Senior Design Project Courses xx491 and xx492

Guidelines Manual for Control & Evaluation

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Contents

For the use of in this manual, the following abbreviations are used:

DC Department Council
SC Steering Committee
SDPC Senior Design Project Committee
PC Program Committee (CE, EE, and ME)
SO Student Outcomes
PLO: Program Leaning Outcomes
HoD Head of the Department
SDP Senior Design Project
SDPE Senior Design Project Examiner
PD Program Director
PI Performance Indicators
CLO: Course Learning Outcomes

1. Introduction

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the mathematics, basic sciences, and engineering sciences are applied to optimally convert resources to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives, criteria, synthesis, analysis, construction, testing and evaluation. The engineering design component of a curriculum must include most of the following features: development of student creativity, use of open-ended problems, development and use of modern design theory and methodology, formulation of design problem statements and specification, consideration of alternative solutions, feasibility considerations, production processes, concurrent engineering design, and detailed system description. Further it is essential to include a variety of realistic constraints, including economic, safety, reliability, aesthetics, ethics and social impact measures. Moreover, in the ABET accreditation criteria, they stress the use of team-work concept in solving problems and performing designs.

The Senior Design Project (SDP) is required for a B.Sc. graduation in all the programs offered by the College of Engineering. In 2014, the College of Engineering modified its academic programs in order to be in agreement with the ABET criteria and the job market requirements. The Senior Design Project shall continue for two consecutive semesters and provided in two courses with a total of five (5) credit hours. The first course, "XX 491" is 3-credit hours while the second one is "XX 492" is 2-credit hours. The "XX" symbolizes "CE", "EE", and "ME".

In SDP, a student is assigned, among a team of students and under the supervision of one or more faculty members, the design of an applied project which simulates the real working conditions to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary field studies, feasibility studies, observation of the necessary codes and specifications, final design drawings, verification and implementation, materials data sheets, and the total operating cost of the project. The SDP must be adequate enough to extend over the two semesters. The objectives as well as the technical work shall be divided on the two semesters as well be detailed later. At the end of each semester, each SDP team must pass a final examination in the form of a written technical report and an oral presentation.

This document is devoted to explain the objectives of SDP, its learning outcomes, main phases, control and evaluation strategy. Since the student is the focus of the SDP; the student's responsibilities are summarized in an upcoming section. The details and conditions of registering the SDP courses are presented in the programs curricula.

2. Senior Design Project Objectives

The SDP is developed to allow students to use their basic mathematics/general sciences background as well as the technical engineering knowledge and skills they gained throughout their course of study to practice the design skill. The students become involved in a project that is similar to what they might encounter in the real professional world. The students work in groups and end up presenting a successful, comprehensive, and efficient design.

3. Senior Design Project Learning Outcomes

As a capstone type of course, the SDP learning outcomes are correlated to the program Student Outcomes stated by the ABET and Program Learning Outcomes required by NCAAA depending on the nature of the SDP. The achievement, and its level, of each outcome will vary in each of the two semesters. As per ABET requirments, it is expected that a student, who successfully completes the SDP courses, will have to demonstrate:

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.

The learning outcomes of the SDP courses are measured through a continuous follow-up, assessment, and final examination of the completed project. The achievement of the student outcomes is assessed based on the evaluation of performance indicators related to the SDP. The relationship of outcomes and ABET Student Outcomes as well as the performance indicators for the both stages of the project (SDP1 & SDP2) are presented in table 1 below and shown in the course syllabus of each part in the Appendix. Moreover, the evaluation based on the Program Learning Outcomes (PLOs), that is required by NCAAA, is implemented. The linkage of SDP with Program Learning Outcomes (PLOs) is presented in table (2). The linkage of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) for both parts of the project (SDP1 & SDP2) are shown in tables (3) and (4), respectively.

Table (1) Linkage of Senior Design Project with Student Outcomes and Associated Performance Indicators (for ABET)

Student Outcomes (SOs)	Performance Indicators (PIs)	SDP1 (XX491)	SDP2 (XX492)
1: An ability to identify, formulate, and solve complex Eng. problems by applying principles of engineering, science, and mathematics	**(1.1)** Recall knowledge of basic sciences (math, physics, management., econ., etc.) and Basic Eng. Sciences.	✓	✓
	(1.2) Identify the basic sciences principles that governing the engineering problems.	✓	✓
	(1.3) Mathematically formulate the Eng. problems .	✓	✓
	(1.4) Apply appropriate techniques in solving complex Eng. problems considering assumptions.	✓	✓
	(1.5) Evaluate problem solutions	✓	✓
	(1.6) Comprehensively identify research and inquiry methodologies	✓	✓
	(1.7) Conduct inquiries, investigations, and research for complex issues and problems	✓	✓
2: An ability to apply Eng. 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.	**(2.1)** Identify design requirements and recognize constraints	✓	✓
	(2.2) Produce design alternatives.	✓	✓
	(2.3) Apply design approaches	✓	✓
	(2.4) Verify and evaluate the design of the component /system/process against the needs and constraints.	✓	✓
3: An ability to communicate effectively with a range of audiences	**(3.1)** Ability to communicate ideas and technical aspects in written technical reports using various means of written communication	✓	✓
	(3.2) Ability to give oral communications through presentation with a range of audiences.	✓	✓
4: An ability to recognize ethical and professional responsibilities in Eng. situations and make informed judgments, which must consider the impact of Eng. solutions ….	**(4.1)** Recognize ethical and professional aspects	✓	✓
	(4.2) Analyze and apply ethical and professional dimensions in engineering practices	✓	✓
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	**(5.1)** Demonstrates leadership skills such as planning tasks, assigning work to team members, and evaluating achievements.	✓	✓
	(5.2) Function effectively in teamwork in terms of participation in discussions, giving ideas, accepting criticism, and contributing into the tasks	✓	✓
6: An ability to develop and conduct appropriate experimentation, analyze and interpret data, …	**(6.1)** Conduct experiments		✓
	(6.2) Analyze and present data using statistical, and graphical tools		✓
	(6.3) Interpret the data and draw the conclusion		✓
	(6.4) Develop experiment and test procedure(s).		✓
7: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	**(7.1)** Ability to seek needed information from different sources and apply it.	✓	✓
	(7.2) Ability to acquire new knowledge through pursuing postgraduate studies or professional training	✓	✓

Table (2) Linkage of Senior Design Project with Program Learning Outcomes (PLOs) (for NCAAA)

Program Learning Outcomes (PLOs)			SDP1 XX491	SDP2 XX492
Knowledge and Understanding (K)	K.1	Recall knowledge of Basic sciences (math, physics, management, economy, etc.) and Basic Engineering sciences.	✓	✓
	K.2	Relate knowledge of Math, Statistics, basic sciences to their (civil/electrical/mechanical) engineering specialization, together with in-depth knowledge of that specialization.	✓	✓
	K.3	Comprehensively Identify research and inquiry methodologies.	✓	✓
Skills (S)	S.1	Formulate complex engineering problems by applying principles of engineering, science, mathematics.	✓	
	S.2	Apply appropriate engineering techniques, and modern IT tools, including prediction and modeling of (civil/electrical/mechanical) engineering devices/equipment/components/systems to assess their characteristics and operation performance.	✓	✓
	S.3	Design a device/component/equipment/system or process related to the (civil/electrical/mechanical) engineering field.	✓	✓
	S.4	Communicate effectively, both orally and in written form using appropriate media, on complex engineering activities with the engineering community and with society.	✓	✓
	S.5	Conduct inquiries, investigations, and research for complex issues and problems.	✓	✓
	S.6	Investigate various (civil/electrical/mechanical) engineering problems through developing and conducting experiments, analyzing, interpreting data, and synthesizing of information to provide valid conclusions.		✓
Values (V)	V.1	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.	✓	✓
	V.2	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	✓	✓
	V.3	Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓	✓

Table (3) Alignment of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) of SDP1 (XX491) (NCAAA)

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Demonstrate comprehensive and deep information concerning basic sciences.	K1
1.2	Demonstrate comprehensive and deep information concerning many subjects in the CE/EE/ME field.	K2
1.3	Comprehensively Identify research and inquiry methodologies.	K3
2	Skills:	
2.1	Define the engineering problems, and formulate them.	S1
2.2	Apply appropriate engineering techniques, and modeling of CE/EE/ME devices/equipment/components/systems to assess their characteristics and operation performance.	S2
2.3	Perform the required design and compare the alternative designs.	S3
2.4	Defend the presented work.	S4
2.5	Write and discuss technical reports as well as deliver an effective presentation.	S4
2.6	Conduct inquiries, investigations, and research for complex issues and problems.	S5
3	Values:	
3.1	Describe knowledge of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	V1
3.2	Have a sound knowledge of engineering design aspects related to CE/EE/ME field.	V2
3.3	Develop ideas and share with others.	V3
3.4	Work in a team and effectively lead the team work.	V3

Table (4) Alignment of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) of SDP2 (XX492) (NCAAA)

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Demonstrate comprehensive and deep information concerning basic sciences.	K1
1.2	Demonstrate comprehensive and deep information concerning many subjects in the CE/EE/ME field.	K2
1.3	Comprehensively identify research and inquiry methodologies.	K3
2	Skills:	
2.1	Use the engineering techniques, and modern IT tools for modelling, predicting and assessing the performance of CE/EE/ME systems.	S2
2.2	Implement a designed item.	S3
2.3	Defend his ideas, suggestions and achievements.	S4
2.4	Write and discuss technical reports as well as deliver an effective presentation.	S4
2.5	Conduct inquiries, investigations, and research for complex issues and problems.	S5
2.6	Conduct inquiries, investigations, and research for complex issues and problems.	S5
2.7	Test the performance of a product	S6
2.8	Evaluate the performance of the designed product.	S6
3	Values:	
3.1	Describe knowledge of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	V1
3.2	Have a sound knowledge of engineering design aspects related to CE/EE/ME field.	V2
3.3	Develop ideas and share with others.	V3
3.4	Work in a team and effectively lead the team work.	V3

4. Courses of Senior Design Project

The SDP is planned to be completed by the end of the two semester courses;" XX 491" and "XX 492".

4.1 XX 491

The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary studies, final design drawings, bill of quantities, and the total cost of the project. The SDP shall continue for one semesters. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

The specific outcomes for this course is as follows:

By the end of this course, students are expected to be able to:

- Define and formulate engineering problems.
- Gather and extract relevant information through internet and library searches.
- Operate effectively within a team.
- Generate alternative solutions to engineering problems and consequently identify the appropriate and realistic solution among the various alternatives.
- Make a conceptual/ preliminary design for a component, or a system that meets the desired needs
- Prepare and deliver effective presentations.

The relationship of these outcomes and ABET Student Outcomes as well as the performance indicators are shown in in the course syllabus in the Appendix.

4.2 XX 492

This course is the continuation of the SDP-1 (XX 491), and shall continue for one semester. The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary studies, final design drawings, bill of quantities, and the total cost of the project. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

The specific outcomes for this course is as follows:

By the end of this course, students are expected to be able to:

- Design a system, a component, a system or a process that meets the desired needs and which reflects considerations to environment, economy, society and safety where appropriate.
- Operate effectively within a team.

- Verify and validate a design product against specified requirements.
- Apply accurately, knowledge of mathematics, science and engineering to analyses a system, component or process.
- Prepare and deliver effective presentations.

The relationship of outcomes and ABET Student Outcomes as well as the performance indicators for SDP2 are presented in the course syllabus in the Appendix.

5. Phases of Senior Design Project

The SDP implementation shall pass through main phases; these are:

Phase 1) Planning and setting up the activities of the SDP.

Phase 2) Execution of Stage I of SDP; Course "XX 491".

Phase 3) Examination of Stage I of SDP according to the evaluation strategy.

Phase 4) Follow up and re-planning of the SDP, if needed.

Phase 5) Execution of Stage II of SDP; Course "XX 492".

Phase 6) Examination of Stage II of SDP according to the evaluation strategy.

Phase 7) Feedback for completing the ABET Improvement Process, when necessary.

5.1 Planning and setting up the activities of SDP

This phase must be carried out in a semester prior to the semester of the start of project implementation, i.e. it will be carried out each semester for the coming semester SDP.

(1) Each department has to establish an SDP-Committee (SDPC) through the department council and under the supervision of the head of the department (HOD).

(2) By the sixth week, *of the semester prior to the SDP semester*, the SDPC needs to ask the department/program faculty members to submit, through emails, their proposals for the new SDP using the form SDP-01.

(3) By the tenth week, *of the semester prior to the SDP semester*, the SDPC needs to collect the SDP proposals. It is the faculty member's responsibility to submit his idea(s) on the SDP-01 form to the SDPC. The following points are recommended to be included in each SDP proposal:

- SDP-Title
- SDP-supervisor(s)
- SDP-specific objectives
- The track/duty of each student (option)
- The requirements –if any- like (prerequisites - elective courses –specific GPA .....etc.) for each track.
- A time chart (Gantt chart is recommended) for each track (option).
- Brief Description
- Recommended number of students

(4) By the 13th week, *of the semester prior to the SDP semester*, the committee has to announce the SDP-proposals for the coming semester to students, using the form SDP-01. The announcement may be electronically (mail and/or on the department site) and/or posting on the department announcement board.

(5) Each proposed SDP-student has to review the committee announcement (mentioned in the previous activity) and set/arrange his priorities for the project-proposals that may fit his capabilities and submit them using form SDP-02. His SDP-02 form must be submitted to the SDPC no later than Monday of the 15th week of the semester prior to the SDP semester.

(6) Nomination of teams of 3-4 students for each SDP is the responsibility of the SDPC. The proposed criteria for this nominations are, not necessarily in the same order:

- The student's priorities
- The eligibility requirements
- The student's GPA.

(7) Afterwards and by last final-exam week, *of the semester prior to the SDP semester*, the SDPC has to issue the final list of the students' nominations for the SDP using the form SDP-03.

(8) The SDPC has to set and announce the proper times for the two Interim Assessment Reports. These reports will be discussed later.

(9) After the student-project assignment – the reminder of the project ideas may be planned for the next semesters. A two-year-plan is recommended to be established by the SDPC.

5.2 Execution of SDP; Stage I, Course "XX 491".

5.2.1 First Meeting in the SDP Implementation Semester

The first meeting between each student-team and the supervisor(s) may be held on or before the first week of the SDP implementing semester. The following activities must be held during this meeting:

(1) The supervisor(s) need to explain to their students the SDP objectives and outline, the SDP stages, the follow up policy, the grading system, the urgent case form, the preparation of the documentations, the final report, the presentation … etc.

(2) The supervisor(s) need to discuss with their students the detailed time plan for their senior design project

(3) The supervisor(s) need to guide the students to prepare and sign the tasks' sheet as that illustrated in the form SDP-04.

(4) The students have to prepare the role(s) of team-reporter for the rest of the semester.
(5) Collect the students' sign-off sheets (Form SDP-05) after signing them by the students.

5.2.2 Regular Progress Meetings of the SDP

This phase is applied during the SDP implementing semester.

(1) On the SDP semester, students have to meet their supervisor(s) weekly and use the Form SDP-06 to report this meeting and the tasks assignments. The form must be submitted to the supervisor(s) and kept in the SDP portfolio.

(2) The supervisor(s) need to take notes of the student attendance, punctuality and the achievement of their previous week's assignments. No specific form is assigned for this task; however; this history will be summarized in the Form SDP-07 and must be available in the SDP portfolio.

(3) Supervisor(s) are supposed to fill two Interim Assessment Reports (Form SDP-07). One of the two Interim Assessment Reports will be performed in the mid of the SDP period in a specific week, will be determined by the SDPC. The second one will be prepared by the end of all activities of the SDP (mostly by the submission date of the SDPs. In these reports, supervisor(s) evaluate the semester work of their SDP students. Both Interim Reports weights 40% of the final SDP evaluation. Each report should be accompanied with copies of the detailed SDP plan and the actual achievement of the plan, all of which must be submitted to the HOD on the associated time.

(4) Extra meetings may be performed during any week according to the supervisor(s) instructions.

5.2.3 End of SDP Stage I, "XX 491"

At the end of this stage; XX 491, it is planned that the SDP team achieves the SDP planned objectives/tasks which include at least executing the following:

(1) Problem definition and formulation.

(2) Literature review about the SDP.

(3) Brain storming and ideas generation for solution/design.

(4) Conceptual/ preliminary design of the SDP within the realistic constrains.

(5) The final technical report of the SDP in the appropriate format.

5.3 Students' Evaluation Process for SDP; Stage I (xx491)

5.3.1 Exam Process

This phase is applied during the SDP implementing semester.

(1) By the 14th week, *of the SDP implementing semester*, the SDPC has to announce the assignment of the exam committees for the running SDPs and the arrangement of the final presentations based on the college calendar. The Form SDP-08 is to be used for this announcement.

(2) The students have to review the SDPC-announcement for the presentation schedule and prepare the final report and presentation based on the given expectations.

(3) By the first day of the final exams, each team has to submit three draft copies of the final-SDP-report to the supervisor(s). The copies are to be distributed by the supervisor(s) on the Senior Design Project Examiners (SDPE) for evaluation.

(4) Before the presentation day; an SDPE needs to arrange with SDP-supervisor(s) the good time to evaluate the SDP-final report, design approach and SDP product. The Form SDP-09 is to be used for this evaluation. The form must be submitted signed to the supervisor(s) on the presentation day.

(5) On the presentation day, an SDPE needs to attend and evaluate the presentation with the use of the Form SDP-10.

(6) On the presentation day, the supervisor(s) need to do the following:
- Collect the report evaluation forms from the SDPEs; Forms SDP-09 and SDP-10 and calculate the average marks.
- Fill in the final SDP evaluation forms; one Form (SDP-11) per each student, and report the final grade to the HOD and Students Affairs Office.

(7) After the presentation, it is the students' responsibility to take into consideration all the examiners' comments and corrections in issuing the final SDP report. They have to submit three final copies to their principal supervisor(s). The final report must meet all report-expectations and satisfies the associated checklist. The final copies must be signed by the principal supervisor(s) to assure that all corrections, remarks, etc. were covered. The copies must be submitted to the head of the department for the department library.

5.3.2 Evaluation Strategy

The evaluation of each student will be based on two criteria: **individual evaluation** and **entire team evaluation**. Each student will be evaluated, individually, based on his semester work and his oral presentation. The entire team evaluation will be based on the written report, design approach and the SDP product, as well as the overall presentation materials. Figures 1 shows the grades distribution for XX 491 SDP course.

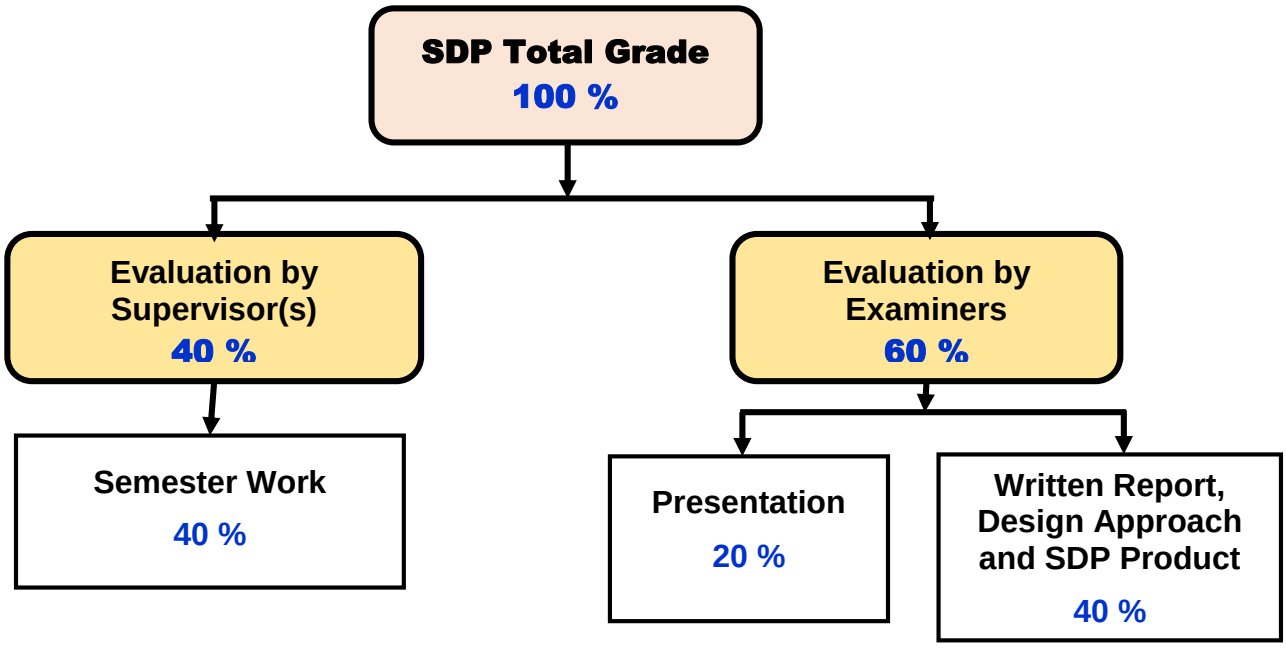

Fig. 1 Students' Evaluation Strategy for the SDP; Phase I (xx491)

5.4 Follow up and re-planning of the SDP, if needed

In this stage, the SDP supervisors have to perform a complete review of the SDP regarding its planned objectives, completed tasks, remaining tasks and activities so that they can well re-plan the tasks/activities of the second stage of the SDP, Course "XX 492".

5.5 Execution of SDP; Stage II, Course "XX 492"

5.5.1 First Meeting in the SDP Implementation Semester

The first meeting between each student-team and the supervisor(s) may be held on or before the first week of the SDP implementing semester. The following activities must be held during this meeting:

(1) The supervisor(s) need to explain to their students the SDP objectives and outline, the SDP stages, the follow up policy, the grading system, the urgent case form, the preparation of the documentations, the final report, the presentation … etc.

(2) The supervisor(s) need to discuss with their students the detailed time plan for their senior design project

(3) The supervisor(s) need to guide the students to prepare and sign the tasks' sheet as that illustrated in the form SDP-04.

(4) The students have to prepare the role(s) of team-reporter for the rest of the semester.

(5) Collect the students' sign-off sheets (Form SDP-05) after signing them by the students.

5.5.2 Regular Progress Meetings of the SDP

This phase is applied during the SDP implementing semester.

(1) On the SDP semester, students have to meet their supervisor(s) weekly and use the Form SDP-06 to report this meeting and the tasks assignments. The form must be submitted to the supervisor(s) and kept in the SDP portfolio.

(2) The supervisor(s) need to take notes of the student attendance, punctuality and the achievement of their previous week's assignments. No specific form is assigned for this task; however; this history will be summarized in the Form SDP-07 and must be available in the SDP portfolio.

(3) Supervisor(s) are supposed to fill two Interim Assessment Reports (Form SDP-07). One of the two Interim Assessment Reports will be performed in the mid of the SDP period in a specific week, will be determined by the SDPC. The second one will be prepared by the end of all activities of the SDP (mostly by the submission date of the SDPs. In these reports, supervisor(s) evaluate the semester work of their SDP students. Both Interim Reports weights 40% of the final SDP evaluation. Each report should be

accompanied with copies of the detailed SDP plan and the actual achievement of the plan, all of which must be submitted to the HOD on the associated time.

(4) Extra meetings may be performed during any week according to the supervisor(s) instructions.

5.5.3 End of SDP Stage II, "XX 492"

At the end of this stage; XX 492, it is planned that the SDP team achieves the SDP planned objectives/tasks which include at least executing the following:

(1) The results of verification and validation of the SDP.

(2) The final SDP product within the realistic constrains.

(3) The final technical report of the SDP in the appropriate format

5.6 Students' Evaluation Process for SDP; Stage II

5.6.1 Exam Process

This phase is applied during the SDP implementing semester.

(1) By the 14th week, *of the SDP implementing semester*, the SDPC has to announce the assignment of the exam committees for the running SDPs and the arrangement of the final presentations based on the college calendar. The Form SDP-08 is to be used for this announcement.

(2) The students have to review the SDPC-announcement for the presentation schedule and prepare the final report and presentation based on the given expectations.

(3) By the first day of the final exams, each team has to submit three draft copies of the final-SDP-report as well as a draft for the SDP poster prepared according to the pre-set template to their supervisor(s). The report copies are to be distributed by the supervisor(s) on the Senior Design Project Examiners (SDPE) for evaluation.

(4) Before the presentation day; an SDPE needs to arrange with SDP-supervisor(s) the good time to evaluate the SDP-final report, design approach and final product. The Form SDP-09 is to be used for this evaluation. The form must be submitted signed to the supervisor(s) on the presentation day.

(5) On the presentation day, an SDPE needs to attend and evaluate the presentation with the use of the Form SDP-10.

(6) On the presentation day, the supervisor(s) need to do the following:
- Collect the report evaluation forms from the SDPEs; Forms SDP-09 and SDP-10 and calculate the average marks.
- Fill in the final SDP evaluation forms; one Form (SDP-11) per each student, and report the final grade to the HOD and Students Affairs Office.

(7) After the presentation, it is the students' responsibility to do the following:
- Take into consideration all the examiners' comments and corrections in issuing the final SDP report.

- Submit three final copies to their principal supervisor(s). The final report must meet all report-expectations and satisfies the associated checklist. The final copies must be signed by the principal supervisor(s) to assure that all corrections, remarks, etc. were covered.
- Submit the three final copies of the report to the head of the department for the department library.
- Prepare the final SDP poster to be presented in the College annually held SDP's symposium.

5.6.2 Evaluation Strategy

The evaluation of each student will be based on two criteria: **individual evaluation** and **entire team evaluation**. Each student will be evaluated, individually, based on his semester work and his oral presentation. The entire team evaluation will be based on the written report, design approach and final-SDP product, as well as the overall presentation materials. Figures 2 shows the grades distribution for XX 492 SDP course.

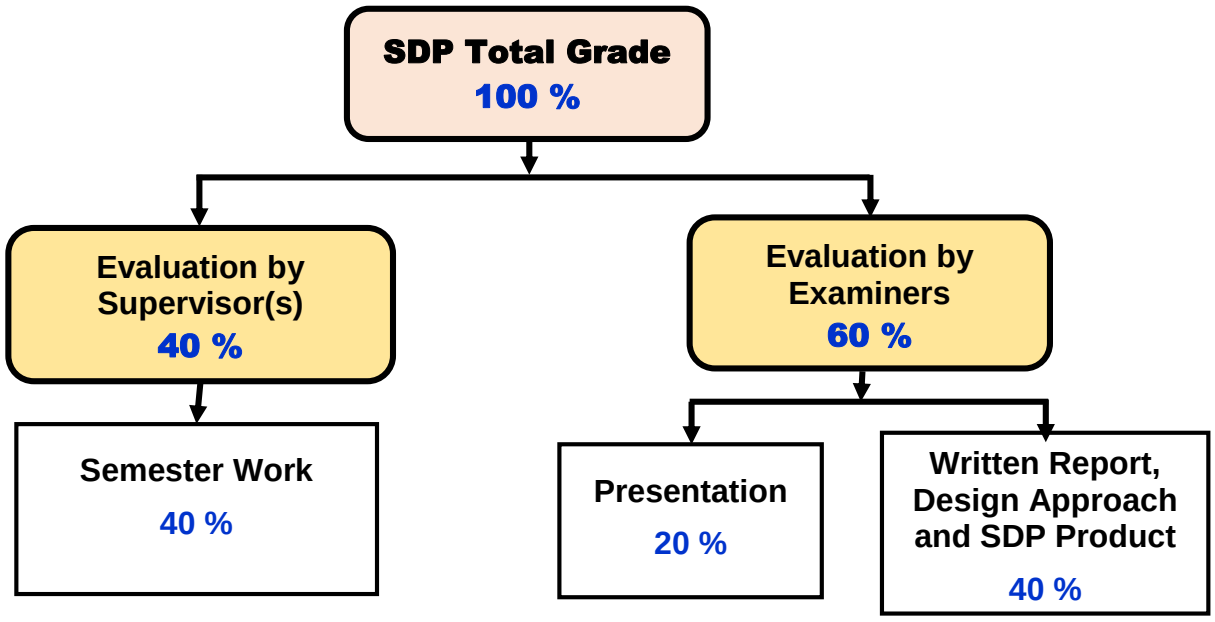

Fig. 2 Students' Evaluation Strategy for the SDP; Phase II (xx492)

6. Feedback for Completing the ABET & NCAAA Improvement Process

This stage is to be conducted in accordance with the ABET "continuous improvement cycle" and NCAAA requirements; i.e. when it is necessary to perform the assessment of the SDP courses. The forms required to be used during this stage are the same forms used as required by the College Quality Assurance and Academic Accreditation Unit (QAAA). After the presentation day, the supervisor(s) need to prepare the SDP "Course Instructor Report" as well as any other SDP-related documents, and submit them to the PC to complete their tasks.

7. Student's Eligibility and responsibilities

The SDP-student is responsible of completing his work with the required quality and on the due times. Examples of; but not all, of his responsibilities are:

1) Doing his work according to the academic integrity rules and the cheating policy.
2) Familiarizing himself by the rules and the grading system of the SDP.
3) Reviewing the SDP-proposal-announcements.
4) Selecting the SDP-proposal(s) that may fit his capabilities and arranging them according to his priorities.
5) Reviewing the final list of the students' nominations for the SDPs.
6) Registering for the SDP and the required elective courses (if any).
7) Contacting the SDP supervisor(s) by the first day of semester.
8) Familiarizing himself by the other team members and making norms for this team.
9) Familiarizing himself by his SDP objectives and outcomes.
10) Attending the SDP meetings from day one of the semester.
11) Preparing with his team the final report and the final presentation based on the given expectations (Appendices B and C).
12) Submitting the final-SDP-report to their supervisor(s).
13) Reviewing the announced SDP exam committees and the exam schedule.
14) Attending the presentation and performs according to the given expectations. ***Otherwise***, he will receive a grade of (INCOMPLETE) and has to submit his excuse to the college and ask for permission to repeat his own presentation. The college may or may not accept the excuse. (*Review the rules and penalties section*).
15) Taking into consideration all the examiners' comments and corrections in issuing the final SDP report. They have to submit three final copies to their principal supervisor(s). The final report must meet expectations and satisfies the associated checklist. The final copies must be signed by the principal supervisor(s) to assure that all corrections, remarks, etc. were covered. ***Otherwise***, the entire team will receive a grade of (INCOMPLETE) and will not get the graduation release from the department.

8. Rules and Regulations

SDP is one of the college courses; therefore, whatever rules apply for any of the regular courses; shall also apply for the SDP. In addition, the following rules are to be considered: -

1. Penalties for report late submission is as follows: 2 marks will be reduced for the first day of lateness, and 1 mark per each additional day will be applied.
2. A grade of (**INCOMPLETE**) will be issued for the entire team until the final three signed-copies of the report are submitted to the principal supervisor(s) and consequently the department issues graduation releases for all the team-students.
3. Attending the presentation session and giving presentation are mandatory. If, for any reason, a student did not show-up on the presentation session or did not give presentation, he (but not the team) will receive a grade of **(INCOMPLETE**). He has to submit his excuse to the college and ask for permission to repeat his own presentation. The college, on such situation, will investigate this excuse and issue a recommendation for how to deal with the 10 marks assigned for the oral presentation. If the excuse is not accepted; the student will have a grade of (**FAIL**) and has to repeat the course (SDP) in the coming semester.

9. Urgent Situations

1. In case of any urgent circumstances, the **supervisor(s)** may report it –written- to the head of the department using the Form SDP-12.
2. In case of any urgent circumstances, the student(s) must report it,written, to the SDP supervisor(s). The late may forward the reported problem to the head of the department, If needed, using form SDP-12.

10. Originality, Copyright & Plagiarism Regulations

Students learn the ethics of applying, analyzing, and evaluating essential data while keeping the project objectives in mind and effectively putting the project's conclusions into practice. The QAAA unit developed regulations and copyright rules to enhance high-quality initiative support. Each program's SDP committee (CE/EE/ME) ensures that the final report submitted has original content. Workshops are given for SDP students to cover originality, copyright rules and regulations as well as how to work in the project and prepare their final report. The SDP supervisor and examination committee will be responsible for upholding these rules. This is assured from the beginning of the SDP process to its successful end by following the regulations outlined below.

1- Before starting their SDP, students get a training session on the various components of project originality as well as an introduction to the adverse consequences of plagiarism. The student workshop will be aimed at project report writing to avoid plagiarism and retaining the originality of the report.

2- When copying any content from electronic databases, an internet source, a book, or another undergraduate's work, students face the risk of experiencing the adverse effects of plagiarism. Copyright occurs when someone makes copies of protected report work using any online tools or in any other way.

The student may be held responsible for copied information if they are proven to have taken plagiarized material from any other sources.

3- If the SDP student has provided a permission to view or copy the materials through an open-access license, then copying could be allowed under certain conditions. Plagiarism is an ethical issue, one of personal and professional integrity, and students are taught the proper ethical norms.

4- The allowed plagiarism percentage is not more than 25%. If the plagiarism exceeds this threshold the report will be rejected by the supervisor and the students will not be permitted to deliver the final presentation. However, a chance may be given to the students to modify their work to meet the requirements. Copyright reports can be done through Blackboard platform which offer this service.

5- Students must provide the copyrighted report when submitting their final project to the supervisor and SDP committee to get their final approval.

6- The SDP's anti-plagiarism declaration was developed under the supervision of the QAAA unit and is the sole work of the student(s). The students will declare and sign that; no parts of the report have been copied illegally or through the use of cut-and-paste techniques from published technical contents, which are considered to be plagiarism. All listed materials were utilized in the SDP report largely to distinguish and reinforce the theories advanced in earlier research and to ensure correct citation.

REFERENCES

1. AlAttyih, W., M. A. Abdel-halim, Emad A., Khodary, Kh., Alkholy, Sh. "Senior Design Project Control and Evaluation", Qassim University Report, February 2018.
2. Almarshoud, A., Gadelmawla, E., Emad, A., and Esmaeil, KH. "Senior Design Project Control and Evaluation", Qassim University Report, February 2010.
3. Engineering College, Qassim University, "ABET Self-Study Report for Engineering Programs", July 2015.
4. Engineering College, Qassim University, "Academic Curricula for Engineering Programs", 2013.

APPENDIX (A)

SDP COURSES

SYLLEBII AND FORMS

XX 491: Senior Design Project I

1. **Course Name and code : Senior Design Project-1,** XX 491
2. **Credit hours : 3 hrs**
   Contact hours : 4 hrs
3. **Coordinator :**
4. **Text book and Other supplemental materials**

Text book:

- No specific textbook (to be determined in consultation with the supervisor(s) based on the scope and application of the project)

References:

- No specific textbook (to be determined in consultation with the supervisor(s) based on the scope and application of the project)

Other supplemental materials

- Senior Design Project Guidelines.

5. Specific course information

A) Catalog Description

The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary studies, final design drawings, bill of quantities, and the total cost of the project. The SDP shall continue for one semesters. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

B) Prerequisites **:** Complete 100 Credit hours

C) Co-requisites **:** None

D) Course Condition **:** ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes

By the end of this course, students are expected to be able to:

- Define and formulate engineering problems.
- Gather and extract relevant information through internet and library searches.
- Operate effectively within a team.
- Generate alternative solutions to engineering problems and consequently identify the appropriate and realistic solution among the various alternatives.
- Make a conceptual/ preliminary design for a component, or a system that meets the desired needs

- Prepare and deliver effective presentations.

B) Relation to the student outcomes

√	Minimally Linked
√	Moderately Linked
√	Strongly Linked

SOs (ABET)	SO1 (Complex Problems)							SO2 (Design)				SO3 (Communication)		SO4 (Ethics & Profession)		SO5 (Team working)		SO6 (Experiments)	SO7 Life Long Learning)	
PIs	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	3.1	3.2	4.1	4.2	5.1	5.2		7.1	7.2
(ME491) Linkage	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√

C) Course Learning Outcomes aligned with Program Learning Outcomes (NCAAA)

	CLOs (NCAAA)	Aligned PLOs
1	Knowledge and Understanding:	
1.1	Demonstrate comprehensive and deep information concerning basic sciences.	K1
1.2	Demonstrate comprehensive and deep information concerning many subjects in the CE/EE/ME field.	K2
1.3	Comprehensively Identify research and inquiry methodologies.	K3
2	Skills:	
2.1	Define the engineering problems, and formulate them.	S1
2.2	Apply appropriate engineering techniques, and modeling of CE/EE/ME devices/equipment/components/systems to assess their characteristics and operation performance.	S2
2.3	Perform the required design and compare the alternative designs.	S3
2.4	Defend the presented work.	S4
2.5	Write and discuss technical reports as well as deliver an effective presentation.	S4
2.6	Conduct inquiries, investigations, and research for complex issues and problems.	S5
3	Values:	
3.1	Describe knowledge of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	V1
3.2	Have a sound knowledge of engineering design aspects related to CE/EE/ME field.	V2
3.3	Develop ideas and share with others.	V3
3.4	Work in a team and effectively lead the team work.	V3

8. Brief list of tasks to be performed

- Survey, internet search, data collection
- Defining and formulation of the design problem, determination of the project objectives
- Building the model/system (to make it applicable to programs), applying the design concepts to the target object or the experimental set
- Comparing the alternative solutions to end with the best design considering the realistic constraints
- Writing the Final Report
- Preparing the Final presentation

XX 492: Senior Design Project 2

1. **Course Name and code :** Senior Design Project-2, XX 492
2. **Credit hours :** 2 hrs

   Contact hours : 3 hrs
3. **Coordinator :**
4. **Text book and Other supplemental materials**

Text book:

- No specific textbook (to be determined in consultation with the supervisor(s) based on the scope and application of the project)

References:

- No specific textbook (to be determined in consultation with the supervisor(s) based on the scope and application of the project)

Other supplemental materials

- Senior Design Project Guidelines.

5. **Specific course information**

A) Catalog Description

This course is the continuation of the SDP-1 (XX 491), and shall continue for one semester. The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary studies, final design drawings, bill of quantities, and the total cost of the project. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

B) Prerequisites : Senior Design Project-1 (XX 491)

C) Co-requisites : None

D) Course Condition : ■ Required □ Elective □ Selective

6. **Specific goals for the course**

A) Course Specific outcomes

By the end of this course, students are expected to be able to:

- Design a system, a component, a system or a process that meets the desired needs and which reflects considerations to environment, economy, society and safety where appropriate.
- Operate effectively within a team.
- Verify and validate a design product against specified requirements.
- Apply accurately, knowledge of mathematics, science and engineering to analyses a system, component or process.
- Prepare and deliver effective presentations.

B) Relation to the student outcomes(ABET)

√	Minimally Linked
√	Moderately Linked
√	Strongly Linked

SOs	SO1 (Complex Problems)							SO2 (Design)				SO3 (Communication)		SO4 (Ethics & Profession)		SO5 (Team working)		SO6 (Experiments)				SO7 Life Long Learning)	
PIs	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	6.3	6.4	7.1	7.2
(ME492) Linkage	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

C) Course Learning Outcomes aligned with Program Learning Outcomes (NCAAA)

	CLOs	Aligned PLOs
1	Knowledge and Understanding:	
1.1	Demonstrate comprehensive and deep information concerning basic sciences.	K1
1.2	Demonstrate comprehensive and deep information concerning many subjects in the CE/EE/ME field.	K2
1.3	Comprehensively identify research and inquiry methodologies.	K3
2	Skills:	
2.1	Use the engineering techniques, and modern IT tools for modelling, predicting and assessing the performance of CE/EE/ME systems.	S2
2.2	Implement a designed item.	S3
2.3	Defend his ideas, suggestions and achievements.	S4
2.4	Write and discuss technical reports as well as deliver an effective presentation.	S4
2.5	Conduct inquiries, investigations, and research for complex issues and problems.	S5
2.6	Conduct inquiries, investigations, and research for complex issues and problems.	S5
2.7	Test the performance of a product	S6
2.8	Evaluate the performance of the designed product.	S6
3	Values:	
3.1	Describe knowledge of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	V1
3.2	Have a sound knowledge of engineering design aspects related to CE/EE/ME field.	V2
3.3	Develop ideas and share with others.	V3
3.4	Work in a team and effectively lead the team work.	V3

7. Brief list of tasks to be performed

- Where appropriate
  - Conducting simulations, constructing the model/system
  - Building the prototype and/or carrying out the planned experiments
- Analyzing the results and evaluating the end product.
- Formulation of the suggestions, recommendations and conclusions.
- Writing the final report
- Preparing the final presentation

List of the SDP forms

Form Code	Form Title	Form Usage	
		for XX491	for XX492
SDP-01	Proposal	√	
SDP-02	Student's Choices Form	√	
SDP-03	Teams Nominations	√	√
SDP-04	Project Detailed Plan	√	√
SDP-05	Student's Sign-Off Sheet	√	√
SDP-06	Meeting Report	√	√
SDP-07 XX491 SDP-07 XX492	Interim Assessment Report	√	√
SDP-08	Presentation and Exam Schedule	√	√
SDP-09 XX491	(Report and SDP Product) Evaluation Checklist	√	
SDP-10 XX491	Oral Presentation Evaluation Form	√	
SDP-11 XX491	Final Grade Report	√	
SDP-09 XX492	(Report and final Product) Evaluation Checklist		√
SDP-10 XX492	Oral Presentation Evaluation Form		√
SDP-11 XX492	Final Grade Report		√
SDP-12	Urgent Reporting Form	√	√

SDP – Proposal

(Guide for use: This form is supposed to be used by the SDP committee in order to collect proposals for new **SDP's** from the faculty members then announce them to students and finally follow up the proposals applicability)

Department :

Academic year : 144 - 144 (202 - 202) Semester: ☐ Fall ☐ Spring

Project Title		
Brief description		
No. of students		
Prerequisite		
Suggested elective courses		
Supervisor(s)	**Name**	**Signature**

Senior Design Project Committee		**Date of Announcement**
Name:	Signature:	
Name:	Signature:	
Name:	Signature:	

Follow up	
Announcement Feed Back	
Actions	

SDP – Student's Choices Form

(Guide for use: This form is to be used by each prospective-SDP-student to rank his choices for the announced SDP and submit it to the SDP Committee by the specified dates. Later, the SDP Committee will use the form to record the SDP in which the student is assigned based on the applied rules)

Academic year : 144 - 144 (202 - 202) **Semester: ☐ Fall ☐ Spring**

Department : .....

Student Name : .....

PIN : ..... **GPA :** .....

Ranking choices for the announced Senior Design Projects

Priority	Project Title	Supervisor(s)	Prerequisite satisfaction (if any)	Intention to get the Suggested elective courses (if any)
1				
2				
3				
4				

Student Signature : **Date: / /**

This part is to be used by the Senior Design Project Committee

Student is approved for the project: .....

.....

Signature : **Date: / /**

SDP - Teams Nominations

(Guide for use: This form is to be used by SDPC to announce the nomination of students' teams assigned for each SDP)

Department :

Academic year : 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

No.	Project Title	Supervisor(s)	Approved Students
1			1. 2. 3. 4.
2			1. 2. 3. 4.
3			1. 2. 3. 4.
4			1. 2. 3. 4.
5			1. 2. 3. 4.

Senior Design Project Committee		Department Approval	Date
Name:	Signature:		
Name:	Signature:		
Name:	Signature:	HOD: Prof.	

Page 1 of ....

SDP – Project Detailed Plan

(Guide for use: This form is supposed to be used by the SDP supervisors and to be submitted to the HOD as attachment to each interim report)

Academic year : 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring) Date: / /

Department				
Project Title				
Supervisor(s)				
Student Names				

No.	Project Phase or Task	Week Number																	Responsible student(s)	Supervisor(s) guiding this task
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				

Student Signatures (respectively)				
Supervisor(s) Approval				

SDP - Student's Sign-Off Sheet

(Guide for use: Two copies of this form must be signed by each SDP-student in front of his principal supervisor no later than the first week of the project. One of the copies is to be kept in the SDP portfolio while the other is to be kept for the student's records)

Academic year : 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

Department			
Project Title			
Supervisor(s)			
Student Name		**Student ID**	

1) It is my own responsibility to know all the requirements and regulations of my academic program, the department, the college and the university regarding the Senior Design Project.
2) I will do my SDP work according to the academic integrity rules and the cheating policy.
3) It is my own responsibility to familiarize myself by the main objectives, outcomes, rules and the grading system of the SDP.
4) I reviewed the project-proposal-announcements and then I selected this SDP proposal that fit my capabilities and it was one of my priorities.
5) I registered for the SDP and the required elective courses (if any).
6) It is my own responsibility to familiarize myself by the other team members, make norms for the team and fully cooperate with the other team members.
7) I shall submit (with the team) reports (meeting minutes) for all SDP meetings using form SDP-06.
8) I shall prepare (with the team) the final report and the final presentation based on the required expectations (Appendices B and C).
9) By the first day of the final exams, I shall submit final-project-report to my supervisor.
10) I shall review the SDP-committee-announced presentations' schedule, attend the presentation on time and perform according to the required expectations.
11) After the presentation, it is my responsibility (among the team) to take into consideration all the examiners' comments and corrections in issuing the final project report.
12) I shall submit (among the team) three final SDP report copies to the principal supervisor. The final SDP report must meet all report-expectations and satisfies the associated checklist and signed by the principal supervisor. ***Otherwise***, I understand that I will not get the graduation release from the department.

Student Name	PIN	Signature	Date

SDP - Meeting Report

(**Guide for use:** This form is to be used for the **regular weekly** meeting or for any additional meetings. **Part I of t**he form is to be filled by students, approved by the supervisor(s). **Part II**, however, is to be filled by the supervisor(s). The final form is to be maintained in the SDP portfolio)

Academic year : 144 - 144 (202 - 202) **Semester : (☐ Fall ☐ Spring)**

Department				
Project Title				
Supervisor(s)				
Student attended the meeting				
Meeting No.			**Meeting Date**	

PART I

Meeting Agenda:

1. Review and follow up for the Outcomes, Recommendations and Decisions from previous meetings (this is an obligatory issue for all weekly meeting).
2.
3.

Meeting Outcomes, Recommendations and Decisions:

	Subject	Outcomes/Recommendations/ Decisions	Responsibility	Timing / Comments
1	Follow up for the previous meetings			
2				
3				
4				
5				

Student Signatures (respectively)				

PART II

Students Performance Measure

(This part is to be used by the supervisors to keep continual evaluation of the SDP students)

Scoring system: 0 = Not exist/acceptable, 1 = Weak, 2 = Acceptable, and 3 = Good.				
Student name	**Attendance and punctuality**	**Performs tasks in the planned time**	**Performs tasks in acceptable quality**	**Functions effectively in team**
Further Comments Regarding Students (if any)				
Further Comments regarding the Project (if any)				

Principal Supervisor Approval		**Date:**
Name:	Signature:	

SDP1 - Interim Assessment Report

(Supervisors Form for Evaluation)

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5= excellent						
No.	**Item to be checked**	**PI**	**Student score**			
			St#1	**St#2**	**St#3**	**St#4**
1	Ability to identify the basic sciences principles that governing the engineering problems.	1.2				
2	Ability to mathematically formulate the engineering problems.	1.3				
3	Ability to comprehensively identify research and inquiry methodologies	1.6				
4	Ability to conduct inquiries, investigations, and research for complex issues and problems	1.7				
5	Ability to identify design requirements and recognize constraints.	2.1				
6	Ability to produce design alternatives.	2.2				
7	Ability to recognize ethical and professional aspects regarding engineering situations.	4.1				
8	Ability to perform tasks in the planned time with acceptable quality.	4.2				
9	Ability to demonstrate leadership skills (planning tasks, assigning work to team members, and evaluating achievements).	5.1				
10	Ability to participate in brainstorming, idea generation, and deciding the course of design.	5.2				
11	Ability to gain knowledge of modern tools/ devices/ apparatus/ equipment.	7.1				
12	Ability to acquire new knowledge through pursuing future postgraduate studies or professional training.	7.2				
Sub-Total (out of 60)						
X= Modified Sub-Total (out of 40)						

Form: SDP-08

SDP – Presentation and Exam Schedule

(Guide for use: This form is to be used by SDPC to announce the SDP's Presentation and Exam Schedules)

Department :

Academic year : 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

No.	Project Title	Supervisor(s)	Students	Exam Committees	Presentation time/place
1			1. 2. 3. 4.	1. 2. 3.	
2			1. 2. 3. 4.	1. 2. 3.	
3			1. 2. 3. 4.	1. 2. 3.	
4			1. 2. 3. 4.	1. 2. 3.	
5			1. 2. 3. 4.	1. 2. 3.	

Coordinator of the SDP Committee		Department Approval	Date
Name:	Signature:	HOD: Prof.	

SDP1: ME491 (Report Evaluation Checklist)

(Guide for use: Students should attach three-copies of this form with their submitted reports to the principal supervisor after filling the required data. Each copy of this form is to be directed to one of the SDP Examiners to evaluate the submitted SDPs. The form evaluates the written report, the design approach and the SDP product. Examiners are urged to complete the form and handle it to the principal supervisor by the celebration day)

Academic year: 144 - 144 (202 - 202), Semester : (☐ Fall ☐ Spring)

Department:	
Project Title:	
Supervisor(s):	
Student Names:	

I) Submission Time; Planned Date: / / Actual Date: / /	
☐ **On time** ☐ **Late for** ..... **days** (in this case **1 mark is reduced** from the total mark for **the first day** of lateness and **Afterwards** extra reduction with a rate of **0.5 mark/day** is applied)	**No of marks to be reduced** **A =**

(II) Evaluation of the Written Report Formality, Style and Quality of Technical Writing

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5= excellent			
No.	**Item to be checked**	PI	**Score**
1	**Report Organization** (Cover page, Acknowledgement, Table of contents, List of figures, List of tables, Nomenclature, Introducing chapter, Main body chapters, Chapter for conclusions and recommendations, References, and Appendices) **and Style** (fonts, titles, page numbers, header and footers, margins, references are cited in the text and written in standard format …etc.)	3.1	
2	**Figures** and **Tables** citations (i.e. all figures and tables have numbers and captions, and are mentioned in the text before they placed) **Graphs Quality** (Size, Axes, Labels, and Legend) and M**athematical equations** (clarity and explanation of the equations)		
3	**English Language Quality** (paragraphs, relations between sentences, using punctuations, grammar, and spell check.)		
4	**Quality** of the **Introduction and Review** in terms of the available data, products and works.		
5	**Quality** of the **Conclusions and recommendations** in terms of the analysis and deep discussions of the obtained results based on the design procedures.		
	Sub-Total (1) = ∑ Weight × Score (Out of 25)		**/25**
	B= Modified Sub-Total (1) (Out of 5)		**/5**

(III) Evaluation of the SDP Approach, and Procedures

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= Very good, 5= Excellent						
No.	**Item to be checked**		**Pages***	PIs	**Weights**	**Score**
1	**Problem description and project objectives** (Report should clearly identify the project purpose besides the problem statement, reality, creativity and impact to the environment, economy and society.)			1.1	**3**	
2	The Literature review clearly reflects, inquiries and investigation of complex issues related to the design problem			1.7	**3**	
3	**Brain storming, ideas generation and deciding the course of design** (Report should demonstrate the different ideas and design alternatives raised to solve the problem and justify the selected approach for design)			2.2	**3**	
4	**Design inputs**	**Identification of design requirement** (Important characteristics that the design must meet in order to be successful are listed)		2.1	**3**	
		Recognition of design constraints (technical and other constraints (global, environmental, social, economic, ethical, health and safety, whichever is applicable)		2.3	**3**	
5	**Design process**	**Approach** is logical, free from technical errors and answers all how and why questions.		2.3	**3**	
		Steps adopt and adhere to national and/or international standard specifications (Design Codes)		2.3	**3**	
		Formulating the design problem (mathematically and/or modeling)		1.2	**2**	
		Application of appropriate techniques in solving engineering design problem		1.3	**1**	
		Evaluation of design problem solution		1.4	**1**	
	Design Outputs (Clear and identifiable design outputs that can be evaluated)			2.4	**3**	
Sub-Total (2) = ∑ Weight × Score (Out of 140)						**/140**
C = Modified Sub-Total (2) (Out of 35)						**/35**

**** In this column students should identify the page(s) in which the corresponding item is demonstrated in the report***

Final Mark for the Senior Design Project (Report, Approach and Product)			
Evaluator Name		**Final Mark: Y = -A+B+C (Out of 40)**	**Y=**
Evaluator Signature			
Date			

SDP1 - Presentation Evaluation Form

Academic Year: 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

Student Names			
St#1.....	St#2.....	St#3.....	St#4.....
Scores: 0 = Not exist/acceptable, 1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5 = excellent			

(I) Presentation Material (written)

No.	Item to be checked	PI	Score
1	Presentation material is well organized from technical writing point of view (Sandwich format: Title slide, Introduction, Main body with different sections and Conclusion)	3.1	
2	Overall appearance, presentation style and readability		
3	English language of the presentation material.		
4	Main ideas are presented logically, Objectively and clearly.		
	Sub-Total (1) out of 20		

(II-a) Individual Assessment of Presentation Skills (Oral)

No.	Item to be checked	Student Score				
		PI	St#1	St#2	St#3	St#4
1	Student's time management	3.2				
2	Seldom returning to notes/reports, and eye-contact					
3	Ability to explain ideas using proper English.					
4	Clear voice and confidence of the student in presentation					
5	Student's ability to handle questions and discussions (in English)					
	Sub-Total (2) out of 25					
	Sub-Total (3) = Sub-Total (1) + Sub-Total (2) (Out of 45)					
	D= Modified Sub-Total (3) (Out of 5)					

(II-b) Individual Assessment of Team working & Design (Oral)

No	Item to be checked	Student Score					
		PI	weight	St#1	St#2	St#3	St#4
1	Student's understanding of task distribution and his role in the project	5.2	2				
2	Student's awareness of the project objectives and the realistic constraints	2.1	3				
3	Student's understanding of the design alternatives	2.2	3				
4	Student's familiarity with the design process and standard specifications (Codes) used.	2.3	3				
	Sub-Total (4) (out of 55)						
	E = Modified Sub-Total (4) (out of 15)						
	Z = D +E (out of 20)						

Final Mark for Each Student (By Examiners)					
Student	**St#1**	**St#2**	**St#3**	**St#4**	**Date:**
Obtained Marks (Y+ Z) out of (60)					
Examiner Name:			Signature:		

SDP1 Final Grade Report

(**Guide for use:** This form is to be used by the SDP principal supervisor to report the final student grades. The completed form attached with copies of Forms SDP-09 and SDP-10 are to be submitted to the HOD)

Academic year: 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

Department	
Project Title	
Supervisor(s)	

Student Names			
St#1.....	**St#2**.....	**St#3**.....	**St#4**.....

I) Students Performance Assessed by the Supervisors (From interim report- Form SDP-07)

St#1	St#2	St#3	St#4
X = ... /40	X = ... /40	X = ... /40	X = ... /40

II) Evaluation of the Final Report, Approach and Product (From: Form SDP-09)

Examiner #1	Examiner #2	Examiner #3	Average
Y = ... /40	Y = ... /40	Y = ... /40	Y = ... /40

III) Evaluation of the Presentation (From: Form SDP-10)

St#1			St#2			St#3			St#4		
Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3
Z = ... /20			Z = ... /20			Z = ... /20			Z = ... /20		

Final Mark and Grade				
Student Name:	St#1	St#2	St#3	St#4 .....
PIN				
Final Mark = (X+Y+Z)	..... /100	..... /100	..... /100	..... /100
Grade				
Supervisor Signature	.....			
HOD Approval		Date: / /		

SDP2 - Interim Assessment Report
(Supervisors Form for Evaluation)

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5= excellent						
No.	**Item to be checked**	PI	**Student score**			
			St#1	**St#2**	**St#3**	**St#4**
1	Ability to identify the basic sciences principles that governing the engineering design problem	1.2				
2	Ability to identify design requirements and recognize constraints.	2.1				
3	Ability to produce design alternatives.	2.2				
4	Ability to comprehensively identify research and inquiry methodologies	1.6				
5	Ability to conduct inquiries, investigations, and research for complex issues and problems	1.7				
6	Ability to recognize ethical and professional aspects regarding engineering situations.	4.1				
7	Ability to perform tasks in the planned time with acceptable quality	4.2				
8	Ability to demonstrate leadership skills (planning tasks, assigning work to team members, and evaluating achievements).	5.1				
9	Ability to participate in brain storming, ideas generation and deciding the course of design.	5.2				
10	Contribution in implementing and evaluating the final product	5.2				
11	Ability to develop experiments or test procedure related to the final product	6.4				
12	Ability to conduct experiments related to the project.	6.1				
13	Ability to analyze and present data using statistical, and graphical tools.	6.2				
14	Ability to interpret the obtained data and draw the conclusion	6.3				
15	Ability to gain knowledge of modern tools/devices/apparatus/equipment.	7.1				
16	Ability to acquire new knowledge through pursuing future postgraduate studies or professional training.	7.2				
	Sub-Total (out of 80)					
	X= Modified Sub-Total (out of 40)					

Form: SDP-09
ME 492

SDP2: ME492 (Report Evaluation Checklist)

(Guide for use: Students should attach three-copies of this form with their submitted reports to the principal supervisor after filling the required data. Each copy of this form is to be directed to one of the SDP Examiners to evaluate the submitted SDPs. The form evaluates the written report, the design approach and the SDP product. Examiners are urged to complete the form and handle it to the principal supervisor by the celebration day)

Academic year: 14 - 14 (20 - 20), Semester : (☐ Fall ☐ Spring)

Department:	
Project Title:	
Supervisor(s):	
Student Names:	

I) Submission Time;	Planned Date: / /	Actual Date: / /
☐ **On time** ☐ **Late for** ..... **days** (in this case **1 mark is reduced** from the total mark for **the first day** of lateness and **Afterwards** extra reduction with a rate of **0.5 mark/day** is applied)		**No of marks to be reduced** **A =**

(II) Evaluation of the Written Report Formality, Style and Quality of Technical Writing

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5= excellent			
No.	**Item to be checked**	PI	**Score**
1	**Report Organization** (Cover page, Acknowledgement, Table of contents, List of figures, List of tables, Nomenclature, Introducing chapter, Main body chapters, Chapter for conclusions and recommendations, References, and Appendices) **and Style** (fonts, titles, page numbers, header and footers, margins, references are cited in the text and written in standard format …etc.)	3.1	
2	**Figures** and **Tables** citations (i.e. all figures and tables have numbers and captions, and are mentioned in the text before they placed) **Graphs Quality** (Size, Axes, Labels, and Legend) and M**athematical equations** (clarity and explanation of the equations)		
3	**English Language Quality** (paragraphs, relations between sentences, using punctuations, grammar, and spell check.)		
4	**Quality** of the I**ntroduction, Review, Conclusions and recommendations** in terms of: the available data, products and works, analysis and deep discussions of the obtained results based on the performance of the final product.		
5	**Poster** quality		
	Sub-Total (1) (out of 25)		**/25**
	B= Modified Sub-Total (1) (out of 5)		**/5**

(III) Evaluation of the SDP2 Approach, Procedures, and Final Product

Scores: 0 = Not exist/acceptable,1 = Weak, 2 = Acceptable, 3 = Good& 4= Very good, 5= Excellent						
No.	**Item to be checked**		**Pages***	PI	**Weights**	**Score**
1	**Problem description and project objectives** (Report should clearly identify the project purpose besides the problem statement, reality, creativity and impact to the environment, economy and society.)			1.1	**3**	
2	**The Literature review clearly reflects, inquiries and investigation of complex issues related to the design problem**			1.7	**3**	
3	**Brain storming, ideas generation and deciding the course of design** (Report should demonstrate the different ideas and design alternatives raised to solve the problem and justify the selected approach for design)			2.2	**3**	
4	**Design inputs**	**Identification of design requirement** (Important characteristics that the design must meet in order to be successful are listed)		2.1	**3**	
		Recognition of design constraints (technical and other constraints (global, environmental, social, economic, ethical, health and safety, whichever is applicable)		2.3	**3**	
5	**Design process**	**Approach** is logical, free from technical errors and answers all how and why questions.		2.3	**3**	
		Steps adopt and adhere to national and/or international standard specifications (Design Codes)		2.3	**3**	
		Formulating the design problem (mathematically and/or modeling)		1.2	**2**	
		Application of appropriate techniques in solving engineering design problem		1.3	**1**	
		Evaluation of design problem solution		1.4	**1**	
6	**Design Outputs (**Clear and identifiable design outputs that can be evaluated)			2.4	**3**	
7	**Verification of Designed Product**	**Development of experimental/test procedure** to **evaluate** the **final design.**		6.4	**2**	
		Conduct Experiment based on developed procedure (subjected to comprehensive evaluation.)		6.1	**1**	
		Analyze and present data using statistical and graphical tools		6.2	**1**	
		Interpret the data and draw the conclusion		6.3	**1**	
8	**Final Product**	**Verification** that the **Final Product is complete** and meets the design requirements.		2.4	**3**	
		The **Final Product** is evaluated and justified against all applicable constraints (technical, environmental, social, economic, ethical, health and safety)		2.4	**3**	
			Sub-Total (2) = ∑ Weight × Score (out of 195)			**/195**
			C = Modified Sub-Total (2) (out of 35)			**/35**

* In this column students should identify the page(s) in which the corresponding item is demonstrated in the report

Final Mark for the Senior Design Project (Report, Approach and Product)			
Evaluator Name		**Final Mark Y = -A+B+C (Out of 40)**	**Y=**
Evaluator Signature			
Date			

SDP2 - Presentation Evaluation Form

Academic Year: 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

Student Names		
St#1.....	St#2.....	St#3.....

Scores: 0 = Not exist/acceptable, 1 = Weak, 2 = Acceptable, 3 = Good& 4= very good, 5 = excellent

(I) Presentation Material (written)

No.	Item to be checked	PI	Score
1	Presentation material is well organized from technical writing point of view (Sandwich format: Title slide, Introduction, Main body with different sections and Conclusion)	3.1	
2	Overall appearance, presentation style and readability		
3	English language of the presentation		
4	Main ideas are presented logically, Objectively and clearly.		
	Sub-Total (1) [out of 20]		

(II-a) Individual Assessment of Presentation Skills (Oral)

No.	Item to be checked	Student Score				
		PI	St#1	St#2	St#3	St#4
1	Student's time management	3.2				
2	Seldom returning to notes/reports, and eye-contact					
3	Ability to explain ideas using proper English.					
4	Clear voice and confidence of the student in presentation					
5	Student's ability to handle questions and discussions (in English)					
	Sub-Total (2) out of 25					
	Sub-Total (3) = Sub-Total (1) + Sub-Total (2) [out of 45]					
	D= Modified Sub-Total (3) [out of 5]					

(II-b) Individual Assessment of Team working & Design (Oral)

No.	Item to be checked	Student Score					
		PI	weight	St#1	St#2	St#3	St#4
1	Student's understanding of task distribution and his role in the project	5.2	2				
2	Student's awareness of the project objectives and the realistic constraints	2.1	3				
3	Student's understanding of the design alternatives	2.2	3				
4	Student's familiarity with the design process and standard specifications (Codes) used.	2.3	3				
5	Ability to describe the final product and related technical aspects.	2.4	3				
	Sub-Total (4) [out of 70]						
	E = Modified Sub-Total (4) [out of 15]						
	Z= D +E [out of 20]						

Final Mark for Each Student (By Examiners)					
Student	**St#1**	**St#2**	**St#3**	**St#4**	**Date:** / /144 / /202
Obtained Marks (Y+ Z) out of (60)					
Examiner Name:					Signature:

SDP2 Final Grade Report

(**Guide for use:** This form is to be used by the SDP principal supervisor to report the final student grades. The completed form attached with copies of Forms SDP-09 and SDP-10 are to be submitted to the HOD)

Academic year: 144 - 144 (202 - 202) Semester : (☐ Fall ☐ Spring)

Department	
Project Title	
Supervisor(s)	

Student Names			
St#1.....	**St#2**.....	**St#3**.....	**St#4**.....

I) Students Performance Assessed by the Supervisors (From interim report- Form SDP-07)

St#1	St#2	St#3	St#4
X = ... /40	X = ... /40	X = ... /40	X = ... /40

II) Evaluation of the Final Report, Approach and Product (From: Form SDP-09)

Examiner #1	Examiner #2	Examiner #3	Average
Y = ... /40	Y = ... /40	Y = ... /40	Y = ... /40

III) Evaluation of the Presentation (From: Form SDP-10)

St#1			St#2			St#3			St#4		
Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3	Examr #1	Examr #2	Examr #3
Z = ... /20			Z = ... /20			Z = ... /20			Z = ... /20		

Final Mark and Grade				
Student Name:	St#1	St#2	St#3	St#4 .....
PIN				
Final Mark = (X+Y+Z)	..... /100	..... /100	..... /100	..... /100
Grade				
Supervisor Signature	.....			
HOD Approval		Date: / /		

SDP - Urgent Reporting Form

Form: SDP-12

Academic year : 144 - 144 (202 - 202), Semester : (☐ Fall ☐ Spring)

Department	
Project Title	
Supervisor(s)	

1) Description of the case/problem, Suggested Action and/or Comment:

Date: / / Supervisor(s) Signature:

2) This is raised to: ☐ HOD ☐ Senior Design Project Committee "SDPC"

3) Feedback and Proposed Action:

Date: / / Signature of HOD/SDPC:

4) Follow up result:

☐ Action was implemented and the case was effectively eliminated

☐ Action was implemented but the case was not eliminated and another action is needed (extra sheet for the new action description and follow up is to be attached)

☐ Action was not implemented. This case should be raised to.....

Date: / / Supervisor(s) Signature:

5) Study for Improvement by the Senior Design Project Committee:

Date: / / Responsible : .....

APPENDIX (B)
Expectations for the Final Report of the SDP Program

Final SDP reports submitted to the exam committee of should follow the Sandwich Presentation Method, which is appropriate to present a technical work. Thus the report must have the following items at least:

- Well formatted cover page
- Acknowledgement
- Table of contents, List of figures and List of tables
- Nomenclature
- Introducing chapter
- Main body chapters
- Chapter for conclusions and recommendations
- References
- Appendices (if any)

1. Cover Page

The cover page of the technical work should at least contain:

- The university and college names and logo.
- The names of the students, PIN numbers.
- The name of the academic advisor(s).
- The Title of the SDP.
- Semester and year.
- Date of submission.

All the information above must be arranged with good page format.

2. Acknowledgement

Acknowledgement section is recommended to be included. Acknowledgement means a statement or expression of thanks for all personnel or entities who assist you to perform the SDP.

3. Table of contents, List of figures and List of tables

Each of these items starts in a new page and must be well formatted and correctly correlates to titles/pages.

4. Nomenclature

It gives a list of all symbols and abbreviation used in the report and their explanations and units.

5. Introducing Chapter

The introduction orients the reader to the report (i.e. gives the reader some sense of what follows). This material could include:

- Introductory text about the SDP, its importance objective and outcomes.
- The important topics presented in the report to enable the reader to follow the report easily.
- **Review** for the available data, products and works.

6. Main Body chapters of the Report

1. Don't write "Body of work" as a title or a subtitle. Divide the main body into chapters/sections and use appropriate titles and subtitles.
2. Body part should contain detailed information.

3. Similar titles and similar subtitles must have similar format (i.e. if bold or underline is used in one subtitle then it must be used with all similar subtitles).
4. Try to use tables, charts, diagram, photos, etc.., to make the subject understandable.
5. All tables and figures must be numbered. Do not put any of them unless you mention it in the text. They appear only after the paragraphs which refer to them.
6. Tables should have titles on the top, while figures have their titles at the bottom.
7. Use a level of language that the supposed reader can easily understand.
8. The main body may include for example:
   a) The SDP plan and schedule,
   b) Brief observations, practices and comments regarding each applied items in the schedule,
   c) **Problem description and project objectives** including the clearly identify of the project purpose besides the problem statement, reality, creativity and its direct impact to the environment, economy and society.
   d) The outputs of **Brain storming, ideas generation and deciding the course of design**. This includes demonstration for the various ideas and design alternatives raised to solve the problem and justify the selected approach for design
   e) **Design inputs**, assumptions, heuristics, technical constraints and other constraints (global, environmental, social, economic, ethical, health and safety, which is applicable)
   f) Demonstration for the **Design process/approach**. The design must free from technical or logic errors and answer all how and why questions.
   g) **Design outputs** like drawings, material data sheet, instructions, software, programs, .. etc.
   h) Description and explanations for the existed **SDP/final product** and its applicability for use/operate.
   i) Verification that the SDP/**final product is complete** and met the design inputs and the purpose of the project
   j) Evaluation and justification of the **SDP/final product** against all applicable constraints (technical, environmental, social, economic, ethical, health and safety)
   k) Results obtained from operating/using the final product and discussion for results/performance.
   l) Engineering problems that student had faced or observed and how they were be solved.
   m) Difficulties may be faced through the SDP.
   n) Any other useful information or material.

7. Conclusions and Recommendations Chapter

This chapter ends the SDP report and reflects the main conclusions and recommendations of the project. These are addressed based on the analysis and deep discussions for the SDP/final product -AND/OR- based on the analysis and discussions for results obtained from (or performance of) the SDP/final product. **Conclusion** quality is a very important issue that should be considered since it is the final touch and impression of the reader about the project.

This end material could include:

a) The main technical conclusions and exciting feature of the SDP/final product.
b) The impact of the SDP and its SDP/final product on the environmental, social, economic, ethical, health and safety context.
c) Main personal outcomes from the SDP and what was learned.
d) Recommendations and final comments

8. References

References must be listed at the end of the report while the references themselves must be maintained in the SDP. In the text the references used are referred to by numbers between two square brackets, e.g. [5]. In the reference section, the references are written in a standard form, like:

- Auletta A., Manca O., Morrone B. and Naso V., Heat transfer enhancement by the chimney effect in a vertical isoflux channel, Int. J. of Heat and Mass Transfer, Vol. 44, pp. 4345-4357, 2001.
- Holman J. P., Heat transfer, Eighth Edition, McGraw-Hill, Inc., 1997.
- Tanda G., Application of the Schlieren technique convective heat transfer measurements, Tutorial posted on the World Wide Web by the Optical Method in Heat and Mass Transfer (OMHAT) site: http://dau.ing.univaq.it/omhat, Posted on the web 18 Oct. 1999.

9. Appendices

Some data or information may be included in an Appendix after the whole report. An Appendix must start in a new page.

10. Important Points to Be Noticed in Report Writing

1. In your writing, one paragraph should contain only one subject. If the subject is changed, use another paragraph.
2. There should be logical relation between sentences in the paragraph.
3. Use punctuation as appropriate.
4. Write with suitable font size (12 pt. or 14 pt.) Times New Roman.
5. If you download anything from web pages do not use copy and paste. You must edit the text to be suitable for your report.

11. Report Submission Time

All team projects are required to submit their SDP reports to their supervisors in a definite date. This date will be fixed and announced by each department head. Late submission is not permitted, however in such cases penalties will be applied as follows:

- For the **First day** of lateness, **2 marks** will be reduced from the total mark obtained by each student after evaluating the SDP report.
- **After wards** an extra one **mark per each additional day** will be applied.

APPENDIX (C)

Expectations for the SDP Presentation

The SDP presentation is to be presented to the exam committee during the Celebration Day.

It is expected that your presentation:

- Be prepared using the MS power point or any equivalent software.
- It should follow the Sandwich Presentation format which is appropriate to present a technical work. Thus the presentation must have the following items at least:
  - Well formatted Title page
  - Introduction
  - Main body
  - Discussions and conclusions
- Reflects what was learned and practiced
- Is in good style and quit readable
- Reflects good command of English

As a presenter, It is expected that you:

- Have good time management (on time and presentation duration)
- Have quite confidence
- Show your good command of English
- manipulate discussion and answer questions in English