy of the final report that shows the comments/corrections of the examiners.
- CD/DVD that includes a soft copy of the final corrected report, presentation, developed programs, performed simulations.

13. References

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- [6] Senior Design Guidelines, College of Engineering, King Faisal University, 2014. <https://www.kfu.edu.sa/en/Colleges/AhsaEngineering/Documents/Senior%20Design/Senior%20Design%20Guidelines.pdf>
- [7] Senior Design Project Handbook, Department of Electrical Engineering, College of Engineering, Qatar University, 2010.

14. Appendixes

14.1 Appendix I (Senior Design Project Assessment Rubrics)

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