جامعة قطر
QATAR UNIVERSITY

كلية الهندسة
COLLEGE OF ENGINEERING

Department of Electrical Engineering

Senior Design Project Handbook

Academic Year 2024-25

Bachelor of Science in Mechatronics Engineering

Department of Electrical Engineering
College of Engineering
Qatar University

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DISCLAIMER

The SDP handbook is provided to guide the Senior Design Project (SDP) students from eligibility to final assessments. SDP I refers to the course MECE498, while SDP II to the course MECE499. While we strive to provide complete and accurate information in this handbook, please note that force majeure cases are not subjected to this. The SDP committee and the department reserve the right to introduce modifications as deemed necessary at all times. The content of this handbook is intended for internal use only within the Department of Electrical Engineering.

The handbook outlines only the main guidelines for all phases of the SDPTherefore, it is essential for students to regularly review the handbook and stay informed about any updates (changes or additions). Students must consult with their assigned advisors as well as their SDP coordinator before registering and throughout the SDP course. It is also important to emphasize that the department is not responsible for any concerns arising from students' failure to read the handbook or consult the focal persons. It is the responsibility of students to form their SDP groups. Once the SDP group is registered, no changes will be allowed.

By using this handbook, students acknowledge and accept that they are responsible for staying informed about any update or change. While ultimate responsibility lies with the students themselves, the Department and the SDP committee will assist students to the best of their abilities.

We wish all the best to all the students in their senior design projects, and encourage them to use the resources available to ensure a successful and fulfilling learning experience.

Electrical Engineering Department

SDP Committee

1. INTRODUCTION

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, to obtain 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.

The Senior Design Project (SDP) is a demanding, challenging, yet rewarding part of your degree. The SDP course provides an integrated assessment of students' progress toward the desired electrical engineering competency. It is, therefore, important to design fair and broad guidelines for better assessment of this course.

The main purpose of the SDP is to improve the students' technical, research and communication skills by integrating writing, presentation and teamwork opportunities. The SDP is comprehensive. It focuses on professional practice and includes a variety of non-technical issues such as economic factors, safety, reliability, environmental impacts and social impacts. The students are required to follow relevant national and international standards as well as understand and apply ethical principles.

A list of projects is typically proposed by the Department faculty members and distributed to students to choose from. Through their summer training course or any other relation to entities outside the University, a group of students can also choose the topic of the SDP; the selected topic has to meet the SDP requirements as deemed by the Department, and if accepted, a faculty member relevant to the technical area of the students' proposal will be assigned by the Department, subject to their availability and willingness. To successfully complete the SDP, students are required to demonstrate their ability to: (i) conduct a critical and comparative literature survey, (ii) perform relevant design calculations, (iii) identify multiple realistic design constraints along with the required standards, (iv) propose several alternative solutions, (v) choose an appropriate justifiable solution to the given problem, (vi) perform hardware and/or software implementation of their design and (vii) evaluate the system performance in the context of the identified multiple realistic design constraints and standards.

Externally sponsored projects are welcome as they benefit the industry and guarantee a strong educational experience for our students. Sponsored projects can be tailored to meet the requirements of the Mechatronics Engineering SDP.

This handbook describes the SDP allocation process, supervision arrangements, assessment requirements and guidelines for writing final reports.

1.1 COURSE OBJECTIVES

Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills required

in earlier coursework and incorporating engineering standards and multiple realistic constraints that consider economic, environmental, safety, manufacturability, ethical, and social aspects. The objectives of this course are:

1. Students can select and plan an engineering project involving analysis and design tasks.
2. Students can conduct a critical and comparative literature survey.
3. Students can carry out, as a team, mechatronics engineering design.
4. Students can perform the relevant calculations, analysis, and implement their design.
5. Students can understand economic, and environmental issues related to technology.
6. Students can understand the impact of engineering on societal issues.
7. Students can communicate technical information in writing.
8. Students can communicate orally and critically evaluate technical information.

1.2 COURSE LEARNING OUTCOMES

Upon successful completion of the SDP, students will be able to:

a) Conduct a thorough literature survey to support the design and execution of engineering projects.
b) Design an engineering project with well-defined objectives that considerpublic health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor.
c) Plan an engineering project involving multiple tasks and demonstrating effective teamwork to complete the project.
d) Identify, formulate and solve a complex engineering problem*****.
e) Communicate technical information clearly in both written reports and oral presentations.
f) Acquire new knowledge using appropriate learning strategies (e.g., various online and library resources) and synthesize the acquired information.

*******Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.*

1.3 RELATIONSHIP OF COURSE LEARNING OUTCOMES TO STUDENT OUTCOMES (SOS)

Course Learning Outcomes (CLOs)	Related Student Outcomes						
	1	2	3	4	5	6**	7
a		✓					
b	✓	✓		✓		✓	
c					✓		
d	✓						
e			✓				
f							✓

***Applies to MECE499 only.*

Student Outcomes (ABET Criteria)

1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3) An ability to communicate effectively with a range of audiences
4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

2. SENIOR PROJECT STUDENT ELIGIBILITY AND ALLOCATION PROCESS

An SDP in the Mechatronics Engineering program is a two-semester course in which students form teams, usually of 2-3 members, select a design project based on their interests, and are supervised by two faculty members, one from the Department of Electrical Engineering (EE) and one from the Department of Mechanical Engineering

A student is eligible to request registration in SDP I, if the following criteria are satisfied:

1) Successfully passed the following **200 core courses**: ELEC 201, ELEC231, ELEC 261, ELEC262, MECH 210, MECH 223, and MECE 212.

   Note: Courses with incomplete (I) grade will be considered as not passed.

2) The academic plan from the student's advisor shows that she can graduate within a **maximum of three (3) semesters** starting on the semester of the requested SDP I registration (For example: the Fall semester for registering SDP I, the Spring semester for registering SDP II, and - if needed - a final Fall semester right after). This cannot include any Summer or Winter plans whether inside or outside Qatar University.

The final decision for SDP I registration for any student is subject to approval by the Department of Electrical Engineering.

During the first semester, the students register in phase one of the projects (course code: MECE 498; three-credit hour). After completing the first part successfully, the students can register for part two of the project (Course code: MECE 499; three-credit hour). For both parts, the students are expected to discuss their progress with their supervisors in regular weekly meetings. The students submit written reports,

logbook, presentations, posters and other supporting material at the end of each semester. They also present and defend their work.

There are several steps to the SDP allocation process, which are summarized as follows:

1. All faculty members will submit the SDP proposal forms (See Appendix I). Students will be allowed to suggest their own project provided it meets the SDP standard. Each project should be co-supervised by one faculty from the EE department and one from the MECH department.
2. All SDP proposal forms will be presented to the SDP Committee by the SDP Coordinator for review and approval.
3. The SDP coordinator will contact faculty members whose proposals require changes.
4. All approved SDP proposals will be made available to all students.
5. For MECE SDP, students should form groups of at least two (2) members.
6. Each student group will select five project choices from the list of approved proposals in descending preference order (i.e., 1st choice is the most preferred and 5th choice is the least preferred). While choosing the project, students should consider the prerequisite courses listed in the project by the faculty. There are two types of prerequisites: individual and group. Individual prerequisites require that each student in the group must meet the prerequisites, whereas for group prerequisites at least one student must meet the prerequisites. If the prerequisites are not met during registration, the students will not be allowed to register for their allocated project. **For students applying for multidisciplinary projects (MDSDP), the MDSDP must be put as the first choice, and they have to select four other projects from the regular SDP-approved list (point 4 above). Once the MDSDP project is approved by the Technology Innovation and Engineering Education (TIEE) unit and students have signed for it, then they cannot withdraw and change the project.**
7. The SDP Coordinator will collect the students' choices and will make an initial allocation based on the following criteria:
    - Student choices
    - Prerequisites of the proposal
    - Number of required students
    - Faculty Load
8. The SDP Coordinator will present the initial allocation list to the SDP Committee for approval.
9. If one project is chosen by more than one group, a random selection draw will be applied, and the groups not selected will be allocated their next available choice.
10. Once approved by the SDP Committee, the allocation list will be published and all students will be asked to register with the assigned faculty members.

Students can propose their own project, preferably sponsored and/or supported by industryIn this case, they should submit the proposal to the SDP coordinator

indicating clear contact information (Name, Email, Phone number) of the industry mentor/focal point/co-supervisor. The SDP committee will evaluate the proposal and allocate appropriate supervisor(s) if the proposed project meets the SDP requirements, and an available faculty member is willing to accept. The students will still need to fill the SDP allocation choices form indicating their 5 choices of SDPs proposed by faculty members. In case the students' proposed project was not accepted or no faculty is found to supervise it, the students will be allocated one of their 5 choices as per the regular SDP allocation process.

2.1 PROJECT TIMETABLE

The key activities that make up the SDP work and an indication of deadlines are shown in Tables 1 and 2. All students are expected to manage their own time throughout the project period, to meet all deadlines, and to meet their supervisor(s) regularly.

Table 1: SDP Timetable for MECE498

Key	Activities	Timetable
1	Submission of an individual progress report	Week 5
2	Progress Presentation	Week 10
3	First draft report submission to the supervisor and examiners	The week before the last teaching week (Tue)
4	Receiving comments from supervisor(s) and examiners on the First Draft Report	Last teaching week (Tue or Wed or Thu)
5	SDP Presentation	Last teaching week (Tue or Wed or Thu)
6	Final Submission of revised report,,and logbook	One week after the presentation

Table 2: SDP Timetable for MECE498

Key	Activities	Timetable
1	Progress Presentation	Week 5
2	First draft report submission with poster (Soft copy)* as well as video demonstration to the supervisor and examiners	The week before the last teaching week (Tue)
3	Receiving comments from supervisor(s) and examiners on the First Draft Report	Last teaching week (Tue or Wed or Thu)
4	SDP Presentation	Last teaching week (Tue or Wed or Thu)
5	Semi-Comprehensive Assessment Exam	Mid February & Mid May
6	Final Submission of revised report, poster, video demonstration, and logbook	One week after the presentation

3. PROJECT SUPERVISORS

Each group of students is allocated two supervisors who are faculty members from EE and MECH departments and experienced in fields appropriate to the project title.

The role of the supervisors is to guide the students as appropriate, but the project work is carried out by the students. It is important for the students to meet with their supervisors regularly so that progress may be monitored and help and advice may be given. Meeting times should be be scheduled between the students and their supervisors, occurring at least once a week. The students may also see their supervisors at other times by mutual arrangement. Students should refer to the SDP coordinator initially if they experience any difficulties with the supervisory arrangements.

External projects (i.e., industry-sponsored projects) are co-supervised by faculty members and an engineer from the host company. The assigned faculty members are responsible for direct communication and coordination with the sponsor company and the external supervisor.

4. PROJECT WORK

4.1 PROJECT LOGBOOK

Students must maintain a project log, which must be in the form of a book such as a laboratory logbook or electronic-based logbook.

Students should keep a record in this book of all times when they work on their project and what they do. They should take the logbook with them whenever they meet their supervisors so that they can show what they have been doing and be reminded of any problems they may wish to discuss.

Students should also make notes in the logbook of what they plan to achieve before the next meeting, together with any information or explanations their supervisors may give them. The main benefit of keeping a record of the work is that the logbook allows students to use their time most effectively, by avoiding the duplication of work and the loss of important ideas or information. They will find it helpful to note any references they use (books, technical journals, papers, etc.). Keeping logbooks is a standard practice in the industry and will be of invaluable help when writing the project report.

The logbook can be used to record the following important information:

- Minutes of the weekly meetings with the action plan of the tasks. The minutes should record the attendee, the time and date of the meeting, and actions taken during the meeting.
- Calculations, ideas, experiments, drawings, handouts, etc., which may have bearing on developments.
- Entries should also include problems worked on as well as possible solutions plus calculations and tests made.
- Drawings, graphs, handouts, etc.

Finally, when the project is completed, each group should submit their logbook along with the other SDP materials.

4.2 BACKING UP WORK

Students are reminded to make regular **backup** copies of their work to prevent total loss of data and a setback in their project schedule in the event of such mishaps as a hard disc “crash” or theft of a computer. Backing-up of data is particularly important in cases where several persons may share the same computer.

Computer software and data loss will not be an acceptable justification for incomplete or untimely completion of project work.

4.3 PROJECT PLANNING

Students will find it difficult to achieve their aims without prior planning due to the limited resources, limited time and the amount of work involved. It is unlikely that they will be able to keep rigidly to a timetable, but an attempt has to be made to devise a schedule so that the work can be completed in the specified time. Therefore, they must begin with a plan and be clear about what they intend to achieve.

Students may consider the following planning outlines:

- Determination of the objectives.
- Identification of multiple realistic design constraints and standards for their chosen design problem.
- Identification and listing of the activities to be carried out.
- Estimation of the time needed for each activity to be completed.
- Checking the resources available and drawing up a schedule taking into account holidays, time to obtain equipment, and other work.
- Re-plan as necessary.

Students must identify any components or items of software that are difficult to obtain, or those with long delivery times, as soon as possible. Students should let the technical staff know if they require help from them.

4.4 TESTING

Students must allow plenty of time for testing and debugging any hardware or software they designed. They should not expect it to work first time! In many cases, more time is required for testing and debugging than for any other activity. Students should make notes and describe in their project report how they overcame the difficulties they faced.

It is often said that testing is only 10% of a project but takes 90% of the time!

4.5 PLAGIARISM

Plagiarism will not be tolerated and is against the University regulations. The large-scale insertion of material straight from the Internet is not acceptable. Any such material must be specifically referenced. This includes the flagrant copying of circuit diagrams from sources such as catalogues or any diagram from an online source. When work undertaken by others is incorporated into a project, it must be reworded/redrawn in addition to being referenced accordingly in the report.

A signed statement that the project and report is the students' own work except where specifically referenced must be submitted with the project report. A copy of this statement can be found in Appendix II.

The Department uses plagiarism detection software to scan all project reports, and anyone found guilty of plagiarizing the work of others will be disciplined according to University regulations.

4.6 ACADEMIC SUPPORT AND LEARNING RESOURCES

The University Student Learning Support Center (SLSC) provides academic support services to male and female students at Qatar University. The SLSC is a supportive environment where students can seek assistance with academic coursework, writing assignments, transitioning to college academic life, and other academic issues. SLSC programs include: Peer Tutoring, the Writing Lab, Writing Workshops, and Academic Success Workshops. Students may also seek confidential academic counselling from the professional staff at the Center.

Contact Information for Students Support and Learning Resources:
Tel: (00974) 4403 3876
Fax: (00974) 4403 3871
Location: Female Student Activities Building
E-mail: learningcenter@qu.edu.qa

4.7 PERSONAL DIFFICULTIES

The project makes considerable demands on students' personal ability, initiative, and dedication. Students may experience periods of doubt and uncertainty, particularly if things do not seem to be going well. Keeping in touch with other project students can provide mutual help and encouragement. If a student feels particularly worried (or sees fellow students in this state), he/she should seek help from his/her Project Supervisors and/or SDP Coordinator.

Students are reminded that the role of the supervisors is to help and support students. Obviously, such help and support should stop short of actually doing the job for them. Students are also reminded to acknowledge any help received from other people.

4.8 SUPPORT FOR STUDENTS WITH SPECIAL NEEDS

It is Qatar University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University, through its Special Needs Section, will exert all efforts to accommodate for individuals' needs.

Contact Information for Special Needs Section:
Tel-Female: (00974) 4403 3843
Tel-Male: (00974) 4403 3854
Location: Student Activities Building
Email: specialneeds@qu.edu.qa

5. PROJECT WORK ASSESSMENT

For each project part (i.e., MECE498 and MECE499), the project work will be assessed throughout the semester and the students will be individually evaluated. MECE498 is assessed by the supervisors and internal examiners, while MECE499

is assessed by the supervisors, an internal, and an external examiner. The final project mark is the collective mark of all assessors. Students' abilities to solve complex problems and effectiveness in expressing ideas through their reports and oral presentations are assessed. By considering the scope and depth of the students' consideration of all issues related to the design project, examiners will be able to assess the students' abilities to consider wider environmental issues that often accompany mechatronics engineering practice.

5.2 REPORTS SUBMISSION

The students are required to submit individually one interim progress report for both courses (i.e., MECE498 and MECE499) and one progress presentation. The progress report in MECE498 should at least include a literature survey, multiple realistic design constraints and standards, problem definition, and design objectives. The progess report in MECE499 should focus on final design, compliance with the set multiple realistic design constraints, results, and discussions. The interim and final reports should be submitted through BlackBoard (link will be provided by the main supervisor). Feedback will be provided on the progress reports.

The final report will be graded by two internal examiners in the case of MECE498 and one internal and one external examiner in the case of MECE499. Feedback will be provided to the students to improve their report. The students will submit final corrected reports as per the specified deadlines.

5.3 ASSESSMENT OF MECE498

An individual progress report needs to be submitted by Week 5 by each student and it should at least include a literature survey, multiple realistic design constraints and standards, problem definition, and design objectives. The progress report will be assessed by the supervisors. A progress presentation is set to take place in Week 10 where the students should show their progress in generating and synthesizing multiple design concepts that meets the developed technical specifications. The progress presentation will be assessed by the supervisors as well as examiners.

At the end of this course, a first final report should be written in which the problem statement, literature survey, design concepts, design options, multiple realistic design constraints, international and national standards used, simulation work, and hardware concepts are clearly described. Students will also be required to prepare an oral presentation. During the project defence, 15 mins will be allocated for presentation and 15 mins for question-answer and 5 mins for deciding on grades. Assessment at this level is based on the SDP proposal submitted at the beginning of the course, the two interim reports, and the progress report submitted in the middle of the semester. Examiners will evaluate and present constructive criticism and suggestions to help improve and develop the project. Table 3 shows the marking scheme for the assessment of MECE498 and all the relevants rubrics are provided in Appendix III.

Table 3: Grading scheme for MECE 498

Key	Assessment Element	Assessor	Maximum Mark
1	Progress Report	Supervisors	10%
2	Progress Presentation	Examiners/Supervisors	20%
3	Student Progress	Supervisors	10%
4	Professional Conduct	Supervisors	10%
5	Project Report[1]	Examiners	30%
6	Presentation and defense	Examiners	20%
7	Logbook	Supervisors	Pass/fail
8	Corrected Final Report	Supervisors	Pass/fail

Note: Grade "I" will be awarded to the group who do not address multiple realistic design constraints and standards in their report.

The two examiners will provide separate grades in two separate grading sheets; however, they are expected to discuss the students' performance together before filling their sheets.

5.4 ASSESSMENT OF MECE499

A progress presentation is set to take place in Week 5 and will be assessed by the examiners/supervisors. At this stage, the students should show their progress in developing of the initial prototype of the system. At the end of this course, each group will submit a final report, prepare an oral presentation and demonstrate their final prototype. By reading the report, observing the presentation, and inspecting the realized project, the examiners should be able to assess the written and oral communication skills and the problem-solving skills of the students.

There will be a written exam (comprised of multiple choice questions) to assess the fundamentals of mechatronics engineering knowledge of graduating students. The exam (semi-comprehensive assessment of the fundamentals of mechatronics engineering) will be online. The questions will be asked from core mechatronics engineering courses based on fundamentals of mechatronics engineering (**scope: Electric Circuit, Statics, Dynamics, Electronics, Digital-Embedded System, Sensors and Actuators, Thermofluids, Mechanical Mechanism, and control systems and Ethics**). The exam will serve as an input to the Department on the quality of our graduates. This exam is weighted as 10% of the total grade. Table 4 shows the breakdown of marks for the MECE499 course and all the relevants rubrics are provided in Appendix IV.

[1] The deadline for submitting the project report is one week before the presentation. If students do not submit their report on time, a 25% per day of the report grade will be deducted. If no report is submitted 24 hours before the presentation, a grade F will be given to the whole project.

Table 4: Grading scheme for MECE499

Key	Assessment Element	Assessor	Maximum Mark
1	Progress Presentation	Supervisors/Examiners	10%
2	Student Progress	Supervisors	10%
3	Professional Conduct	Supervisors	10%
4	Project Report[2]	Examiners	25%
5	Presentation and defense	Examiners	15%
6	Poster	Supervisors	5%
7	Semi-Comprehensive Assessment of Mechatronics Engineering Fundamentals	-	10%
8	Prototype Evaluation/Video Demonstration	Examiners	15%
7	Logbook	Supervisors	pass/fail
6	Corrected Final Report	Supervisors	pass/fail

Note: Grade "I" will be awarded to the group who do not address multiple realistic design constraints and standards in their report and show evidence of using those constraints in their design process (compliance with the constraints).

The two examiners (internal and external) will provide separate grades in two separate grading sheets; however, they are expected to discuss the students' performance together before filling their sheets.

5.5 SDP MATERIAL SUBMISSION

Before posting the final grade of MECE 498 and MECE499, each group of students must submit the following files to their supervisor placed in different folders named as follows:

- **SDPF1. Reports** (this folder should include the first draft report, interim reports (Progress Report and Progress Presentation), reports with examiners' and supervisor's comments, and the final report)
- **SDPF2. Logbook**
- **SDPF3. PPT** (presentation and poster)
- **SDPF4. Source Code** (if applicable – software project files)

[2] The deadline for submitting the project report is one week before the presentation. If students do not submit their report on time, a 25% per day of the report grade will be deducted. If no report is submitted 24 hours before the presentation, a grade F will be given to the whole project.

Important note: The submission of the listed material should respect the deadlines and must use the filenames given in **Table 5.**

Table 5: Deliverable material filenames

Folders	Material	Filename
SDPF 1.	Progress Report	PR_Student last name_Name.pdf or PR_Student_Name.docx
	Progress Presentation	PP.pdf or PP.docx
	First Draft Report	FinalReport_FirstDraft.pdf
	Examiner's Comment on the report	FinalReport_ExaminerComment.pdf
	Supervisor's comments on the report	FinalReport_SupervisorComment.pdf
	Final Version of Report	FinalReport_Final.pdf
SDPF 2.	Logbook	Logbook.pdf or Logbook.docx
SDPF 3.	Presentation (PPT)	Presnetation.ppt
	Poster	Poster.ppt or Poster.pdf

6. THE PROJECT REPORTS BRIEF

Students must obtain a copy of the SDP report template file and use it as the starting point for creating their project reports (interim progress and final). Using the template will ensure that the reports comply with the required standard layout. The template must not be changed in any way. The reports will be marked down for poor presentation if the template is not used. The template can be downloaded from the Department website or the course website on Blackboard.

Interim progress reports are very important to check students' progress in the course and will be graded by the supervisors The interim reports should be prepared using the final report template.

It is important to emphasize the project's design component, show multiple solutions and justification for choosing a particular solution out of several solutions. Multiple realistic design constraints should be included with quantitative values and qualitative descriptions. It is also important to show that the design constraints are used throughout the design process in the report (at the end of the design section or within the design steps), as well as evaluate the system's compliance to the design constraints. International and/or national standards should be included and discussed, and its impact on the design should be addressed.

6.1 WRITING STYLE

The report should be written in a clear, concise, and direct style. There is no reason to make the wording of a report complex. The aim of writing a report is to convey information and ideas to the reader, not to impress them with obscure vocabulary or jargon. Do not use long phrases when shorter ones will do. The use of correct English is essential.

6.2 REPORT FORMAT

The report must consist of the following items in order:

1. A Title Page
2. Declaration Statement: a signed statement that the project and report are the students' own work except where specifically referenced must be submitted with the project report.
3. Abstract: the abstract is a short summary describing the overarching objective of the work, the summary of the work done, and the main findings as described in the report and should not normally be longer than 400 words. The abstract is not intended to replace any other sections of the report, e.g., the introduction.
4. Acknowledgment: this section includes thanks to all the people who have helped.
5. Table of Contents: this is a list of every major item in the report, including Chapter headings and sub-sections, each with its page number given.
6. List of Figures
7. List of Tables
8. Glossary of Terms: this section consists of a list of all specialist vocabulary or acronyms with a brief explanation of their meanings.
9. Main body of the report: this part should contain the main chapters of the report. See the next section for more details.
10. References
11. Appendices

6.3 MAIN BODY OF THE REPORT

Due to the diversity of projects, students should consult their project supervisors about the most appropriate structure for the main body of the report.

The main body of the report should typically contain the following sections:

Introduction: this section should contain a brief statement about the subject and its importance, a justification for dealing with the subject, the aims and objectives of the project and the methods employed to achieve them.

Multiple realistic design constraints and Standards: Once the problem is defined and the project's objectives are set, multiple realistic design constraints should be identified. Some constraints can be qualitative, such as ease of use, social, political, health and safety, ethical, manufacturability, sustainability, reliability, durability, legality, etc. Some constraints should be quantitative, such as physical dimension, weight, power consumption, system response, cost, efficiency, etc. International/national standards should be identified related to the design. The designed system should also be evaluated in terms of compliance with the constraints and standards.

Literature Review: this should be written as a stand-alone chapter that reviews the history and background plus the present state of knowledge of the subject area of the project work. Any material derived or quoted from published or unpublished work of other persons has to be very clearly referenced or acknowledged. This chapter should also show the reader that students have read, and have a good grasp of, the main published work concerning a subject area of the project work.

Description of the Project Work: what has been achieved throughout the period of the project work should be described here. Students may split this into several chapters if there are several distinct areas.

Results and Discussions: results and measurements that have been generated throughout the project should be presented and discussed in this section. Make the best use of methods for expressing results in a useful and informative manner (e.g., Graphs, charts, diagrams, etc.). The results and discussion section may re-examine the cost aspects and marketability of the project.

Conclusions: this should provide a concise summary of the project's major findings together with comments and recommendations. The conclusions should be readable on a "stand-alone" basis by someone who has not read the rest of the report yet can understand what has been done. Hence, the conclusion should start with a brief outline of the project work, and then provide a critical outcome of the investigation based on a discussion of all results. References should be made to the objectives set out in the introduction.

Further Development: in this section details about any further development, improvement and future direction of the current project are discussed. This could be part of the “conclusion” chapter. Discussions of the commercial viability of the project can also be included here.

Other points:

In addition to the technical aspect, the report must demonstrate an awareness of time management, costs, and market needs. This part of the report may vary from a project to another. Examples of the type of material which should be included are:

- **a.** A time plan that shows timescales for major activities and comments about any modifications made to ensure the smooth running of the project.
- **b.** A detailed costing of the development work that has been undertaken during the project.
- **c.** A discussion of potential applications for the presented work.

APPENDIX I – **Proposal Forms**

SDP Proposal Form

Project Title:			
Area of Specialization of Project:			
Number of Students:			
Industrial Partner:			
Industrial Contact [ ] or Co-Supervisor [X]			
Supervisor: **Co-supervisor:**			
Individual pre-req:		**Group pre-req:**	

Short Project Description

Problem statement: (*Discuss the main problem addressed by the project.)*

Objectives: (*List of key objectives that need to be achieved.)*

Deliverables*: (List of key deliverables from the project.)*

Design aspects: (workload should be uniformly distributed among student members)

- Subsystem 1 design:
- Subsystem 2 design:
- Subsystem 3 design:

Subsystem Integration*: (How the subsystem are integrated)*

References:

Student SDP Proposal Form

Project Title:	
Area of Specialization of Project:	
Names and IDs of Students:	**S#1**
	S#2
	S#3
Industrial Partner:	
Industrial Contact [ ] or Co-Supervisor [ ]	
Supervisor: **Co-supervisor (if any):**	

Individual pre-req:	TO BE FILLED BY DEPARTMENT	**Group pre-req:**	TO BE FILLED BY DEPARTMENT

Short Project Description

- **Problem statement:**

Discuss the main problem addressed by the project.

- **Objectives:**

List of key objectives that needs to be achieved.

- **Deliverables:** *(List of key objectives that need to be achieved.)*

- **Design aspects:** (workload should be uniformly distributed among student members)
  - Subsystem 1 design:
  - Subsystem 2 design:
  - Subsystem 3 design:

- **Subsystem Integration**: *(How the subsystem are integrated)*

References:

APPENDIX II – **Plagiarism Statement**

We, the undersigned students, confirm that the work submitted in this project report is entirely our own and has not been copied from any other source. Any material that has been used from other sources has been properly cited and acknowledged in the report.

We are fully aware that any copying or improper citation of references/sources used in this report will be considered plagiarism, which is a clear violation of the Code of Ethics of Qatar University.

In addition, we have read and understood the legal consequences of committing any violation of the Qatar University's Code of Ethics.

	Student Name	Student ID	Signature	Date
1				
2				
3				

THIS STATEMENT MUST BE INCLUDED IN YOUR REPORT AS THE FIRST PAGE.

APPENDIX III - **MECE 498 Assessment Rubrics**

MECE 498: Progress Report Assessment Rubrics

Individual report will be submitted by Week 5 of the semester and it will be assessed by the supervisors based on the following rubrics from SO(2) PI(2)1 and SO(3)PI(3)1 with equal weight in 10% grading.

SO(2): *an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(2)1 – Develop technical specifications of the mechatronics engineering system to meet the design goals under specific constraints and standards considering public health, safety, and welfare, as well as global, cultural, social, environmental, economic factors and risks.	Unable to develop technical specifications or does not understand the concept of constraints and standards.	Partially develop technical specifications or show limited ability to understand the concept of constraints and standards.	Develop most of the technical specifications or show satisfactory ability to understand the concept of constraints and standards **with** weak justification	Develop most of the technical specifications and show satisfactory ability to understand the concept of constraints and standards with proper justification.

SO(3): *An ability to communicate effectively with a range of audiences*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(3)1 – Communicate effectively in writing.	Does not follow the provided organization and structuring. Does not convey the content in a technical and organized manner. Has many grammatical and typographical errors.	Follows partially the provided organization and structuring. Convey partially the content in a technical and organized manner. Has some grammatical and/or typographical errors.	Follows mostly the provided organization and structuring. Convey mostly the content in a technical and organized manner. Has few grammatical or typographical errors.	Follows always the provided organization and structuring. Convey always the content in a technical and organized manner. Has very few grammatical and typographical errors.

MECE 498: Progress Presentation Assessment Rubrics

Individual presentation will be done by Week 10 of the semester and it will be assessed by the supervisors/examiner based on the following rubrics from SO(2) PI(2)2 and SO(3)PI(3)2 with equal weight in 20% grading.

SO(2): *an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(2)2 – Generate and synthesize multiple design concepts that meets the developed technical specifications.	Fail to generate and synthesize any meaningful design concept	Generate and synthesize less than three design concepts	Generate multiple (at least three) design concepts **with** weak synthesis of some of the design concepts.	Properly Generate and synthesize multiple (at least three) design concepts

SO(3): *An ability to communicate effectively with a range of audiences*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(3)2 – Demonstrate effective oral communication with a range of audiences.	Speaker is rarely able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is sometime able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is mostly able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is always able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.

MECE 498: Final Report and Presentation Rubrics

SO(2): *an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(2)1 – Develop technical specifications of the mechatronics engineering system to meet the design goals under specific constraints and standards considering public health, safety, and welfare, as well as global, cultural, social,	Unable to develop technical specifications or does not understand the concept of constraints and standards.	Partially develop technical specifications or show limited ability to understand the concept of constraints and standards.	Develop most of the technical specifications or show satisfactory ability to understand the concept of constraints and	Develop most of the technical specifications and show satisfactory ability to understand the concept of constraints and standards with proper justification.

environmental, economic factors and risks.			standards **with** weak justification	
PI(2)2 – Generate and synthesize multiple design concepts that meets the developed technical specifications.	Fail to generate and synthesize any meaningful design concept	Generate and synthesize less than three design concepts	Generate multiple (at least three) design concepts **with** weak synthesis of some of the design concepts.	Properly Generate and synthesize multiple (at least three) design concepts
PI(2)3 – Perform analysis and evaluate the design concepts based on appropriate engineering and/or scientific principles	Fail to perform analysis and evaluate the design concepts	Show limited and less than adequate ability to perform analysis and evaluate the design concepts	Demonstrate satisfactory ability to perform analysis **with** weakness in evaluating the design concepts using a Decision Matrix	Perform comprehensive analysis and evaluate the design concepts using a Decision Matrix

SO(3): *An ability to communicate effectively with a range of audiences*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(3)1 – Communicate effectively in writing.	Does not follow the provided organization and structuring. Does not convey the content in a technical and organized manner. Has many grammatical and typographical errors.	Follows partially the provided organization and structuring. Convey partially the content in a technical and organized manner. Has some grammatical and/or typographical errors.	Follows mostly the provided organization and structuring. Convey mostly the content in a technical and organized manner. Has few grammatical or typographical errors.	Follows always the provided organization and structuring. Convey always the content in a technical and organized manner. Has very few grammatical and typographical errors.
PI(3)2 – Demonstrate effective oral communication with a range of audiences.	Speaker is rarely able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is sometime able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is mostly able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is always able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.

Student Outcome (4)

SO(4): *An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(4)1 – Recognize ethical and professional responsibilities in engineering situations.	Does not show awareness for the need to incorporate ethical and professional understanding in the given engineering situation.	Shows awareness for the need to incorporate code of ethics and professional responsibilities in the given engineering situation but does not provide related details.	Shows a good awareness for the need to incorporate relevant code of ethics, and professional responsibilities in the given engineering situation and provides most of the related details.	Shows a strong understanding of relevant code of ethics and professional responsibilities in an engineering situation and provides related details matching the given engineering situation.
PI(4)2 – Make informed judgments that consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Unable to identify or to discuss the impact of engineering solutions in global, economic, environmental, and societal contexts.	Able to identify and gives a limited explanation of the impact of engineering solutions with respect to one of the global, economic, environmental, and societal contexts.	Able to identify and give an adequate explanation of the impact of engineering solutions with respect to up to three of the global, economic, environmental, and societal contexts.	Able to identify and give a comprehensive explanation of the impact of engineering solutions with respect to global, economic, environmental, and societal contexts.

SO(5): *An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(5)1 – Provide collective leadership to successfully complete the tasks	Rarely provide leadership and initiatives within the team	Sometime provide leadership and initiatives within the team	Mostly provide leadership and initiatives within the team	Always provide leadership and initiatives within the team
PI(5)2 – Contribute effectively and positively within the team whose members together create a collaborative and inclusive environment.	Rarely contribute effectively and positively within the team in collaborative	Sometimes contribute effectively and positively within the team in collaborative and inclusive manner.	Mostly contribute effectively and positively within the team in collaborative and inclusive manner.	Always contribute effectively and positively within the team in collaborative and inclusive manner.

	and inclusive manner.			
PI(5)3 – Establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Rarely establish goals, plan and accomplish tasks, and contribute to meeting objectives	Sometimes establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Mostly establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Always establish goals, plan and accomplish tasks, and contribute to meeting objectives.

APPENDIX IV - **MECE 499 Assessment Rubrics**

MECE 499: Progress Presentation Assessment Rubrics

Presentation will be done by Week 5 of the semester and it will be assessed by the supervisors/examiner based on the following rubrics with the focus on initial prototype development and oral communication skills.

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
Progress in Developing the initial prototype	Show no Progress in Development of the initial prototype	Show limited Progress in Development of the initial prototype	Demonstrate good Progress in Development of the initial prototype	Demonstrate excellent Progress in Development of the initial prototype

SO(3): *An ability to communicate effectively with a range of audiences*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(3)2 – Demonstrate effective oral communication with a range of audiences.	Speaker is rarely able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is sometime able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is mostly able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.	Speaker is always able to communicate the content using proper vocabulary and complete sentences to the given range of audiences.

MECE 499: Final Report and Presentation Rubrics

SO(2): *an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(2)1 – Develop technical specifications of the mechatronics engineering system to meet the design goals under specific constraints and standards considering public health, safety, and welfare, as well as global, cultural, social, environmental, economic factors and risks.	Unable to develop technical specifications or does not understand the concept of constraints and standards.	Partially develop technical specifications or show limited ability to understand the concept of constraints and standards.	Develop most of the technical specifications or show satisfactory ability to understand the concept of constraints and standards **with** weak justification	Develop most of the technical specifications and show satisfactory ability to understand the concept of constraints and standards with proper justification.

PI(2)2 – Generate and synthesize multiple design concepts that meets the developed technical specifications.	Fail to generate and synthesize any meaningful design concept	Generate and synthesize less than three design concepts	Generate multiple (at least three) design concepts **with** weak synthesis of some of the design concepts.	Properly Generate and synthesize multiple (at least three) design concepts
PI(2)3 – Perform analysis and evaluate the design concepts based on appropriate engineering and/or scientific principles	Fail to perform analysis and evaluate the design concepts	Show limited and less than adequate ability to perform analysis and evaluate the design concepts	Demonstrate satisfactory ability to perform analysis **with** weakness in evaluating the design concepts using a Decision Matrix	Perform comprehensive analysis and evaluate the design concepts using a Decision Matrix
PI(2)4- Test and validate the final design/prototype considering risk assessment	Unable to test and validate the final prototype	Show limited and less than adequate ability to test and validate the final design/prototype	Demonstrate satisfactory ability to test and validate the final design/prototype **with** weakness in risk assessment	Comprehensively test and validate the final design/prototype with complete risk assessment

SO(3): *An ability to communicate effectively with a range of audiences*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(3)1 – Communicate effectively in writing.	Does not follow the provided organization and structuring. Does not convey the content in a technical and organized manner. Has many grammatical and typographical errors.	Follows partially the provided organization and structuring. Convey partially the content in a technical and organized manner. Has some grammatical and/or typographical errors.	Follows mostly the provided organization and structuring. Convey mostly the content in a technical and organized manner. Has few grammatical or typographical errors.	Follows always the provided organization and structuring. Convey always the content in a technical and organized manner. Has very few grammatical and typographical errors.
PI(3)2 – Demonstrate effective oral communication with a range of audiences.	Speaker is rarely able to communicate the content using proper	Speaker is sometime able to communicate the content	Speaker is mostly able to communicate the content using proper	Speaker is always able to communicate the content using proper vocabulary and complete

	vocabulary and complete sentences to the given range of audiences.	using proper vocabulary and complete sentences to the given range of audiences.	vocabulary and complete sentences to the given range of audiences.	sentences to the given range of audiences.

Student Outcome (4)

SO(4): *An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(4)1 – Recognize ethical and professional responsibilities in engineering situations.	Does not show awareness for the need to incorporate ethical and professional understanding in the given engineering situation.	Shows awareness for the need to incorporate code of ethics and professional responsibilities in the given engineering situation but does not provide related details.	Shows a good awareness for the need to incorporate relevant code of ethics, and professional responsibilities in the given engineering situation and provides most of the related details.	Shows a strong understanding of relevant code of ethics and professional responsibilities in an engineering situation and provides related details matching the given engineering situation.
PI(4)2 – Make informed judgments that consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Unable to identify or to discuss the impact of engineering solutions in global, economic, environmental, and societal contexts.	Able to identify and gives a limited explanation of the impact of engineering solutions with respect to one of the global, economic, environmental, and societal contexts.	Able to identify and give an adequate explanation of the impact of engineering solutions with respect to up to three of the global, economic, environmental, and societal contexts.	Able to identify and give a comprehensive explanation of the impact of engineering solutions with respect to global, economic, environmental, and societal contexts.

SO(5): *An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(5)1 – Provide collective leadership to successfully complete the tasks	Rarely provide leadership and initiatives within the team	Sometime provide leadership and initiatives within the team	Mostly provide leadership and initiatives within the team	Always provide leadership and initiatives within the team

PI(5)2 – Contribute effectively and positively within the team whose members together create a collaborative and inclusive environment.	Rarely contribute effectively and positively within the team in collaborative and inclusive manner.	Sometimes contribute effectively and positively within the team in collaborative and inclusive manner.	Mostly contribute effectively and positively within the team in collaborative and inclusive manner.	Always contribute effectively and positively within the team in collaborative and inclusive manner.
PI(5)3 – Establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Rarely establish goals, plan and accomplish tasks, and contribute to meeting objectives	Sometimes establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Mostly establish goals, plan and accomplish tasks, and contribute to meeting objectives.	Always establish goals, plan and accomplish tasks, and contribute to meeting objectives.

Student Outcome (7)

SO(7): *An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.*

Performance Indicator	Poor 1	Below Expectations 2	Meets Expectations 3	Excellent 4
PI(7)1 - Demonstrate an ability to acquire new knowledge (e.g. entrepreneurship, sustainability) using appropriate learning strategies (e.g. seminars, various online and library resources).	Not able to acquire new knowledge using appropriate learning strategies.	Able to acquire new knowledge using appropriate learning strategies, but unable to synthesize the acquired information.	Able to acquire new knowledge using appropriate learning strategies, and to synthesize the acquired information to some extent.	Able to acquire new knowledge using appropriate learning strategies and synthesize the acquired information.
PI(7)2 – Demonstrate the application of acquired knowledge	Not able to apply acquired knowledge	Demonstrates little ability to apply acquired knowledge	Demonstrates adequate ability to apply acquired knowledge	Fully able to apply acquired knowledge

Rubrics for Prototype Evaluation

Criteria 1-2-3-4-5	Detail	1 (Poor)	2 (Satisfactory)	3 (Good)	4 (Excellent)	5 (Exceptional)	Comments
LOOKS (Design & Build Quality) (50%)	Excellent craftsmanship, and all	Poor craftsmanship, and	Partially craftsmanship, and parts	Good craftsmanship, and	Excellent craftsmanship, and		

	parts well assembled	parts poorly assembled	partially assembled	parts good assembled	parts well assembled		
PERFORMANCE (Is it working?) (50%)	Prototype operates successfully without any interruptions and failures. Team is able to justify intended operation.						
						Total >>>	**/ 10**

Rubrics for Video Evaluation

Criteria	Poor (1)	Good (2)	Excellent (3)	Exceptional (4)

Effectiveness (3)	Final Design (3)	Video Quality (4)	Total
Building process	**Shows the working**	**Engaging Video**	
Video reflects clearly how the whole team spent their efforts for the project	The working of final design is clear	The video components are clear with proper labels, and the length is within 1-2 mins	**10**

APPENDIX V – **Individual Contribution Tables**

Table A - SO(2): Demonstration of ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

	Design (Identify, formulate and evaluate) (Specify the subsystem designed by individual student and refer to the corresponding sections/sub-sections of the report)
Student 1	
Student 2	
Student 3	

Table B - SO(3): Demonstration of effective writing communication with a range of audiences

	Individual writing contribution (Section # and subsection # with headings written by the student individually)
Student 1	
Student 2	
Student 3	

Table C - SO(7): Demonstration of ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

	New knowledge used, resources used, and learning strategies adopted (Section/subsection # in the report where described)
Student 1	
Student 2	
Student 3	