

Evaluation and Assessment Frameworks for Improving Students Outcomes in Electrical Engineering Department

Table of Contents

Introduction.....	4
Determinative Assessment (Direct Method).....	6
Indirect Assessment.....	6
Indirect Assessment of Course Learning Outcome:	7
SO Assessment Plan	7
SO Assessment Data.....	9
Graduation Project Assessment Details	11
Assessment	11
GP Objectives	12
Roles and Responsibilities	12
Student	12
Supervisor	13
Assessment Panel	13
GP Committee	14
Deliverables.....	14
Logbook	14
Graduation Project CLOs & CLO-SO Map.....	14
GP Assessment Data Collection for Graduation Project (I) 491EE-2	16
GP Assessment Data Collection for Graduation Project (II) 492EE-3	18
Indirect Methods	26
Course Survey.....	26
Faculty Survey	28
Exit Survey Assessments (Indirect Method).....	32
Faculty Survey Assessment (Indirect Method).....	33
Alumni Survey Assessment	33
Employer Surveys	34
SO Attainment Data and Evaluation.....	34
Extracting SO Attainment Data from CLOSO	34
Comparing SO Attainment Data for Varying Satisfaction Criteria for Semester 1 and Semester 2, 2016-2017	36
SO Attainment Data Comparison over two Semesters during 2017-2018.....	38
SO Attainment indicated by Graduation Project Assessment	39
SO Attainment indicated by Student Survey	43

SO Attainment indicated by CLOSO Faculty Survey	44
Conclusion	44

Introduction

The evaluation process is important in the educational process through which to achieve the following set of objectives:

1. Determine students' achievement of learning outcomes for courses and programs, as well as to determine the level and degree of achievement of learning outcomes
2. Identify students' strengths and weaknesses in learning outcomes
3. Emphasize and adopt strategies that enhance strengths and develop plans improvement to raise vulnerabilities and increase the level of achievement of learning outcomes.

Therefore, the Department of Electrical Engineering in its programs adopted and designed modern evaluation mechanisms suitable for learning outcomes, education strategies and methods of teaching and learning. The department paid particular attention to the analysis of evaluation results for policy making and work to develop evaluation mechanisms periodically to achieve its objectives.

The evaluation mechanisms for students in the Department of Electrical Engineering programs were designed using the latest evaluation methods used in universities and international education centers. Evaluation methods included many mechanisms, including direct assessment, Indirect Assessment, Absolute Assessment, Relative Assessment, Summative Assessment, and Continuous Assessment. Also, the evaluation mechanisms include evaluation of all areas of learning from general, scientific and engineering knowledge, Cognitive Skills, Information and analysis skills, and Communication Skills. It was emphasized to take into account the appropriateness of the evaluation mechanism with learning scopes. The learning outcomes assessment mechanisms for each Course Outcomes have been scaled up to measure the learning outcomes of the Student / Program Outcomes and the Program Education Objective.

The flow chart for the evaluation of SO is as shown in figure 1.1.

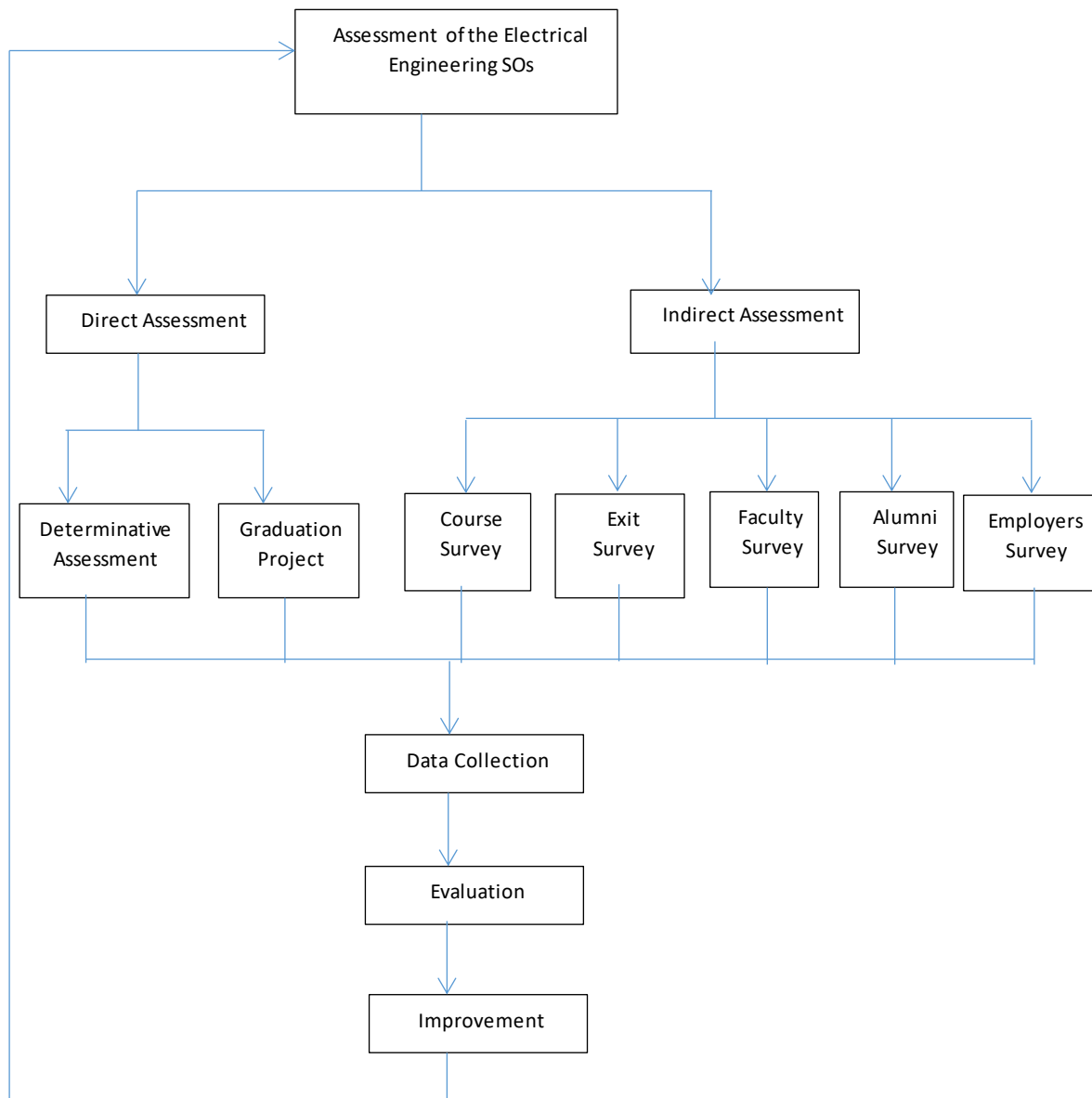


Figure 1.1 Continuous Assessment Plan Process of the EE for learning outcomes and outputs of the program

Determinative Assessment (Direct Method)

For each subject, the assessment data are collected by the instructor. The information for every core subject is input to the CLOSO software. The outcomes are finally reviewed and evaluated by the Assessment committee. Details are discussed in different section below.

Table 1.1 SO Assessment Processes

NO.	SO assessment process	Type of Assessment	Frequency	Data collected by	Data processing	Evaluated by
1	Course learning outcomes	Direct	Each semester	Instructor	Instructor	Assessment committee
2	Graduation Project	Direct	Each semester	Project advisor	Instructor	Assessment committee
3	Course Survey	Indirect	Each semester	Instructor	Instructor	Assessment committee
4	Exit Survey	Indirect	Each year	Surveys committee	Surveys committee	Assessment committee
5	Staff Survey	Indirect	Each semester	Surveys committee	Surveys committee	Assessment committee
6	Alumni	Indirect	Each year	Surveys committee	Surveys committee	Assessment committee
7	Employer	Indirect	Each year	Surveys committee	Surveys committee	Assessment committee

Indirect Assessment

Include all the evaluation mechanisms adopted by the engineering programs to measure the learning outcomes of each course in the study plans, measure the extent and level of achievement of the learning outcomes of the program and measure the achievement of the objectives of the program on direct assessment methods and Indirect Assessment mechanisms and all indirect assessment mechanisms do not monitor scores in the admission and registration system and in the student's record. Rather, it is based on the determination of the rates of achievement of the results on the Likert scale of five grades determined according to the opinion of the students or members of the faculties or graduates or employers and other evaluators. The results ratios are used and considered in the improvement and development plans without any ratios to write on the students' record.

Indirect Assessment of Course Learning Outcome:

As shown in Figure 1 above, all learning outcomes for all courses in the study plan of each College of Engineering program are evaluated indirectly by a Student Survey questionnaire distributed to all students enrolled for the course in the last week before the final exam. The questionnaire is designed on a five-point Likert scale and analyzes the results of the questionnaires by the teacher in order to determine the level of achievement of the outputs and identify the strengths and weaknesses of the students' perspective in order to take them into account in designing the decision improvement plan. The faculty member shall keep a copy of this assessment in the course file for that semester and handle it over to the department for safekeeping in the quality corner of the scientific section.

SO Assessment Plan

The first piece of data that is required by all instructors is the SO assessment plan for the subjects they are teaching and share it with the students in the first week of the semester. The objective of this idea is to increase the awareness of the subjects relevant SOs among the students. The plan is to re-emphasize among all instructors as well as students to disseminate the SO assessment in the first week of the semester. The instructor helps in designing an assessment for CLOs keeping in view the relevant SOs. At the same time, it helps the students in paying attention to their skills that are required at the time of completion of the course. Table 1.2, Table 1.3 and Table 1.4 show the choices available to the instructor for three dissimilar aspects of the SO assessment plan. Figure 1.2 shows a typical instructors' input in CLOSO software

Table 1.2 SO Introduction to Students - Choices for Instructors

Choice No.	When will the SO be introduced to the students?
1	In the first week of classes
2	In the second week of classes
3	Any time before mid-term
4	After the mid term
5	Last week of classes
6	Never

Table 1.3 SO Students Awareness Check - Choices for Instructors

Choice No.	How will it be ascertained that students are aware of the SO?
1	Through verbal cross questioning
2	Through a questionnaire
3	Through questions in assessment
4	No nothing will be done

Table 1.4 SO Assessment Method - Choices for Instructors

Choice No.	How will the SO be assessed
1	Implicitly through CLO based questions
2	Explicitly through SO based questions
3	Through a presentation student will make
4	Through an assessment for this purpose
5	Through oral questions
6	Not applicable

Five different components of valuation plan should be implemented and entered to the CLOSO software by the instructor as follows:

1. SO Assessment Plan
2. Weekly Teaching Plan.
3. Instruction Methods.
4. Assessment Methods.
5. Assessment Distribution.

Here the instructor enters the plan of SO evaluation. The screen snapshot shown in Figure 1. are the questions and there possible answers. The SOs in the first column are only those that are relevant to the subject. This data is collected from all instructors to increased awareness between the faculty teaching the course and the students and this may be used by the Assessment and Evaluation Committee to solve any issues regarding the satisfaction of SO achievement.

SO ID	When will the SO be introduced to students?	How will it be ascertained that students are aware of the SO?	How will the SO be assessed?
a	In the first week of classes	Through verbal cross-questioning	Implicitly through CLO based questions
b	In the second week of classes	Through a questionnaire	Explicitly through SO based questions
c	Any time before the mid-term	Through questions in assessments	Through a presentation student will make
d	After the mid-term	No. Nothing will be done	Through an assignment for this purpose
e	Last week of classes	Click to select	Through oral questions
f	Never	Click to select	Not Applicable

Figure 1.2 Instructor Panel for Entering SO Assessment Plan

To input the data to CLOSO software, an assessment is characterized by two attributes.

- 1) A name given to the assessment.
- 2) Marks out of 100 that the assessment contributes to the final grade.

An example is shown below in Figure 1. of the panel used by the instructor to enter the assessment marks contribution data of students.

Raw Marks Distribution for calculating the Final Grade

Quizzes	5
Homework Assignments	5
Term-project	0
Attendance	0
Presentation	0
Life-long Learning Assignment	0
Contemporary Issues Knowledge Test	0
Lab. Reports	10
Lab. Examination	10
Mid-term Examination	0
Exam 1	10
Exam 2	10
Final Examination	50
Other Assessments	0
Total	100

Figure 1.3 Instructor Panel for Entering Marks Distribution Data

SO Assessment Data

The instructor enters the idea of SO assessment via the CLOSO software, as shown in figure 1.4 and figure 1.5. The instructor should go through three phases: marks allocation, marks input and final grade to enter CLOs assessment plan which matches to SOs evaluation plan. Only those SOs which are relevant to the course are evaluated. This data is collected from all the instructors to increased awareness between the faculty teaching the course and the students and may be used by the Assessment Committee to resolve any point concerning the satisfaction of SO achievement.

Assessment Design

Assessment ID: 9 Assessment Name: Final Exam

Total Raw Marks for all Question Sets of this Assessment = 50

Contribution of this Assessment to the final grade = 50 %. Sum of contribution of all assessments (entered so far) = 100

Question Set	From Question	To Question	Raw Marks	CLO	SO	Bloom's Level
1	1	1	6	CLO 1	a	1
2	2	2	8	CLO 2	b	2
3	3	3	10	CLO 3	c	3
4	4	4	13	CLO 4	d	4
5	5	5	6	CLO 5	e	5
6	6	6	7	Click to select	Click to select	Click to select
7	7	7	0	Click to select	Click to select	Click to select
8	8	8	0	Click to select	Click to select	Click to select
9	9	9	0	Click to select	Click to select	Click to select
10	10	10	0	Click to select	Click to select	Click to select

Assessment ID: 9 Assessment Name: Final Exam Contribution to Final Grade: 50 %

Delete the last row Append a row Delete Assessment Cancel OK

Figure 1.4 Instructor Panel for Entering Marks Allocation.

After entering SOs evaluation plan and calculating the final grade with the help of CLOs assessment plan the instructor can monitor the percentage of achievement of SOs as shown in Figure 1.5. SO satisfaction analysis for each subject is performed with the help of CLOSO using a conversion formula based on CLO-SO map for that subject and produces the percentage of students satisfaction criterion for each SO that is relevant to the subject as shown in Figure 1.5 below. There are two columns of data for each SO. The first column displays the marks allocated for the assessment of the particular SO. The second column displays the percentage of students getting marks greater than 60% (Program Satisfaction Criterion). The last row of the table shown in Figure 1.5 gives the cumulative sum of all assessments done for the subject. In this example shown in Figure 1.5 45% marks are allocated to assessments related to SO (a) and the percentage of students getting more than 60% marks are 73%. For SO (e), 45% marks are allocated to this assessments and the percentage of students getting marks greater than 60% marks are 69%. For SO (k), 10% marks are allocated and the percentage of students getting marks more than 60% marks are 47%.

SO Satisfaction Data

Student Outcomes >>		a		b		c		d		e		f		g		h		i		j		k	
Assessment Name	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	
▶ QUIZ 1	3.5	61							1.5	78													
MID-TERM 1	9	81							6	78													
QUIZ 2	2	28							2	28										1	33		
MID-TERM 2	6.2	61							6.2	61										2.7	44		
CHW	3.3	44							3.3	44										3.3	44		
FINAL EXAM	21	83							26	75										3	56		
Cumulative Sum (Out of 100)	45	73							45	69										10	47		

M: Marks allocated to the respective SO for each Assessment
P: Percentage of students scoring 60% or better.
Target satisfaction criterion for the program is: 60% students get 60% or above.

Figure 1.5 Instructor Panel for SO Satisfaction

Graduation Project Assessment Details

The Graduation Project Guidelines manual is officially prepared as a reference for graduating year students of Electrical Engineering Department. The manual is considered as a supplementary instrument in achieving the goal of completing the Graduation Project (GP): to equip students with key academic knowledge theoretically and practically for their professional competency in the future working life.

Graduation Project (GP) is implemented in divisions of two semesters - GP I & GP II:

- i) GP I (491EE-2): For this 2 (two) credit hours is allotted to the students per week and they must prepare a feasible project proposal.
- ii) GP II (492EE-3): For this 3 (three) credit hours is allotted to the students per week and in the end, a final report have to be submitted to the department on the given date. Students have 491EE-2 as a pre requisite for this GP II. Students must prepare the project report in accordance with the guidelines provided by the department.

The aim of GP is to train students to be able to apply theoretical knowledge gained in the classes throughout the previous years on a practical design project of their choice in order to acquire useful skills and experience during the learning process with the hope to produce skillful and competent engineering graduates.

Assessment

The GP assessment is based on the Student's accomplishment and capability to prepare a project proposal, project report, materials and poster for presentation, oral presentation during the seminars and effective use of the logbook. Assessment is done by the supervisor and assessment panel separately and discretely. The distribution of marks for the two components above is:

- Assessment Panel : 50%
- Supervisor : 50%

The GP marks justification is shown in Table 1.5. The allocation of marks and criteria considered in the assessment process are shown in the assessment forms in Appendix A (GP I) and Appendix B (GP II). The graduation project grading form process is provided in Appendix C and the assessment guide for supervisors and assessment panels is provided in Appendix D. The data will be used for input to the GP template of CLOSO software. CLOSO will calculate the final grade and the satisfaction of each CLO and SO.

Table 1.5 GP Marks Justification

	Marks					
	GP I (491EE-2)			GP II (492EE-3)		
Supervisor	Logbook	Project Proposal	Total	Logbook	Final Report Draft	Total
	15	35	50	15	35	50
Assessment Panel	Presentation	Project Proposal	Total	Presentation and Poster	Final Report Draft	Total
	20	30	50	20	30	50
Total	35	65	100	35	65	100

GP Objectives

The objectives set for students undertaking the GP are:

- To independently work on students' own initiative.
- To enthusiastically explore one area of their program in depth.
- To thoroughly gather and manage information in a scientifically rigorous method.
- To competently process and integrate materials in a sustained exercise of intellectual ordering.
- To skillfully produce coherent, literate official documents.
- To constructively appreciate and incessantly involved in life-long learning.
- To initiate students their path of success in the future industrial careers.

These objectives are relevant to the required criteria for the assessment of the final report.

Roles and Responsibilities

The success of GP implementation is determined by the quality of the enthusiasm, commitment and cooperation from all parties involved towards their roles and responsibilities.

Student

In order to produce a GP that accomplishes the above conditions established, each student must perform the following responsibilities:

- 1) Register the GP I and GP II courses before the deadlines set by the University.
- 2) Choose your team member for the project – maximum is three members in a team.
- 3) Oblige to the GP work schedule set by the Department.
- 4) Choose a supervisor and propose a GP title along with a summary before the deadlines set by the Faculty.

- 5) Verify the originality of the GP work you proposed (either a novel work or an extension of a previously conducted research).
- 6) Meet the supervisor frequently to discuss anything arises about your GP.
- 7) Update your activities in the logbook. Bring it along when you meet the supervisor.
- 8) Systematically plan and manage the project to complete within the allocated time for the project.
- 9) Get ready to submit all items of assessment on time as incorporated into the Gantt chart timeline in accord with standard format.
- 10) Avoid anything considered as or related to plagiarism.
- 11) Present about your GP work at both GP I and GP II seminars.
- 12) Submit three (3) hard-bound copies of the GP final report.
- 13) Let your supervisor to certify all items of assessment and hard-bound copies of the final report.

Supervisor

A supervisor serves as a facilitator, mentor, observer and evaluator to the student under his supervision. The supervisees need constant monitoring, guidance, and evaluation. The roles and responsibilities of the supervisor include the following:

- 1) Have a carefree discussion about the GP title with the supervisee.
- 2) Approve the proposed title and summary of the GP that he will conduct.
- 3) Offer guidance and advise to the supervisee on conducting the GP research.
- 4) Maintain the level of supervisee's GP research within bachelor degree level as long as it does not overdo that level and scope of GP stipulated by the Department.
- 5) Certify the student's logbook and record their attendance of consultation visits.
- 6) Check and approve the supervisee's project proposal, draft of final report and hard-bound final report.
- 7) Endorse (if appropriate) GP forms submitted by the supervisee.
- 8) Evaluate the logbook, project proposal, and draft of final report reasonably and without any prejudice or bias.
- 9) Key-in the supervisee's marks into the CLOSO system before the dateline set by the Department.
- 10) Prepare a justification report if the supervisee has failed his GP.

Assessment Panel

The assessment panel comprises of three academicians other than the supervisor, which are appointed by the Department. The main function of the panel is to evaluate the items of assessment produced by the student. The roles and responsibilities of the assessment panel include the following:

- 1) Fairly evaluate the student's project proposal, draft of final report and oral presentation without any prejudice or bias.
- 2) Attend the GP seminar sessions that involve students assessed by the panel.
- 3) Share opinions and/or constructive criticism pertaining to the student's GP work.
- 4) Submit the student's marks to the department before the dateline set by the department.

GP Committee

The roles and responsibilities of the GP Committee include the following:

- 1) Prepare the activities for GP I and GP II planner calendar.
- 2) Effectively disseminate information related to the implementation of GP to all parties involved respectively.
- 3) Allocate all supervisors with a fair quota of GP supervisees.
- 4) Plan and conduct methodology seminars for GP students.
- 5) Manage the receiving end of project proposals, drafts of final report from students, and distribute them to the assessment panels.
- 6) Arrange properly the list of students who will queue to present at both GP I and GP II seminars.
- 7) Propose and approve names of academicians to be appointed as members of the assessment panels and prepare presentation schedules for the GP I and GP II seminars.
- 8) Organize and manage the GP I and GP II seminars, including the GP awards ceremony.
- 9) Ensure that the assessment of GP students is conducted according to the timeframe set by the Department and is managed systematically.
- 10) Key-in the distributed to parts of certain assessments and the final total into the University's student assessment system (CLOSO).
- 11) Analyze the overall performance of GP students at the end of each semester, identify problematic students and suggest suitable solutions.
- 12) Observe and cooperate the implementation of GP within the Faculty to establish its accomplishment by continuously improving the quality of delivery.

Deliverables

Continuous monitoring and evaluation are crucial in the implementation of GP. To facilitate this process, students are required to provide the following deliverables:

Logbook

The logbook is the Student's record of accomplished work during the GP. The supervisee should show the logbook to the supervisor every time he meets the supervisor, who will certify the records he made. These records include:

- Title, objectives, scope and work plan.
- Important dates related to the implementation and evaluation of the project.
- Dates of meetings with the supervisor, and outcomes of the meetings such as discussions, advice and instructions.
- Preparations, problems that have arisen, proposed solutions and equipment that is needed.
- Raw data and/or results achieved to date.
- Sketching of all relevant diagrams.

Graduation Project CLOs & CLO-SO Map:

Assessment data submitted by the GP supervisors for the graduation project are based on a set of CLOs that are strongly linked to the SOs and pre-specified. The CLO-SO map for the graduation

project is also pre-specified. The Curriculum Committee approved the CLOs and the CLO-SO maps of the graduation project. To make sure that all the SOs are properly represented these are also reviewed by the Assessment Committee. The prescribed CLOs are shown in Table 1.6 a and b and the CLO-SO map is shown in table 1.7 a and b. All the eleven SOs from (a) to (k) are significant in the GP as it can be seen from the CLO-SO map. Therefore for two semesters, the students show their skills in all the required SOs through the tasks required by the GP. Since graduation project is done by the students when they are in their final years of the graduation, the data achieved from the GP is the most reliable indicating the achievement of the SOs.

Table 1.6 Graduation Project CLOs: (a) Graduation Project (I), 491EE-2

CLO ID	CLO
1	Identify and formulate engineering problems in the area of electrical engineering.
2	Plan a project effectively using project-planning techniques to ensure proper timing and budgeting.
3	Review the available literature in the project domain.
4	Communicate effectively in writing engineering report and oral presentation.
5	Work effectively as a member of the team.

(b) Graduation Project (II), 492EE-3

CLO ID	CLO
1	Identify and formulate engineering problems in the area of electrical engineering.
2	Work effectively as a member of the team.
3	Conduct enough literature review in the project domain.
4	Design a system, component or process with defined constraints.
5	Solve engineering problems and implement designed solution.
6	Collect and analyze data, and draw conclusions through experiments while testing a project.
7	Communicate orally and in writing the details of project design in a technical report.

Table 1.7 Mapping of Graduation Project CLOs with SOs:

(a) Graduation Project (I), 491EE-2

CLO-SO Map

	Student Outcome (SOs)										
CLO ID	a	b	c	d	e	f	g	h	i	j	k
CLO 1	1	0	0	1	1	0	1	0	1	1	0
► CLO 2	1	0	0	1	1	0	1	1	0	0	0
CLO 3	1	0	1	1	1	0	1	0	0	1	1
CLO 4	0	0	0	1	0	1	1	0	0	0	0
CLO 5	0	0	0	1	0	0	1	0	0	0	1

(b) Project (II), 492EE-3

CLO-SO Map

	Student Outcome (SOs)										
CLO ID	a	b	c	d	e	f	g	h	i	j	k
CLO 1	1	0	0	0	1	0	0	0	1	0	0
► CLO 2	0	0	0	1	0	0	0	0	0	0	1
CLO 3	1	0	1	0	1	1	0	0	1	1	1
CLO 4	1	0	1	0	0	0	0	0	0	1	1
CLO 5	1	1	1	0	1	0	0	1	0	1	1
CLO 6	0	1	0	0	0	0	0	0	0	1	1
CLO 7	0	0	0	0	0	1	1	0	0	0	0

GP Assessment Data Collection for Graduation Project (I) 491EE-2:

For each of the two semesters of GP, the project supervisor submits the assessment data using excel spread sheet. The project supervisor needs just to enter the marks obtained by the students in the project group for each task. Table 1.8 a and b shows the list of criteria for the First Semester of GP I. It also shows the relative weight of each criteria and the CLO it belongs to.

Table 1.8 (a): Supervisor Assessment for Graduation Project I (491EE-2)

PART 1: Logbook Assessment (15 Marks)			
No.	Criteria	CLO	Weight
a	Meeting with supervisor	CLO 2	3.75
b	Attitude		3.75
c	Project planning, implementation chart and budgeting		3.75
d	Weekly activities		3.75
Total			15
PART 2: Project Proposal Assessment (35 Marks)			
Project Report			
No.	Criteria	CLO	Weight
a	Abstract	CLO 5	2.5
b	Introduction (Background, problem statement, objectives, scope and limitation of work)	CLO 1	6
c	Apply reasoning to assess health/safety/societal issues based on literature review using latest and relevant references	CLO 3	3.5
d	Investigation of complex problems using proper techniques, tools and resources	CLO 3	3.5
e	Expected results	CLO 5	2.5
f	Originality and ethics	CLO 5	2.5
g	Reports organization and language usage	CLO 4	3.5
Project Work			
a	Ability to conduct project and team work	CLO 5	2.5
b	Effectiveness of project management	CLO 2	5
c	Execution of project work/procedures	CLO 4	3.5
Total			35

Table 1.8 (b): Examination Panel Assessment for Graduation Project I (491EE-2)

PART 1: Presentation Assessment (20 Marks)			
No.	Criteria	CLO	Weight
a	Presentation contents	CLO 4	5
b	Presentation organization		5
c	Delivery methods and techniques		5
d	Ability to answer questions based on contemporary issues		5
Total			20
PART 2: Project Proposal Assessment (30 Marks)			
No.	Criteria	CLO	Weight
a	Abstract	CLO 5	3
b	Introduction (Background, problem statement, objectives, scope and limitation of work)	CLO 1	6
c	Apply reasoning to assess health/safety/societal issues based on literature review using latest and relevant references	CLO 3	3
d	Investigation of complex problems using proper techniques, tools and resources	CLO 3	3
e	Expected results	CLO 2	6
f	Originality and ethics	CLO 5	3
g	Reports organization and language usage	CLO 4	6
Total			30

GP Assessment Data Collection for Graduation Project (II) 492EE-3:

For each of the two semesters of GP, the project supervisor submits the assessment data using excel spread sheet. The project supervisor needs just to enter the marks obtained by the students in the project group for each task. Table 1.9 a and b shows the list of criteria for the second Semester of GP II. It also shows the relative weight of each criteria and the CLO it belongs to.

Table 1.9 (a): Supervisor Assessment for Graduation Project II (492EE-3)

PART 1: Logbook Assessment (15 Marks)			
No.	Criteria	CLO	Weight
a	Meeting with supervisor	CLO 2	3.75
b	Attitude		3.75
c	Project planning, implementation chart and budgeting	CLO 7	3.75
d	Weekly activities		3.75
Total			15
PART 2: Draft of Final Report Assessment (35 Marks)			
Project Report			
No.	Criteria	CLO	Weight
a	Abstract	CLO 2	1.25
b	Introduction	CLO 1	5
c	Apply reasoning to assess health/safety/societal issues based on literature review using latest and relevant references	CLO 3	5
d	Design and investigation of complex problems using proper techniques, tools and resources	CLO 4	5
e	Testing, data analysis and critical thinking	CLO 6	5
f	Results and discussion including societal/health/safety impact	CLO 5	2.5
g	Originality and Ethics	CLO 7	2.5
h	Reports organization and language usage	CLO 7	2.5
i	Conclusion and recommendation and assessment on implication to society/environment	CLO 5	2.5
Project Work			

a	Ability to conduct project and team work	CLO 2	1.25
b	Effectiveness of project management		1.25
c	Execution of project work/procedures		1.25
Total			35

Table 1.9 (b): Examination Panel Assessment for Graduation Project II (492EE-3)

PART 1: Presentation Assessment (20 Marks)			
No.	Criteria	CLO	Weight
a	Presentation contents	CLO 7	5
b	Presentation organization		5
c	Delivery methods and techniques		5
d	Ability to answer questions based on contemporary issues		5
Total			20
PART 2: Project Proposal Assessment (30 Marks)			
No.	Criteria	CLO	Weight
a	Abstract	CLO 2	4
b	Introduction	CLO 1	4
c	Apply reasoning to assess health/safety/societal issues based on literature review using latest and relevant references	CLO 3	4
d	Design and investigation of complex problems using proper techniques, tools and resources	CLO 4	4
e	Testing, data analysis and critical thinking	CLO 6	4
f	Results and discussion including societal/health/safety impact	CLO 5	2.5
g	Originality and Ethics	CLO 7	2.5
h	Reports organization and language usage	CLO 7	2.5
i	Conclusion, recommendation and assessment on implication to society/environment	CLO 5	2.5

Total	30
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A.3.6.3 GP Assessment Data Evaluation:

The GP Assessment done by the supervisor and examination panel as described in the above table can be assessed through different criteria. The supervisor tries to follow a guideline in the marking of these criteria according to the description given below in different assessment methods like logbook, presentation, project proposal and final draft of the report.

Assessment of Logbook

Score	Description
Excellent (5)	<ul style="list-style-type: none"> Meets the supervisor more frequent than weekly basis. Very enthusiastic towards the project and obviously seen in striking inquisition, extraordinary commitment, and seamless teamwork spirit. Project proposal is very soundly prepared, neatly organized and affirmatively applicable. Activities progress earlier than planned as well as adjusting swiftly and creatively to changes.
Good (4)	<ul style="list-style-type: none"> Meets the supervisor on weekly basis. Enthusiastic towards the project and seen in constant inquisition, full commitment, and functioning teamwork spirit. Project plan is efficiently prepared, well-organized and convincingly applicable. Most of the activities are conducted in accord to plan and adjusting appropriately to changes.
Average (3)	<ul style="list-style-type: none"> Meets with the supervisor fortnightly or less. Lack of enthusiasm towards the project, which is seen in lack of inquisition, commitment, and teamwork spirit. Project plan is prepared but lack of organization but seemed applicable. The activities are mostly slightly delayed compared to the planned and adjusting rather slowly to changes.
Poor (2)	<ul style="list-style-type: none"> Meets the supervisor on monthly basis or less. Less enthusiasm than the average where inquisition, commitment and teamwork spirit are all at lower level or being more dependent on the supervisor than own initiative. Project plan is ambitiously or not fully prepared with lower level of organization, and less convincingly applicable.

	<ul style="list-style-type: none"> – The activities are all delayed longer than the planned and adjusting poorly to changes.
Very Poor (1)	<ul style="list-style-type: none"> – Rarely meets the supervisor less than two-monthly or less. – Hardly shows enthusiasm towards the project with almost no initiative, inquisition, commitment and team spirit seen. Almost ignorant and senseless. – Project plan is not prepared in completion. – The common activities lag unacceptably behind and refused to adjust to any change.

Assessment of Presentation

Score	Description
Excellent (5)	<ul style="list-style-type: none"> – Impressive presentation that is fascinating and smoothly revealing excellent talent of multi-skills. – Amazingly prepared slides and catchy poster that successfully highlight the critical aspects of the project. – Answer questions informatively convincing, creatively coherent, and smoothly cohesive.
Good (4)	<ul style="list-style-type: none"> – Interesting presentation that is enjoyable and traceable main skills of communication. – Well-prepared and appealing slides/poster that highlight the main aspects of the project. – Answer question convincing, coherent, and cohesive.
Average (3)	<ul style="list-style-type: none"> – Ordinary presentation with lower level of needed skills of communication. – Satisfactorily prepared slides/poster covered only some important aspects of the project. – Answer some questions unconvincingly with lack of coherence and cohesion.
Poor (2)	<ul style="list-style-type: none"> – Inappropriate presentation due to lack of skills of communication. – Poorly prepared slides/poster covering unimportant aspects of the project. – Answer most of the questions poorly convincing with poor coherence and cohesion.
Very Poor (1)	<ul style="list-style-type: none"> – Insignificant presentation due to lack of too much or almost absence of skills in communication. – Carelessly prepared slides/poster missing most important aspects of the project. – Hardly able to answer the questions convincingly.

Assessment of Project Proposal

Score	Description
Excellent (5)	<ul style="list-style-type: none"> – The research background, statement of problem, aim, objectives, scope and importance are outstandingly defined. – The supporting literature is very significantly focused and is meticulously reviewed. – The proposed methods are very applicable and are clarified in minute details. – The expected results are very perceptibly drawn and very agreeable with the objectives stated. – The sources of reference are very reliable and citations are very consistent with the list of references. – The project plan is extraordinarily prepared and easily approved by the supervisor. – The entire proposal preparation is very carefully compliant with the set format.
Good (4)	<ul style="list-style-type: none"> – The research background, statement of problem, aim, objectives, scope and importance are clearly defined. – The supporting literature is focused and is thoroughly reviewed. – The proposed methods are applicable and clarified in details. – The expected results are perceptibly drawn and agreeable with the objectives stated. – The sources of reference are reliable and citations are consistent with the list of references. – The project plan is thoughtfully prepared and approvable by the supervisor. – The proposal preparation is generally compliant with the set format.
Average (3)	<ul style="list-style-type: none"> – The research background, statement of problem, aim, objectives, scope and importance are satisfactory defined. – The supporting literature is relevant but not focused and is incompetently reviewed. – Some of the proposed methods are applicable and clarified in details. – Some of the expected results are hesitantly drawn and doubtfully agreeable with the objectives stated. – Some of the sources of reference are of unconvincing reliance and some citations are not consistent with the list of references. – The project plan is plainly prepared and approved at the mercy of the supervisor. – The proposal preparation is a careless compliant with the set format.
Poor (2)	<ul style="list-style-type: none"> – The research background, statement of problem, aim, objectives, scope and importance are unclearly defined. – The supporting literature is mostly irrelevant with poor focus and is poorly reviewed.

	<ul style="list-style-type: none"> – The proposed methods are mostly inapplicable and poorly clarified. – The expected results are poorly drawn and poorly agreeable with the objectives stated. – The sources of reference are poorly reliable and most citations are poorly consistent with the list of references. – The project plan is poorly prepared and difficult to be approved by the supervisor. – The proposal preparation is a loose compliant with the set format.
Very Poor (1)	<ul style="list-style-type: none"> – The research background, statement of problem, aim, objectives, scope and importance are unsatisfactorily defined. – The supporting literature is completely irrelevant, and is ill-reviewed. – The proposed methods are completely inapplicable and deficient of clarity. – The expected results are weakly drawn and disagreeable with the objectives stated. – The sources of reference are highly unreliable and citations are very inconsistent with the list of references. – The project plan is very ill-prepared and easily disapproved by the supervisor. – The proposal preparation is incompliant with the set format.

Assessment of Draft of Final Report

Score	Description
Excellent (5)	<ul style="list-style-type: none"> – The abstract writing is extremely catchy, concise and comprehensive. – The research background, statement of problem, aim, objectives, scope and importance are outstandingly defined. – The supporting literature is extremely focused, relevant and the review is meticulous, comprehensive, and critical. – The methods are extremely applicable and are very manifestly clarified. – The results are very brilliantly reported and significantly interpreted, and the discussions are enjoyably very perceptive. – The conclusions very appealingly highlight the key findings and include decent significance and limitations of current work, and recommendations for future work sections. – The sources of reference are extremely reliable and citations are extremely consistent with the list of references.
Good (4)	<ul style="list-style-type: none"> – The abstract writing is very catchy, concise and comprehensive. – The research background, statement of problem, aim, objectives, scope and importance are visibly defined.

	<ul style="list-style-type: none"> – The supporting literature is very focused, relevant and the review is thorough and critical. – The methods are very applicable and are manifestly clarified. – The results are very brightly reported and considerably interpreted, and the discussions are perceptive. – The conclusions appealingly highlight the key findings and include proper significance and limitations of current work, and recommendations for future work sections. – The sources of reference are very reliable and citations are very consistent with the list of references.
Average (3)	<ul style="list-style-type: none"> – The abstract writing is common, lengthy and incomprehensive. – The research background, statement of problem, aim, objectives, scope and importance are plainly defined. – The supporting literature is quite focused, relevant and the review is incomprehensive and lack of criticality. – The methods are quite applicable and are plainly clarified. – The results are plainly reported and interpreted, and the discussions are boring due to lack of interest. – The conclusions lack of appeal to present the key findings and include plain significance and limitations of current work, and recommendations for future work sections. – The sources of reference are quite reliable and citations are quite consistent with the list of references.
Poor (2)	<ul style="list-style-type: none"> – The abstract writing is very simple, short, incomprehensive and inaccurate. – The research background, statement of problem, aim, objectives, scope and importance are poorly defined. – The supporting literature is poorly focused, poor relevancy and it is poorly reviewed at poor criticality. – The methods are poorly applicable and are poorly clarified. – The results are poorly reported and interpreted, and the discussions are dull. – The conclusions lose appeal to present the key findings and include poor significance and limitations of current work, and recommendations for future work sections. – The sources of reference are poorly reliable and citations are poorly consistent with the list of references.
Very Poor (1)	<ul style="list-style-type: none"> – The abstract is ill-written, very incomprehensive and incorrect. – The research background, statement of problem, aim, objectives, scope and importance are ill-defined. – The supporting literature is not focused, irrelevant and it is ill-reviewed at ill-criticality. – The methods are inapplicable and are very unsatisfactorily clarified. – The results are ill-reported and interpreted, and the discussions are disintegrating.

	<ul style="list-style-type: none">– The conclusions lose appeal to present the key findings without significance and limitations of current work, and recommendations for future work sections.– The sources of reference are unreliable and citations are inconsistent with the list of references.
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The Graduation Project data collected from the supervisor are directly input to CLOSO software.

Indirect Methods

Course Survey

The most important indirect assessment method for valuation of SO is through subject-wise student survey. Students get a chance to say about their insight about the achievement of the CLOs. Figure 1. shows the snapshot of the student survey form example for receiving each student's view. The forms are printed differently for each course since the CLOs are different for each subject. On the form, the CLOs are listed and a student scores the learning outcome attained as perceived by him.

Just before the final examination the filled forms are collected from all students. The information is entered in the CLOSO software. The data assesses the CLO satisfaction. The mapping of CLOs and SOs is used to evaluate the SO satisfaction. It may be noted that the required satisfaction is found when 60% students have confidence that they have achieved the CLOs to the level of 60% or higher marks (i.e. D or above).

Through indirect assessment of SOs Survey one can make the judgment of the instructor's teaching methodology. The CLOSO software is used in the assessment of SOs, which is as shown in Figure 1..For each subject, CLO satisfaction survey is made. At the end of the semester before the final examination the instructor distributes the survey form to the students. The students fill in the survey form based on their perception to express their opinion about how well they have learned. The data analysis is done by the instructor through the CLOSO software. The results are finally reviewed and evaluated by the Assessment committee as explained in further section.

Najran University, Najran, Kingdom of Saudi Arabia
College of Engineering
Department of Electrical Engineering
Instructor: Saifur Rahman
Basic Electronics Laboratory
Course Number: 334EE-1 - Class Section: 1
Term: Term 1; Academic Year: 2018-19
Indirect Assessment of CLOs

(Student Survey)

Score Scale

1	2	3	4	5
Less than 60%	60% to 69%	70% to 79%	80% to 89%	90% to 100%

Respond to each of the following statements by giving a "Score" (1,2,3,4 or 5) using the scale given above. Your answer will not affect your actual grade in any way. The data will be used to improve the teaching in the future. If you think that your abilities in the CLO are worth an A grade give a score of 5, if you think that your abilities in the CLO are worth a B grade give a score of 4, if you think that your abilities in the CLO are worth a C grade give a score of 3, if you think that your abilities in the CLO are worth a D grade give a score of 2, if you think you learned almost nothing then give a score of 1:

	Course Learning Outcome (CLO)	Score
1	Identify the applications and functions of electronics in Engineering.	4
2	Recognize basic electronic components and devices.	5
3	Identify the characteristics of diodes, MOSFET, BJT, and operational amplifier.	4
4	Analyze and design analog electronic circuits using discrete components.	3
5	Compute the amplitude and frequency responses of common amplification circuits.	4

Following is optional: If your estimation of learning outcome is different from your actual grade, this information will be used to find a way to minimize such anomalies.

Student's Name (Optional):	Signature (Optional):
----------------------------	-----------------------

Figure 1.6 Student Survey Form

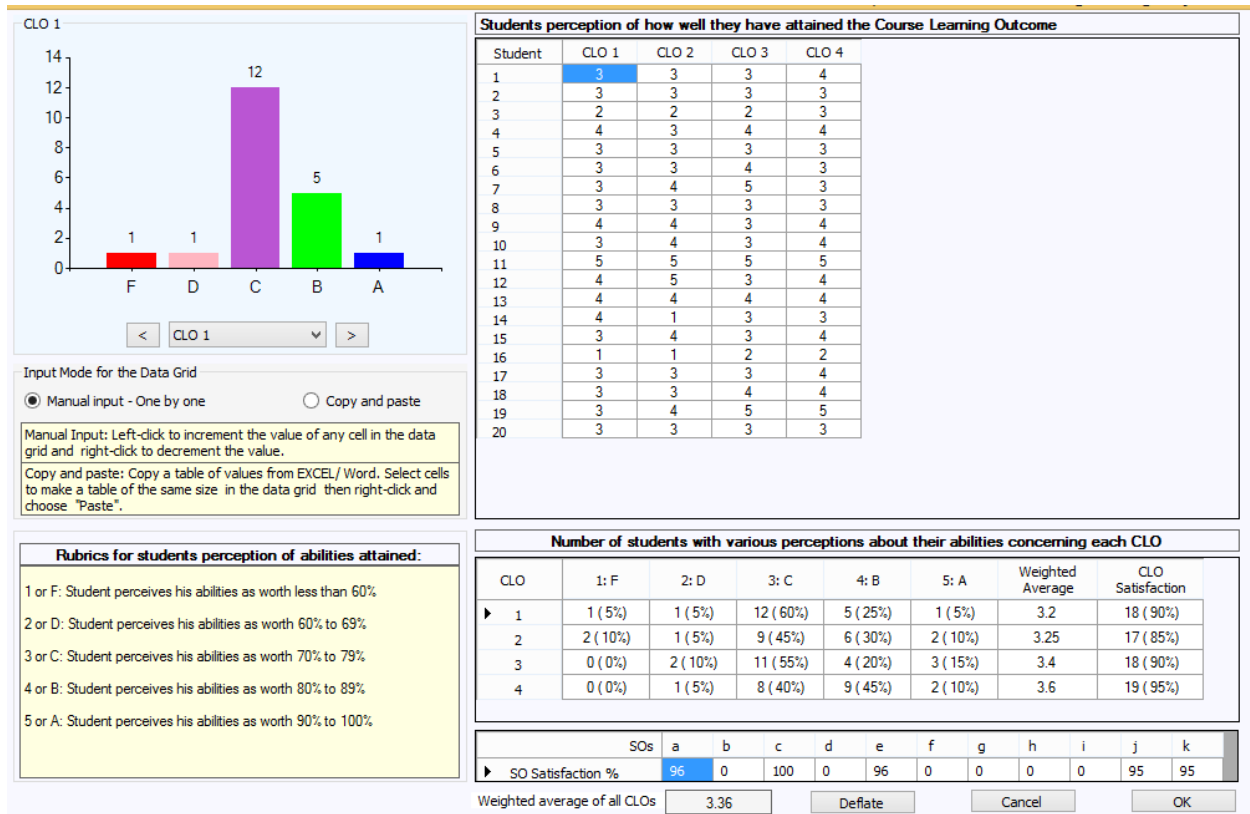


Figure 1.7 Instructor Panel for Entering Student Survey about CLOs

Faculty Survey

Indirect assessment of SOs through Faculty Survey is important because one can judge the instructor who is teaching the course. However, the instructor knows through the direct assessment that how well the students have achieved the CLOs and SOs. As reflected by the direct assessments the judgment of the instructor will be usually the same. However, the instructor notes the performance of students throughout the semester and there may be some reasons to believe that the students' skill as reflected by the direct assessments is not true. Therefore, Faculty Survey through the indirect assessment is necessary. It shows the observation of the instructor who is well aware about the students' skills achieved in the course. In this survey, for each CLO, the instructor indicates his opinion about the real skills achieved by the students. Therefore the input is very simple. The instructor enters the input into the CLOSO and then the CLOSO converts the input to SO satisfaction using the same CLO-SO mapping as discussed earlier. Figure 1. shows a snapshot of a CLOSO of the faculty survey of CLO satisfaction for a typical subject and Figure 1.9 show a CLOSO screen snapshot of the faculty survey of SO satisfaction for all courses. CLOSO displays the rubrics to help the instructor input his perception of students' abilities. These rubrics are as follows:

- 1: Unsatisfactory
- 2: Progressing (towards satisfaction)
- 3: Satisfactory (i.e. 70% students are attaining the abilities to a level of C grade)
- 4: Excellent
- 5: Exemplary

A score less than 3 is disappointing and therefore an improvement plan is essential to resolve the low achievement of the CLO and the relevant SOs.

Learning Readiness	Syllabus Coverage	CLO Satisfaction	Weaknesses	Improvement Methods	SO Loop Closing																		
<table border="1"> <thead> <tr> <th>CLO ID</th> <th>CLO Statement</th> <th>Achievement Score*</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Describe the major components of a computer system and state their function and purpose.</td> <td>4</td> </tr> <tr> <td>2.</td> <td>Recognize the hardware and software model of microprocessors.</td> <td>5</td> </tr> <tr> <td>3.</td> <td>Identify addressing modes, instruction set of microprocessors.</td> <td>3</td> </tr> <tr> <td>4.</td> <td>Demonstrate the ability to program a microprocessor in assembly language.</td> <td>1</td> </tr> <tr> <td>5.</td> <td>Identify interrupt, memory and input/output interfaces.</td> <td>2</td> </tr> </tbody> </table>						CLO ID	CLO Statement	Achievement Score*	1.	Describe the major components of a computer system and state their function and purpose.	4	2.	Recognize the hardware and software model of microprocessors.	5	3.	Identify addressing modes, instruction set of microprocessors.	3	4.	Demonstrate the ability to program a microprocessor in assembly language.	1	5.	Identify interrupt, memory and input/output interfaces.	2
CLO ID	CLO Statement	Achievement Score*																					
1.	Describe the major components of a computer system and state their function and purpose.	4																					
2.	Recognize the hardware and software model of microprocessors.	5																					
3.	Identify addressing modes, instruction set of microprocessors.	3																					
4.	Demonstrate the ability to program a microprocessor in assembly language.	1																					
5.	Identify interrupt, memory and input/output interfaces.	2																					
<p>Considering that the grades may not truly indicate the level of abilities attained by the students, please answer the question: What is your perception about roughly how many students have attained the abilities concerning each CLO to the satisfaction level required by the program?</p> <p>Please respond to each CLO shown above. Click to select a value. Use the following rubrics:</p> <p>* OUTCOME SATISFACTION RUBRICS:</p> <p>1: UNSATISFACTORY...> Number of students attaining the abilities to "Satisfaction Level or better" are roughly less than 60%</p> <p>2: PROGRESSING.....> Number of students attaining the abilities to "Satisfaction Level or better" are roughly more than 60%</p> <p>3: SATISFACTORY.....> Number of students attaining the abilities to "Satisfaction Level or better" are roughly more than 70%</p> <p>4: EXCELLENT.....> Number of students attaining the abilities to "Satisfaction Level or better" are roughly more than 80%</p> <p>5: EXEMPLARY.....> Number of students attaining the abilities to "Satisfaction Level or better" are roughly more than 90%</p>																							

Figure 1.8 An example of faculty survey data input

The CLO satisfaction data is converted to the SO satisfaction data by the CLOSO software. Figure 1.9 shows the converted data for a number of subjects. This is shown here as an example. The CLO and SO attainment analysis is not done only for the faculty survey but actually is done for many factors affecting the quality of learning and improvements process.

The example of faculty survey based on SO satisfaction data is shown in Figure 1.9 in which it is shown that the marks allocated for each subject to the relevant SO and the percentage of students getting more than 60%. For example the SO (a) has two columns namely M(a) and P(a). The marks that were allotted to questions used in the assessments of SO(a) is represented by M(a). The perception of the percentage of students satisfying the criterion based on the faculty survey data is represented by P(a). The first few columns of the table shown in Figure 1.9 and Figure 1. give the course ID, Sections, Credit hours (CH) and number of students (NS). A comparison of course wise faculty survey for the last two semesters is shown in Figure 1.11.

% Students with abilities worth 60% or better					a		b		c		d		e		f		g		h		i		j		k	
►	Course ID	Sections	CH	NS	M(a)	P(a)	M(b)	P(b)	M(c)	P(c)	M(d)	P(d)	M(e)	P(e)	M(f)	P(f)	M(g)	P(g)	M(h)	P(h)	M(i)	P(i)	M(j)	P(j)	M(k)	P(k)
1	204GE-3	1	3	18	0	0	23.1	99	21.5	99	0	0	23.1	99	0	0	9.1	99	0	0	0	0	0	23.1	99	
2	211EE-3	1	3	3	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	
3	212EE-3	7	3	13	42.3	99	0	0	0	0	0	0	42.3	99	0	0	0	0	0	0	5.3	99	0	0	0	
4	213EE-1	1	1	22	20	99	30	99	0	0	20	99	0	0	0	0	0	0	0	0	0	0	0	30	99	
5	214EE-3	1	3	15	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	
6	215EE-3	1	3	19	54	80	0	0	5.5	99	0	0	29.5	67	0	0	5.5	99	0	0	0	5.5	99	0	0	
7	321EE-3	1	3	15	32.9	99	0	0	3.8	99	0	0	32.9	99	0	0	0	0	0	0	0	18.4	99	12	99	
8	323EE-3	1	3	19	33.3	99	0	0	0	0	0	0	33.3	99	0	0	0	0	0	0	0	0	0	33.3	99	
9	324EE-1	1	1	23	27.2	99	14.5	99	0	0	14.5	99	12.7	99	0	0	3.8	99	0	0	0	0	0	27.2	99	
10	325EE-3	1	3	16	27.6	99	4.3	99	0	0	4.3	99	27.6	99	0	0	4.3	99	0	0	0	4.3	99	27.6	99	
11	331EE-3	1	3	17	25.3	99	0	0	25.3	99	0	0	25.3	99	0	0	0	0	0	0	0	12	99	12	99	
12	332EE-1	1	1	28	17.4	99	17.4	99	12.8	99	17.4	99	17.4	99	0	0	0	0	0	0	0	0	0	17.4	99	
13	333EE-3	1	3	20	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	
14	334EE-1	1	1	14	14.3	99	25.4	99	4.7	99	7.2	99	0	0	0	0	22.9	99	0	0	0	0	0	25.4	99	
15	335EE-3	1	3	15	45	99	0	0	0	0	0	0	45	99	0	0	0	0	0	0	0	0	0	10	99	
16	336EE-1	2	1	23	7.5	99	30.8	99	0	0	0	0	0	0	0	0	30.8	99	0	0	0	0	0	30.8	99	
17	341EE-3	1	3	28	18.9	99	0	0	11.7	99	0	0	25.6	99	0	0	12.9	99	0	0	9	99	4	99	17.9	99
18	342EE-1	1	1	27	10.7	99	15.8	99	15.8	99	8.8	99	13.8	99	0	0	15.8	99	0	0	3.4	99	0	15.8	99	
19	351EE-3	1	3	17	22.7	99	10.2	99	10.2	99	11.5	99	22.7	99	0	0	0	0	0	0	0	0	0	22.7	99	
20	416EE-3	1	3	16	33.4	99	10	99	0	0	3.6	99	33.4	99	0	0	0	0	0	0	9.3	99	3.6	99	6.7	99
21	417EE-3	1	3	12	33.3	99	0	0	0	0	0	0	33.3	99	0	0	0	0	0	0	0	0	0	33.3	99	
22	422EE-3	1	3	8	11.2	99	0	0	27.7	99	0	0	27.7	99	0	0	5.8	99	13.7	99	0	0	7.9	99	5.8	99
23	426EE-3	1	3	9	31.7	99	0	0	0	0	0	0	31.7	99	0	0	0	0	0	0	0	5	99	31.7	99	
24	427EE-3	1	3	15	16	99	16	99	16	99	0	0	16	99	0	0	0	6.6	99	6.6	99	6.6	99	16	99	
25	428EE-3	1	3	9	47	99	0	0	4.8	99	0	0	19.3	99	4.8	99	14.5	99	4.8	99	0	0	0	4.8	99	
26	437EE-3	1	3	12	26.2	75	0	0	7.8	99	7.8	99	33.9	83	0	0	0	0	0	0	0	24.4	80	0	0	
27	491EE-2	3	2	16	9.1	99	0	0	1.9	99	25.4	99	9.1	99	11	99	25.4	99	5.2	99	2	99	3.9	99	7.2	99
28	492EE-3	2	4	8	8	99	4.4	99	5	99	8.2	99	5.7	99	20	99	18.8	99	1.4	99	4.3	99	8	99	16.2	99

SO Satisfaction Index	Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
Weighted: NS		98	99	99	99	97	99	99	99	99	98	99
Outcome Analysis Type	<input type="radio"/> Direct Assessment <input type="radio"/> Student Survey <input checked="" type="radio"/> Faculty Survey											
		Export (.CSV)										

Figure 1.9 Faculty Survey Assessment for the first semester, 2016-2017

% Students with abilities worth 60% or better					a		b		c		d		e		f		g		h		i		j		k	
►	Course ID	Sections	CH	NS	M(a)	P(a)	M(b)	P(b)	M(c)	P(c)	M(d)	P(d)	M(e)	P(e)	M(f)	P(f)	M(g)	P(g)	M(h)	P(h)	M(i)	P(i)	M(j)	P(j)	M(k)	P(k)
1	204GE-3	1	3	16	0	0	21.3	99	19.6	99	0	0	21.3	99	0	0	16.6	99	0	0	0	0	0	0	21.3	99
2	211EE-3	1	3	11	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	0
3	212EE-3	1	3	10	43.8	99	0	0	0	0	0	0	43.8	99	0	0	0	0	0	0	12.3	99	0	0	0	0
4	213EE-1	1	1	8	20	99	30	99	0	0	20	99	0	0	0	0	0	0	0	0	0	0	0	0	30	99
5	214EE-3	1	3	8	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	0
6	215EE-3	1	3	19	57.8	80	0	0	2.8	0	0	0	30.2	67	0	0	6.5	99	0	0	0	0	2.8	0	0	0
7	321EE-3	1	3	6	33.9	99	0	0	4	99	0	0	33.9	99	0	0	0	0	0	0	0	0	17.9	99	10.2	99
8	323EE-3	1	3	22	33.3	99	0	0	0	0	0	0	33.3	99	0	0	0	0	0	0	0	0	0	0	33.3	99
9	324EE-1	2	1	24	27.1	99	13.8	99	0	0	13.8	99	13.3	99	0	0	5	99	0	0	0	0	0	0	27.1	99
10	325EE-3	1	3	19	27.6	99	4.3	99	0	0	4.3	99	27.6	99	0	0	4.3	99	0	0	0	0	4.3	99	27.6	99
11	331EE-3	1	3	6	23.7	99	0	0	23.7	99	0	0	23.7	99	0	0	0	0	0	0	0	0	14.4	99	14.4	99
12	332EE-1	1	1	6	17.2	99	17.2	99	14	99	17.2	99	17.2	99	0	0	0	0	0	0	0	0	0	0	17.2	99
13	333EE-3	1	3	17	50	99	0	0	0	0	0	0	50	99	0	0	0	0	0	0	0	0	0	0	0	0
14	334EE-1	1	1	20	15.1	99	26.8	99	0	0	10.8	99	0	0	0	0	20.7	99	0	0	0	0	0	0	26.8	99
15	335EE-3	1	3	15	49.8	99	0	0	0	0	0	0	39.8	99	0	0	0	0	0	0	0	0	0	0	10.3	99
16	336EE-1	1	1	10	7.5	99	30.8	99	0	0	0	0	0	0	0	0	30.8	99	0	0	0	0	0	0	30.8	99
17	341EE-3	1	3	11	19.5	99	0	0	11.3	99	0	0	25.8	99	0	0	11.8	99	0	0	9	99	4	99	18.5	99
18	342EE-1	2	1	19	6	99	15.6	99	15.6	99	11.9	99	13.6	99	0	0	15.6	99	0	0	6.3	99	0	0	15.6	99
19	351EE-3	1	3	30	22.4	99	16.5	99	10.2	99	12.4	99	16.1	99	0	0	0	0	0	0	0	0	0	0	22.4	99
20	416EE-3	1	3	20	32.9	99	10	99	0	0	4.6	99	32.9	99	0	0	0	0	0	0	8.3	99	4.6	99	6.7	99
21	417EE-3	1	3	10	33.3	99	0	0	0	0	0	0	33.3	99	0	0	0	0	0	0	0	0	0	0	33.3	99
22	422EE-3	1	3	12	10.6	99	0	0	28.9	99	0	0	28.9	99	0	0	6.8	99	12.4	99	0	0	5.7	99	6.8	99
23	426EE-3	1	3	11	31.7	99	0	0	0	0	0	0	31.7	99	0	0	0	0	0	0	0	0	5	99	31.7	99
24	427EE-3	1	3	13	10	99	0	0	15	99	0	0	25	99	0	0	0	0	8.3	99	8.3	99	8.3	99	25	99
25	428EE-3	1	3	11	44.4	99	0	0	4.8	99	0	0	20.6	99	4.8	99	15.8	99	4.8	99	0	0	0	0	4.8	99
26	437EE-3	1	3	12	28.8	99	0	0	6	99	6	99	34.8	99	0	0	0	0	0	0	0	0	24.3	99	0	0
27	491EE-2	6	2	17	9.1	99	0	0	1.9	99	25.4	99	9.1	99	11	99	25.4	99	5.2	99	2	99	3.9	99	7.2	99
28	492EE-3	2	4	16	8	99	4.4	99	5	99	8.2	99	5.7	99	20	99	18.8	99	1.4	99	4.3	99	8	99	16.2	99

SO Satisfaction Index

Student Outcomes (SO):

Average▼

a

b

c

d

e

f

g

h

i

j

k

98

99

92

99

98

99

99

99

99

91

99

Outcome Analysis Type

☐ Direct Assessment

☐ Student Survey

☒ Faculty Survey

Export (*CSV)

Figure 1.10 Faculty Survey Assessment for the second semester, 2016-2017

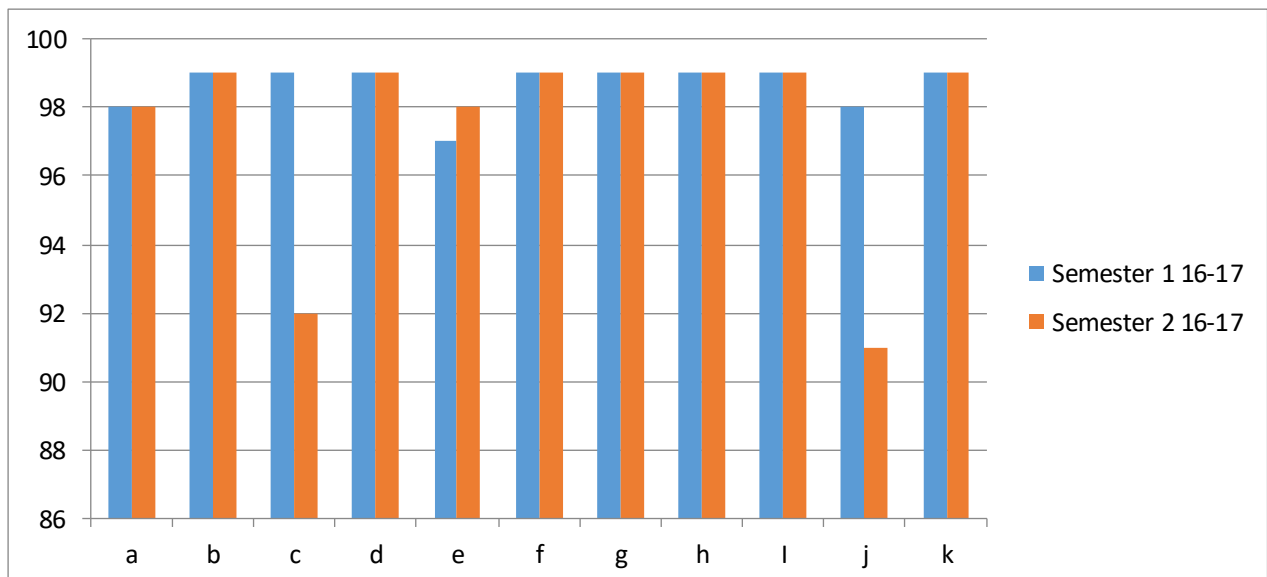


Figure 1.11 Course-wise Faculty Survey Assessment over the last two semesters, 2016-2017

Exit Survey Assessments (Indirect Method)

The exit survey is performed using a template mentioned in the link provided: https://docs.google.com/forms/d/1vhsKcD2JOpwirYchV188E9dVh1kUa8Q5aQW0eIIwm-8/viewform?usp=send_form which illustrate the different questionnaires upon which the analysis data are collected and analyzed. The students go to this link given above to fill the survey form online through which we can get the SO attainment. An example of SO achievements obtained from exit survey is given below in the Table 1.10.

Table 1.10 An Example of SO Attainment Obtained From Exit Survey

NO.	SO	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
1	a	1(6%)	4(23%)	6(35%)	2(12%)	3(18%)	1(6%)
2	b	1(6%)	4(23%)	6(35%)	4(24%)	2(12%)	0(0%)
3	c	3(17%)	2(11%)	4(22%)	6(33%)	2(11%)	1(6%)
4	d	0(0%)	1(5%)	3(17%)	11(61%)	2(11%)	1(6%)
5	e	0(0%)	5(29%)	6(35%)	2(12%)	2(12%)	2(12%)
6	f	1(6%)	5(29%)	2(12%)	4(23%)	3(18%)	2(12%)
7	g	3(19%)	2(12%)	6(37%)	1(6%)	2(13%)	2(13%)
8	h	3(16%)	3(17%)	3(17%)	3(17%)	4(22%)	2(11%)
9	i	3(17%)	3(17%)	3(17%)	2(11%)	6(33%)	1(5%)
10	j	2(11%)	2(11%)	3(17%)	5(28%)	5(28%)	1(5%)
11	k	5(29%)	1(6%)	3(17%)	3(18%)	2(12%)	3(18%)

Faculty Survey Assessment (Indirect Method)

The purpose of this survey is to evaluate the students' achievement of SOs. Each faculty member has to complete the survey by going on the link:

https://docs.google.com/forms/d/1-F-e29MEY7rKR6mnPXszpmwNIUJo_ccf4kp4CCPsakI/viewform and fill the form online indicating the level of his satisfaction for each aspect of the department. An example of SO achievements obtained from faculty survey is given below in the Table 1.1.

Table 1.11 An Example of SO Attainment Obtained From Faculty Survey

NO.	SO	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
1	a	6(55%)	2(18%)	3(27%)	0(0%)	0(0%)	0(0%)
2	b	5(50%)	3(30%)	0(0%)	1(10%)	1(10%)	0(0%)
3	c	3(27%)	1(9%)	1(9%)	4(36%)	2(18%)	0(0%)
4	d	5(50%)	4(40%)	0(0%)	0(0%)	0(0%)	1(10%)
5	e	7(64%)	1(9%)	1(9%)	1(9%)	1(9%)	0(0%)
6	f	5(50%)	4(40%)	0(0%)	0(0%)	1(10%)	0(0%)
7	g	6(55%)	2(18%)	1(9%)	1(9%)	1(9%)	0(0%)
8	h	4(40%)	4(40%)	0(0%)	1(10%)	0(0%)	1(10%)
9	i	4(36%)	5(46%)	1(9%)	0(0%)	1(9%)	0(0%)
10	j	4(36%)	4(37%)	1(9%)	1(9%)	1(9%)	0(0%)
11	k	7(64%)	1(9%)	1(9%)	1(9%)	1(9%)	0(0%)

Alumni Survey Assessment

The Alumni survey is performed using a template which is given in the link https://docs.google.com/forms/d/1Uuppp8AzpO_bCZpgzt7IZz5sReRRA1aMtrTGa3nV0jI/viewform?usp=send_form in which there is different questionnaires upon which the analysis data are collected and analyzed. Among many questionnaires, one of the sample data has been shown in Figure 1.2. As we can observe from the figure that near about 83% students are satisfied with their effective use of skills and computer knowledge.

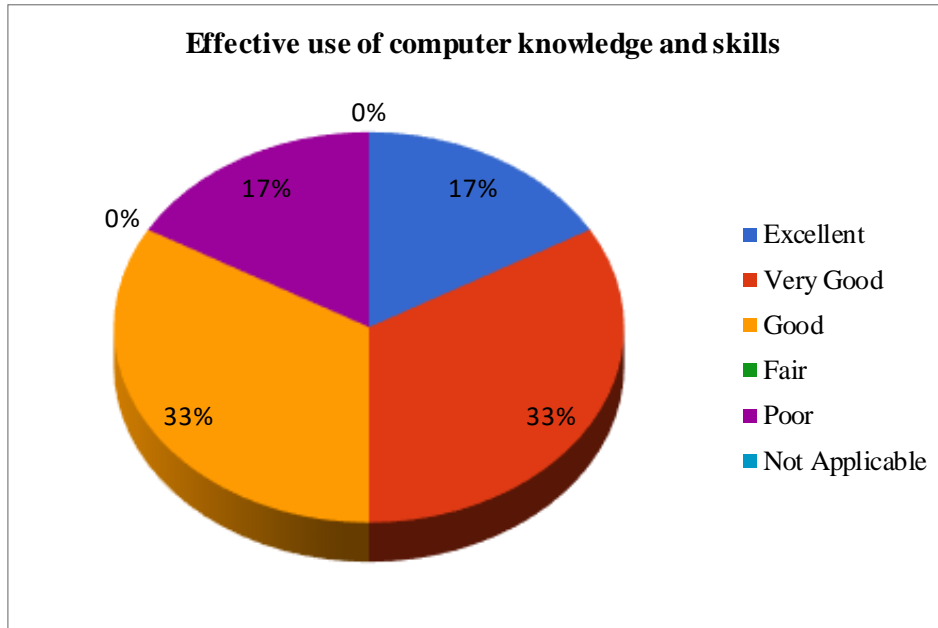


Figure 1.12 A Sample Satisfaction Level of the Alumni Survey

Employer Surveys

After every three years Employer survey is also performed but till now we have not got enough response from the employers. The employers are given the link to go and fill the survey details https://docs.google.com/forms/d/183_-aOySrKyCVYi2nQRvcqyWGwxA5uye5xM1pgjIHgg/viewform.

The Employer survey is performed using this link in which the different questionnaires are there upon which the data are collected and analyzed. The numbers of graduate students are less because of which the number of employers is also less.

SO Attainment Data and Evaluation

Extracting SO Attainment Data from CLOSO

SO achievements indicated by the Courses Assessments, Projects Assessments and Student Surveys are assessed by CLOSO software Admin Panel. The CLOSO Administrator of the department is authorized to use the Admin panel of CLOSO. Since the authority for CLOSO Admin Panel allows the user to change the data base including the syllabus and customization of data, only one person

in the department (currently the ABET coordinator) has such authorization. The head of the Assessment Committee assembles the CLOSO assessment files in each semester from all instructors and save them in a single folder. The folder is sent to the CLOSO Administrator for analysis and evaluation using CLOSO Admin Panel. CLOSO Admin Panel opens with an interface screen with many other controls, it has a button labeled “Open Course Files”. Clicking this button opens a dialog for the user to specify the folder that contains the course files (i.e. CLOSO data files). The columns of data displayed in “SO Based Satisfaction Window” shown in Figure 1. below need some explanation to understand the data, and therefore, are briefly described as:

1. Column 1 shows the serial number of the course in the folder of CLOSO Course Files.
2. Column 2 displays the course IDs as specified in the curriculum.
3. Column 3 gives the sections of the course that the same instructor was teaching.
4. Column 4 has the header CH. It indicates the credit hours for the course.
5. Column 5 has the header NS. It shows the number of students registered in the course.
6. Column 6 and 7 have the header (a) and sub headers M(a) and P(a). This means that columns 6 and 7 are displaying the data for the SO (a). Column 6 with header M(a) shows the marks allocated to the questions related to SO (a). Column 7 has the header P(a). It shows the percentage of students getting marks 60% or higher.
7. The same is repeated for SOs (b to k) in the subsequent columns.
8. In the bottom of the screen the weighted averages are displayed. The user may display the simple averages or the weighted averages based on NS, CH and marks allocated to the SO.
9. The data may be exported to EXCEL by clicking the button EXPORT.

% Students getting 60% or better					a		b		c		d		e		f		g		h		i		j		k	
►	Course ID	Sections	CH	NS	M(a)	P(a)	M(b)	P(b)	M(c)	P(c)	M(d)	P(d)	M(e)	P(e)	M(f)	P(f)	M(g)	P(g)	M(h)	P(h)	M(i)	P(i)	M(j)	P(j)	M(k)	P(k)
1	204GE-3	1	3	18	0	0	23.1	83	21.5	84	0	0	23.1	83	0	0	9.1	73	0	0	0	0	0	0	23.1	83
2	211EE-3	1	3	3	50	78	0	0	0	0	0	0	50	78	0	0	0	0	0	0	0	0	0	0	0	0
3	212EE-3	7	3	13	42.3	79	0	0	0	0	0	0	42.3	79	0	0	0	0	0	0	5.3	99	0	0	0	0
4	213EE-1	1	1	22	20	89	30	91	0	0	20	89	0	0	0	0	0	0	0	0	0	0	0	30	91	
5	214EE-3	1	3	15	50	60	0	0	0	0	0	0	50	60	0	0	0	0	0	0	0	0	0	0	0	0
6	215EE-3	1	3	19	54	72	0	0	5.5	78	0	0	29.5	65	0	0	5.5	87	0	0	0	0	5.5	78	0	0
7	321EE-3	1	3	15	32.9	77	0	0	3.8	71	0	0	32.9	77	0	0	0	0	0	0	0	0	18.4	71	12	71
8	323EE-3	1	3	19	33.3	88	0	0	0	0	0	0	33.3	88	0	0	0	0	0	0	0	0	0	0	33.3	88
9	324EE-1	1	1	23	27.2	89	14.5	94	0	0	14.5	94	12.7	81	0	0	3.8	96	0	0	0	0	0	0	27.2	89
10	325EE-3	1	3	16	27.6	70	4.3	66	0	0	4.3	66	27.6	70	0	0	4.3	66	0	0	0	0	4.3	66	27.6	70
11	331EE-3	1	3	17	25.3	85	0	0	25.3	85	0	0	25.3	85	0	0	0	0	0	0	0	0	12	83	12	83
12	332EE-1	1	1	28	17.4	78	17.4	78	12.8	82	17.4	78	17.4	78	0	0	0	0	0	0	0	0	0	0	17.4	78
13	333EE-3	1	3	20	50	70	0	0	0	0	0	0	50	70	0	0	0	0	0	0	0	0	0	0	0	0
14	334EE-1	1	1	14	14.3	89	25.4	94	4.7	99	7.2	99	0	0	0	0	22.9	93	0	0	0	0	0	0	25.4	94
15	335EE-3	1	3	15	45	71	0	0	0	0	0	0	45	74	0	0	0	0	0	0	0	0	0	0	10	74
16	336EE-1	2	1	23	7.5	82	30.8	81	0	0	0	0	0	0	0	0	30.8	81	0	0	0	0	0	0	30.8	81
17	341EE-3	1	3	28	18.9	87	0	0	11.7	60	0	0	25.6	74	0	0	12.9	70	0	0	9	79	4	68	17.9	80
18	342EE-1	1	1	27	10.7	96	15.8	92	15.8	92	8.8	98	13.8	97	0	0	15.8	92	0	0	3.4	78	0	0	15.8	92
19	351EE-3	1	3	17	22.7	76	10.2	73	10.2	73	11.5	79	22.7	76	0	0	0	0	0	0	0	0	0	0	22.7	76
20	416EE-3	1	3	16	33.4	90	10	88	0	0	3.6	99	33.4	90	0	0	0	0	0	0	9.3	88	3.6	99	6.7	99
21	417EE-3	1	3	12	33.3	98	0	0	0	0	0	0	33.3	98	0	0	0	0	0	0	0	0	0	0	33.3	98
22	422EE-3	1	3	8	11.2	64	0	0	27.7	71	0	0	27.7	71	0	0	5.8	76	13.7	71	0	0	7.9	66	5.8	76
23	426EE-3	1	3	9	31.7	81	0	0	0	0	0	0	31.7	81	0	0	0	0	0	0	0	0	5	60	31.7	81
24	427EE-3	1	3	15	16	87	16	87	16	87	0	0	16	87	0	0	0	0	6.6	84	6.6	84	6.6	84	16	87
25	428EE-3	1	3	9	47	84	0	0	4.8	62	0	0	19.3	77	4.8	62	14.5	87	4.8	62	0	0	0	0	4.8	62
26	437EE-3	1	3	12	26.2	80	0	0	7.8	83	7.8	83	33.9	80	0	0	0	0	0	0	0	0	24.4	81	0	0
27	491EE-2	3	2	16	9.1	98	0	0	1.9	99	25.4	98	9.1	98	11	97	25.4	98	5.2	96	2	99	3.9	99	7.2	99
28	492EE-3	2	4	8	8	99	4.4	99	5	99	8.2	99	5.7	99	20	99	18.8	99	1.4	99	4.3	99	8	99	16.2	99

SO Satisfaction Index	Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
	Weighted: NS	83	85	81	89	81	88	84	84	87	79	84

Outcome Analysis Type

☒ Direct Assessment☐ Student Survey☐ Faculty Survey

Export (*.CSV)

Figure 1.13 CLOSO Admin panel showing an example of SO attainment data display for semester 1, 2016-2017

Comparing SO Attainment Data for Varying Satisfaction Criteria for Semester 1 and Semester 2, 2016-2017

The data showed above in Figure 1. shows whether the target PSC of SO attainments has been achieved. However, for making decision, a question always arises: what percentage of students will be achieving the satisfaction, if the percentage marks specified for the satisfaction of SO attainments are raised or lowered. For this purpose a comparative data for varying satisfaction criteria is given by the CLOSO. The comparative data can be displayed for each SO by clicking the button “Compare criteria” given in CLOSO. When this button is clicked, a window opens called “Satisfaction Criterion Comparison” window. A comparative data for SO Attainment for Semester 1 and Semester 2, 2016-2017 is shown in the Table 1.12 given below in which it is shown that average number of students attaining the percentage of marks. For example for SO (a) for S1 77% is the average of students achieving 60% of marks.

Table 1.12 Comparison of SO Attainment Data for Semester 1 and Semester 2, 2016-2017

Percentage Of Marks→		60%	65%	70%	75%	80%	85%	90%
Average↓								
<i>a</i>	S ₁	80	74	70	63	58	48	42
	S ₂	75	70	65	59	55	45	40
<i>b</i>	S ₁	86	81	78	73	67	58	51
	S ₂	81	77	74	67	64	53	48
<i>c</i>	S ₁	81	75	69	62	56	47	40
	S ₂	77	72	68	61	57	45	40
<i>d</i>	S ₁	89	85	82	75	69	56	47
	S ₂	82	79	77	75	71	61	55
<i>e</i>	S ₁	78	72	67	61	55	46	40
	S ₂	75	69	64	59	54	44	39
<i>f</i>	S ₁	94	92	85	80	67	54	43
	S ₂	96	94	94	89	83	67	58
<i>g</i>	S ₁	86	82	78	73	67	56	50
	S ₂	85	81	77	71	67	54	47
<i>h</i>	S ₁	80	78	69	65	59	47	43
	S ₂	84	79	75	69	66	56	52
<i>i</i>	S ₁	85	82	81	77	72	62	59
	S ₂	83	77	74	67	62	43	42
<i>j</i>	S ₁	79	73	69	59	54	45	38
	S ₂	82	77	72	67	63	52	46
<i>k</i>	S ₁	85	80	76	69	65	54	49
	S ₂	79	74	71	65	62	51	48

There are some subjects where the satisfaction criterion for a one or more SOs could not be attained. These subjects with their not attaining of particular SO are shown in open loop. Table 1.13 given below for both semesters where one can see that in first semester all the subjects satisfied the criteria for SOs whereas in second semester we can see that there are some subjects which does not satisfied all the SOs. We can overcome this problem of not attaining the particular SO for some subjects and this overcoming the problem is the continuous improvement of the department.

Table 1.13 Open Loop Comparison for Semester 1 and Semester 2, 2016-2017

SO→											
SEM ↓	a	b	c	d	e	f	g	h	i	j	k
S ₁	-	-	-	-	-	-	-	-	-	-	-
S ₂	321EE 3		215EE3,332EE 1		321EE3,428EE 3		428EE 3		215EE 3		321EE3,335EE 3

SO Attainment Data Comparison over two Semesters during 2017-2018

A summary of SO attainment for Semester 1, 2017-2018 is shown in Table 1.14 The data is for the PSC of 60%. It is obvious that SO (a), (c) and (e) are the weakest and ways to improve it must be explored. The Assessment Committee looked into the matter and asked the instructors to come up with a Continuous Improvement Plans. The results improved in Semester 2 a little bit, 2017-2018 as will be obvious from the Attainment data of Semester 2, 2017-2018. A summary of SO attainment for Semester 2, 2017-2018 is also shown in Table 1.15.

Table 1.14 SO attainment for P: 60% (Semester 1, 2017-2018)

Student Outcomes (SOs)	a	b	c	d	e	f	g	h	i	j	k
SO Satisfaction Index	75	78	75	78	75	90	77	86	92	81	77

Table 1.15 SO attainment for P: 60% (Semester 2, 2017-2018)

Student Outcomes (SOs)	a	b	c	d	e	f	g	h	i	j	k
SO Satisfaction Index	77	76	76	77	76	90	76	76	83	69	78

A comparison is shown in Figure 1.1 for SO satisfaction data for the last two semesters in all courses excluding graduation projects. From the figure it can be seen that all the criterion has achieved 60% in both the semester of 2017-2018. It can also be seen that the achievement level of almost all criteria have increased in a significant amount. Therefore, we are planning to increase the satisfaction criteria to a new level at 70% for 70% of students from the next semester.

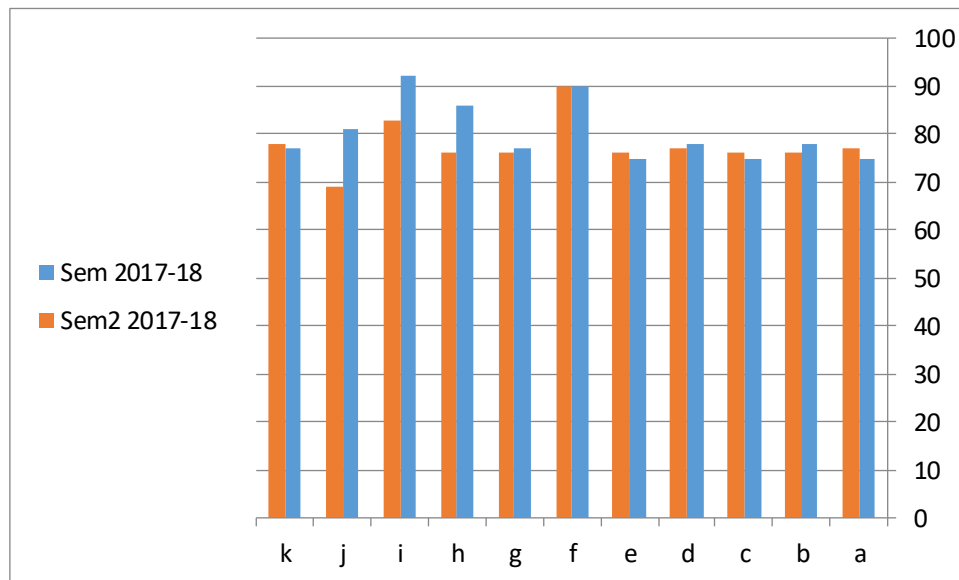


Figure 1.1 SO Attainment Data Comparison: Semester 1 vs. Semester 2 of 2017-2018

SO Attainment indicated by Graduation Project Assessment

As described earlier, while discussing the assessment process of the graduation project, the Graduation Project addresses all the SOs from (a) to (k). Also the Graduation Project is completed just before graduation and therefore it represents the abilities at the time of graduations. No other course or set of courses have such strong summative property for the purpose of assessment of the SOs. Therefore, we consider the Graduation Project assessment as the most important direct Summative Assessment of the Electrical Engineering Program. The department has established a system to regulate, monitor and assess the Graduation Projects. Since the grade inflation has been too high with the Graduation Projects, the implementation of the new Graduation Project Assessment and Control system will bring down the grade inflation to some extent. Figure 1.1 to Figure 1. show the SO attainment data for all SOs. Again all raw assessment data was collected by the GP supervisors and was input to CLOSO. CLOSO performed all the required data processing and generated these figures.

-SO Satisfaction Data

Student Outcomes >>	a		b		c		d		e		f		g		h		i		j		k	
Assessment Name	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P
LOGBOOK	3	100					3	100	3	100			3	100	3	100						
PRESENTATION							6.7	83			6.7	83	6.7	83								
REPORT SUPERVISOR	3	99			1	100	8.7	97	3	99	2.3	90	8.7	97	1	97	1	100	2	100	4.3	100
Final Report Examination	3.1	94			0.9	86	7.1	96	3.1	94	2	97	7.1	96	1.2	100	1	97	1.9	91	2.9	93
Cumulative Sum (Out of 100)	9.1	98			1.9	94	25.4	93	9.1	98	11	87	25.4	93	5.2	99	2	98	3.9	96	7.2	97

M: Marks allocated to the respective SO for each Assessment

P: Percentage of students scoring 60% or better.

Target satisfaction criterion for the program is: 60% students get 60% or above.

Figure 1.1 SO attainment for 491EE-2 Graduation Project I, semester 1, 2017-2018

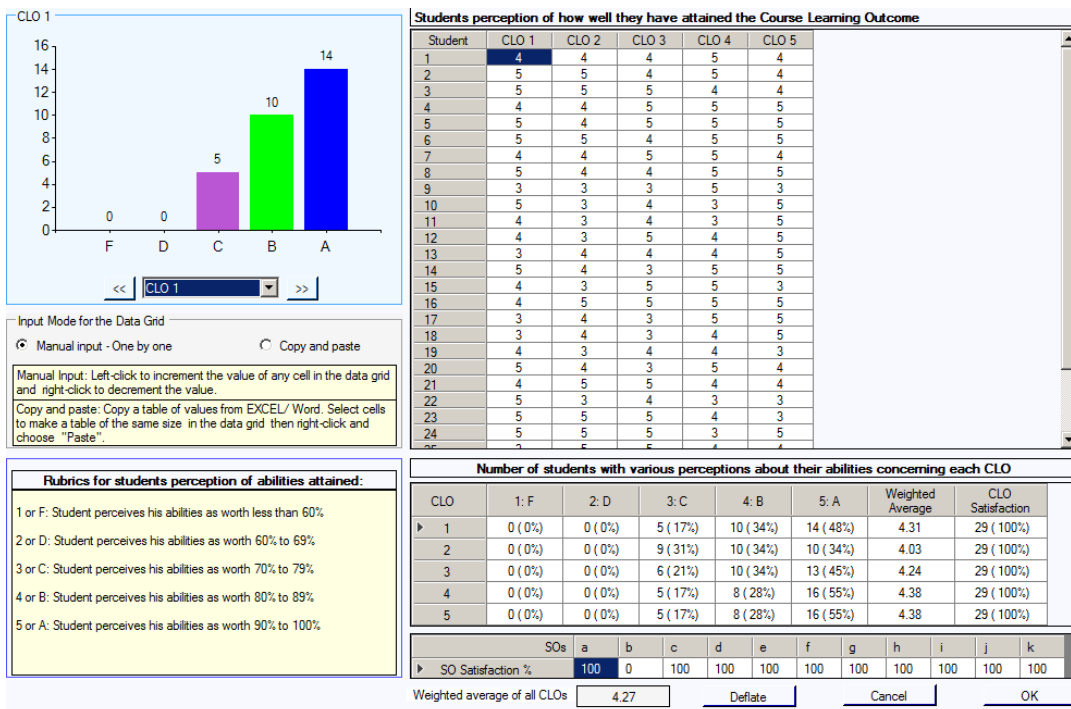


Figure 1.2 Students' perception of how well they have attained the Course Learning Outcomes for 491EE-2 Graduation Project I, semester 1, 2017-2018

SO Satisfaction Data

Student Outcomes >>	a		b		c		d		e		f		g		h		i		j		k	
Assessment Name	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P
LOGBOOK	3	100					3	100	3	100			3	100	3	100						
PRESENTATION							6.7	83			6.7	83	6.7	83								
REPORT SUPERVISOR	3	99			1	100	8.7	97	3	99	2.3	90	8.7	97	1	97	1	100	2	100	4.3	100
Final Report Examination	3.1	94			0.9	86	7.1	96	3.1	94	2	97	7.1	96	1.2	100	1	97	1.9	91	2.9	93
Cumulative Sum (Out of 100)	9.1	98			1.9	94	25.4	93	9.1	98	11	87	25.4	93	5.2	99	2	98	3.9	96	7.2	97

M: Marks allocated to the respective SO for each Assessment
P: Percentage of students scoring 60% or better
Target satisfaction criterion for the program is: 60% students get 60% or above.

Figure 1.3 SO attainment for 492EE-3 Graduation Project II, semester 1, 2017-2018

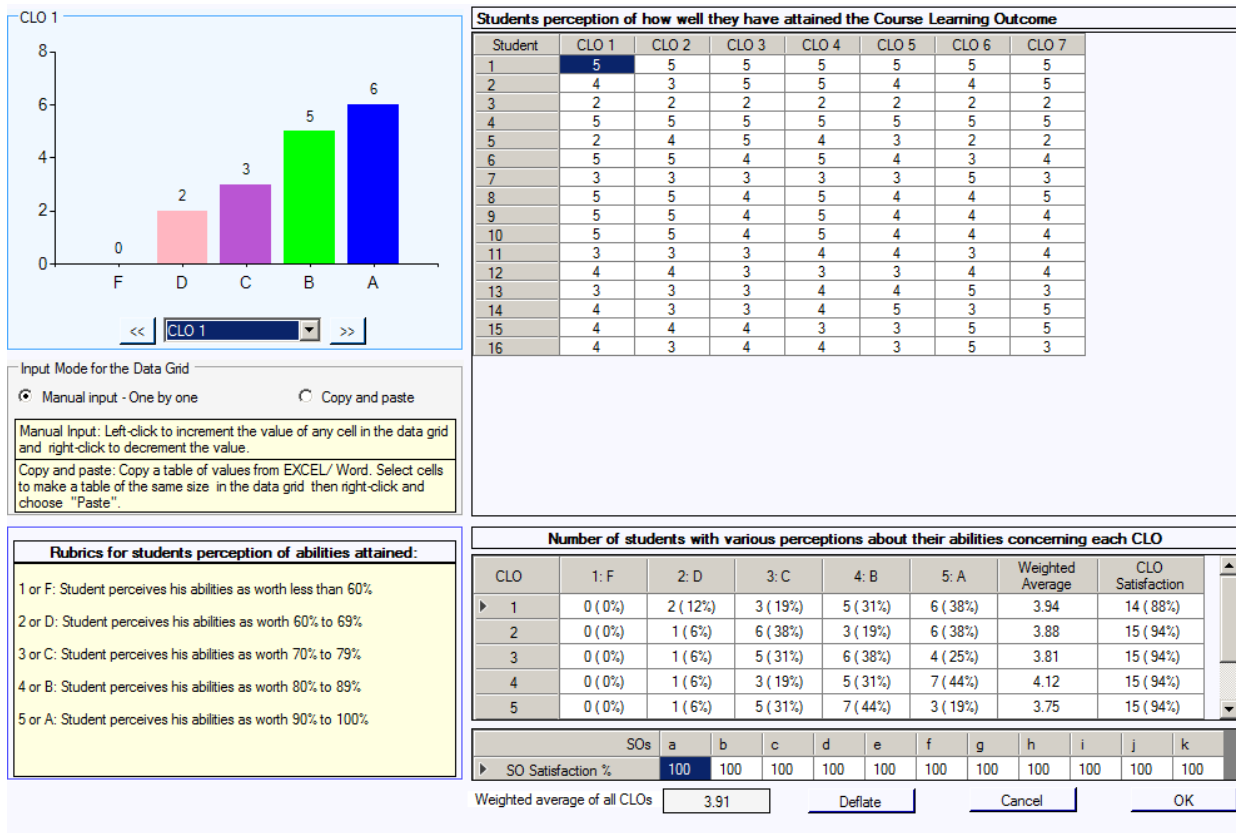


Figure 1.4 Students' perception of how well they have attained the Course Learning Outcomes for 492EE-3 Graduation Project II, semester1, 2017-2018

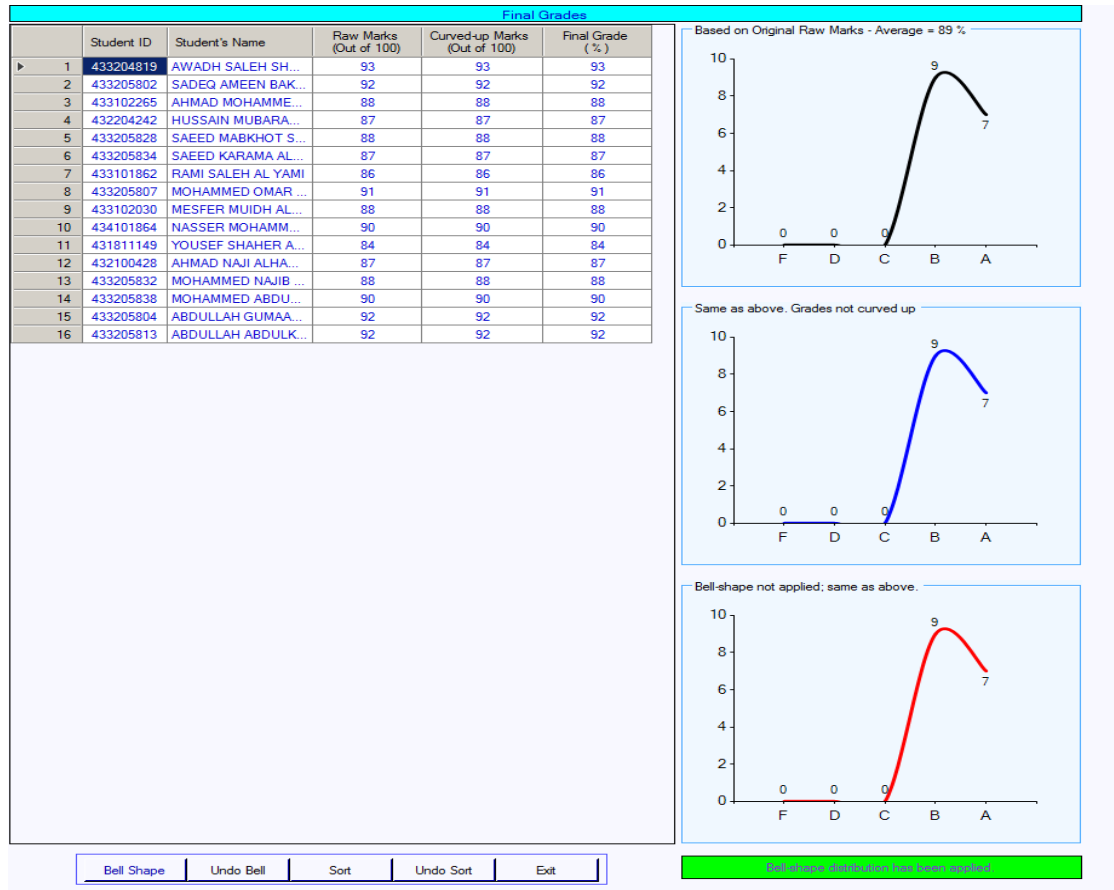


Figure 1.19 Final grades of 492EE-3 graduation project II, semester 1, 2017-2018

CLO Satisfaction Data

Assessment Name	CLO1 M	CLO1 P	CLO2 M	CLO2 P	CLO3 M	CLO3 P	CLO4 M	CLO4 P	CLO5 M	CLO5 P	CLO6 M	CLO6 P	CLO7 M	CLO7 P	Non-CLO M	Non-CLO P
Logbook	0	0	7.5	97	0	0	0	0	0	0	0	0	7.5	97	0	N/A
Final report supervisor	5	97	5	100	5	100	5	100	5	86	5	100	5	100	0	N/A
Presentation	0	0	0	0	0	0	0	0	0	0	0	0	20	86	0	N/A
Final report examination panel	4	90	4	100	4	100	4	48	5	100	4	90	5	100	0	N/A
Weighted Average	9	93	16.5	98	9	100	9	77	10	93	9	95	37.5	92	0	N/A

M: Marks allocated to the respective CLO for each Assessment
P: Percentage of students scoring 60% or better.
Target satisfaction criterion for the program is: 60% students get 60% or above.

Figure 1.20 CLO Attainment Data for 492EE-3 graduation project II, semester 2, 2017-2018

SO Satisfaction Data

Student Outcomes >>	a		b		c		d		e		f		g		h		i		j		k	
Assessment Name	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P
Logbook							3.8	97			3.8	97	3.8	97							3.8	97
Final report supervisor	4.3	96	2.4	93	2.7	95	2.5	100	3.1	94	3.2	100	2.5	100	0.7	86	2.4	98	4.3	97	6.8	97
Presentation											10	86	10	86								
Final report examination panel	3.6	84	2	95	2.3	83	2	100	2.6	97	3.1	100	2.5	100	0.7	100	1.9	95	3.6	84	5.6	88
Cumulative Sum (Out of 100)	8	91	4.4	94	5	90	8.2	98	5.7	95	20	92	18.8	92	1.4	93	4.3	97	8	91	16.2	94

M: Marks allocated to the respective SO for each Assessment
P: Percentage of students scoring 60% or better.
Target satisfaction criterion for the program is: 60% students get 60% or above.

Figure 1.21 SO Attainment Data for 492EE-3, Project (II), semester 2, 2017-2018

SO Attainment indicated by Student Survey

As described earlier, CLOSO analyzes the student survey data. Students' views are based on their opinion of learning regarding each CLO of the subject. The data is converted to SO based satisfaction by CLOSO. The attainment indicated by the course-wise student survey shows very satisfactory results. Almost for all SOs in various courses, 98% students believe that they have the abilities to score 60% marks. Though the direct assessment results shows much lower satisfaction, this expression of students' belief of their learning is a good indicator. Its reliability however must be determined. The data shown in Figure 1. and Figure 1. are student survey results for Semester 1 and Semester 2, 2017-2018. The weighted averages have been shown. Student survey becomes beneficial when the students strongly disagree with the notion that they have achieved the abilities and the satisfaction goes below 60%. In such special cases, the department looks into the matter on the recommendation of the Assessment Committee and corrective measures are taken though the averages indicate 60% or higher satisfaction.

Student Outcomes (SOs)	a	b	c	d	e	f	g	h	i	j	k
SO Satisfaction Index	75	78	75	78	75	90	77	86	92	81	77

Figure 1.22 Students perceiving their learning worth 60% or better (data collected during first semester 2017-2018).

Student Outcomes (SOs)	a	b	c	d	e	f	g	h	i	j	k
SO Satisfaction Index	77	76	76	77	76	90	76	76	83	69	78

Figure 1.23 Students perceiving their learning worth 60% or better (data collected during second semester 2017-2018).

SO Attainment indicated by CLOSO Faculty Survey

The process of faculty survey has been described earlier. Each instructor gives his perception of the level of learning of the students in each CLO of the subjects. This way the instructor shows his opinion about whether the direct assessment data is in accordance with his perception of students' learning or not. The faculty input is processed and converted into SO based satisfaction data by the CLOSO software. The data obtained from CLOSO for the academic year 2016-2017 are shown in Figure 1. and Figure 1.. These are weighted averages for all the core courses including the Graduation Projects. It can be seen from the data that in faculties' opinion the abilities are being achieved by the students in the courses at satisfactory level.

SO Satisfaction Index	Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
	Weighted: NS	98	99	99	99	97	99	99	99	99	98	99
Outcome Analysis Type												
<input type="radio"/> Direct Assessment <input type="radio"/> Student Survey <input checked="" type="radio"/> Faculty Survey Export (*.CSV)												

Figure 1.24 Course-wise Faculty Survey Semester 1, 2016-2017

SO Satisfaction Index	Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
	Weighted: NS	98	99	89	99	97	99	99	99	99	87	99
Outcome Analysis Type												
<input type="radio"/> Direct Assessment <input type="radio"/> Student Survey <input checked="" type="radio"/> Faculty Survey Export (*.CSV)												

Figure 1.25 Course-wise Faculty Survey Semester 2, 2016-2017

The final exam is reviewed by a faculty member in the same field of specialization. The result of the student is not approved until after the signature of the auditor on the examination paper. The Monitoring and Auditing Committee of the Scientific Section reviews the correction and the collection of grades and their conformity with the degree to which the registration system at the University and the input to the program of analysis of the results of the College.

Conclusion

From this evaluation and assessment processes one can clearly see that the students are communicated at the beginning of courses about the SO and CLO assessment of the course and also about the different methods which the instructor will use to assess the outcomes. Appropriate valid and reliable mechanisms are used for verifying standards of student achievement of SO.

Different survey's like course survey, exit survey, alumni survey, employer survey, staff survey is used for the SO assessment process. Grading of student's tests, assignments and final exams are assisted by the instructor properly and fairly. The projects are also assisted using logbook matrices means to ensure that the planned range of domains of student learning outcomes are addressed properly and fairly. Different methods of feedback on performance and results of assessments are given promptly to students and accompanied by mechanisms for assistance if required. From the

above contents it can be concluded that effective systems is used for evaluation of SO for different courses and also about teaching methods of the staff.