Jordan University of Science and Technology

Faculty of Computer and Information Technology

Department of Computer Engineering

Graduation Project Manual

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By

Graduation Projects Committee

Dr. Taisir Eldos, Chair

Dr. Mohammad Fraiwan, Member

Dr. Osama Alkhaleel, Member

Graduation Projects Manual

This manual is prepared by the graduation projects committee to help both faculty and students carry out the graduation projects in accordance with the department's guidelines towards achieving the program objectives and students outcomes. This document outlines the graduation projects significance, outcomes, selection criteria, essentials, professional constraints, responsibilities of students and supervisors, and milestones.

The appendices include reports templates, format requirements and assessments forms

Project Significance

Graduation projects are quite significant as they provides opportunities to practice design in a way that mimics professional practice. Typically, students are required to apply a systematic design process, incorporate engineering codes, standards, and realistic constraints in solving a computer engineering problem of their choice. Such projects employ knowledge and skills acquired in earlier course work and incorporate appropriate engineering standards and multiple realistic constraints. The main outcome is then to have the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Project Outcomes

The graduation project is a two semester capstone senior course that ensures necessary exposure to the engineering design process. This experience is expected to be associated with the following outcomes in specific:

- An ability to design a system, component, or process to meet desired needs. Students have to demonstrate the ability to apply design process systematically in any design environment, conduct research on the economical, global impact, ethical and technical aspects of the engineering design, and then optimize engineering solutions and designs in accordance with technical and contemporary constraints.

- An ability to function on multi-disciplinary teams. Students have to work in teams, preferably multidisciplinary one; like mechatronics, electrical engineering, computer network engineering, and carry out regular meetings, project management, and presentations.

- An understanding of professional and ethical responsibility. Students have to realize the professional and ethical responsibilities of the engineers, so they differentiate between ethical and legal issues and how these are related to their design projects.

- An ability to communicate effectively. Students have to perform written, oral, and technical communication, through standard formal technical reports complying with the proper conventions, formats, labeling of figures and tables, reference citation, proper presentation of the technical content of the report, and techniques for oral presentation.

- The broad education necessary to understand the impact of engineering solutions in a global and societal context. Students have to investigate the impact of engineering solutions in a global and societal context, so they can analyze the impact of the their project on society, both locally and globally.

- A recognition of the need for, and an ability to engage in life-long learning. Students learn to recognize the need for, and the ability to engage in life long learning, so they can review the literature for concepts not covered in the curriculum but needed for the successful completion of the project.

- A recognition of contemporary issues. Students have to stay current by reading engineering magazines, journals, websites, and contacting professors and fellows to stay current in the domain issues.

- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Students have to use techniques, skills, and modern engineering tools; modeling and simulation software, project management software, engineering equation solvers, design software, toolboxes, etc. to complete the final design project

Project Selection Criteria

The graduation project is intended to provide capstone design experience; it builds on the students' skills and knowledge gained from previous years of coursework in mathematics, sciences, engineering science and design. The project should be sufficient in scope and technical content to demonstrate the technical competence in computer engineering. The successful completion of the project is indicative of the students' preparedness to pursue professional practice at work. The following guidelines are provided to help faculty, students and project sponsors identify suitable senior project topics:

- The project should emphasize hardware and/or software design, experimentation and/or hands-on skills. Beside hardware design and implementation, developing algorithms and software systems like: simulators, image processing algorithms, CAD/CAM/CAE tools, smart network protocols, etc.

- The project should offer opportunity for creativity.

- The project should be of sufficient complexity for a team of 3 students, each students contributing 10 hours in class time and 30 hours outside class in the first phase, and 30 hours in class time and 120 hours outside class in the second phase. Hence, it is highly recommended not take many other courses during those semesters.

- The project should draw on the students' skills and knowledge gained from previous years of coursework.

- The project should incorporate engineering standards and realistic constraints that include: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political ones.

- The project schedule should span two full semesters, with nearly eight months of work.

- The project should have concrete and measurable goals and well defined deliverables.

Project Essentials

It is necessary for any project to achieve a minimum, and the following actions are essential:

- Determination of design objectives and functional requirements based on needs statement, identification constraints on the design problem, and establishing criteria for acceptability and desirability of solutions.

- Formulation of the design problem based on objectives and constraints.

- Development of a design strategy, including an overall work plan, decomposition of design problem into subtasks, prioritization of subtasks, establishment of timetables and milestones by which progress may be evaluated. This plan will be used to guide the course of action during design implementation.

- Analysis and assessment of alternative solutions to obtain the best solution based on their feasibility by considering the realistic constraints, to select the most feasible and suitable solution.

- Realizing the selected/best solution in a working model or prototype.

- Documentation of design work properly in a standard formal report

Professional Practice Constraints

The graduation project offers the student an early exposure to engineering practices. Hence, it incorporates other considerations such as project management, and communication experiences, in addition to the design. A major issue in the project design is to cope with the professional constraints, including:

- Manufacturability Constraints; limits placed on the product form, components, industrial standards and the assembly methods employed so as to provide for ease of construction.
- Economic Constraints; limits placed on fiscal, temporal and manpower resources in developing alternative design solutions.
- Sustainability; limits placed on the design and use of products and processes in recognition of their true lifecycle and long-term costs to society.
- Environmental Constraints; restrictions that limit the adverse effects of human activity on the quality of all life on Earth.
- Health and Safety Constraints; standards that serve to protect or maintain human life by minimizing risks from injury or disease.
- Ethical Standards Constraints; principles of conduct and integrity, which govern the behavior of an individual or group toward other individuals or groups within a community.
- Social Values Constraints; limits which society places on the research and development of new technology and advanced products according its own prescribed set of values.
- Political Constraints; restrictions instituted by society, as expressed through its governing bodies, which reflects the prevailing political will of its constituents.

Student and Supervisor Responsibilities

Student Duties:

- Students must meet and consult with their supervisor periodically.
- Perform the work assigned and put significant individual effort towards the completion of the group task.
- Maintaining honesty and personal conduct when searching for and obtaining relevant information.
- Submitting all reports on time as specified by project supervisors.
- Attend weekly meeting scheduled by the common advisor.
- Appear for oral examination at the end of the term.

Supervisor’s Duties:

- Regularly meet with the students and provide assistance.
- Approve the schedule of the different project tasks.
- Control and monitor the progress of the project.

- Assess students both collectively as well as individually.
- Ensure that the team keeps the project binder up-to-date.
- Correct and evaluate the final report, presentation, posters, etc.
- Approve the submission of the final project report.

Project Major Milestones

A generic time table for major milestones in the project is shown below, and the projects' supervisors are strongly advised to ensure that the schedule is followed as closely as possible to ensure successful timely completion of the projects.

Project Timeline: Phase #1 (1st semester)

Week: 1 - 2	Project Identification
Week: 3 - 4	Project Definition, Specification and Background Research
Week: 5 - 7	Project Planning and Task Definition
Week: 8 - 9	Literature Review and Presentation
Week: 10 - 14	Preliminary Design and Parts Acquisition
Week: 15	Preliminary Report
Week: 16	Presentation / Assessment

Project Timeline: Phase #2 (2nd semester)

Week: 1 - 3	Detailed Design Development
Week: 4 - 5	Design Review and Presentation
Week: 6 - 10	System Simulation, Optimization, Design Iteration, Construction and Testing
Week: 11 - 14	Final Design and Draft Report / Presentation
Week: 15	Final Report
Week: 16	Presentation / Assessment

Report Structure

The final report must detail the project in a way that makes it clear to understand and even implement or reproduce. Regarding the style, the report should be printed on A4 paper with 2 cm margins, in Times Roman font size 10 pints for the body, 12 points for the section headers and 14 points for the chapter titles. Text must be left and right adjusted, with 1.5 line spacing, and properly numbered or bulleted lists, and well numbered and captioned tables, figures and images. Codes, detailed specifications and images that may hinder the reading should be included in the appendices not the body of the report.

The structure should include the following chapters and sections:

Cover page (University and Department names and logo, project title, authors, supervisors, year)

Acknowledgment (Those who truly helped you achieve your goals and made contributions)

Abstract (brief description of the project and achievements)

Table of content

List of figures

List of tables

1. Introduction
    1.1. Statement
    1.2. Significance
    1.3. Goals
    1.4. Contemporary issues
    1.5. Impact on society
    1.6. Initial constraints
2. Project Planning and Task Definition
    2.1. Task identification
    2.2. Timeline
3. Literature Review (Sub-sections as needed)
4. Preliminary Design
    4.1. Concept
    4.2. Concept evaluation and selection
    4.3. Design constraints
    4.4. Applicable codes and standards used in the design
    4.5. Preliminary analysis
5. Detailed System Design

5.1. Engineering analysis and simulation

5.2. Layouts, drawings, equipment specifications

5.3. Applicable codes and standards used in the design

5.4. Economic analysis

6. Implementation

6.1. Construction

6.2. Programming

6.3. Validation

7. Results and Discussion

7.1. Summary of goals met by the design and justification for any shortcoming

7.2. Summary of constraints and codes met by the design

8. Conclusion

9. Recommendations

List of references

Appendix