THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND INSTRUMENTATION ENGINEERING

- **Feedback from Graduating Students**
- **Feedback from Alumni**
- **Feedback from Employer**
- **Feedback from faculty**
- **Analysis of feedbacks received and action taken report**

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SAMPLE FILLED STUDENT SURVEY FORM:

TU/sur-Form/EE/01

Survey form to assess the level of attainment of student outcomes – Graduating Students

The program of **BE Electrical Engineering** has been designed with certain student outcomes (the knowledge, skills and attitudes that students develop during the course of study). The students of graduating class are requested to answer the questionnaire given in this form to assess how well they judge they have attained the student outcomes set for the program. Please answer the questionnaire on a scale of 1 to 5 where 1 indicates little achievement of skill, and 5 indicates great deal of achievement.

	Survey questionnaire	Level of attainment (answer on a scale of 1 to 5)				
	I achieved	1	2	3	4	5
1	an ability to apply knowledge of mathematics, science, and engineering.				4	
2	an ability to design and conduct experiments, as well as to analyze and interpret data.				4	
3	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.				4	
4	an ability to function on multidisciplinary teams.				4	
5	an ability to identify, formulate, and solve engineering problems.				4	
6	an understanding of professional and ethical responsibility.				4	
7	an ability to communicate effectively.				4	
8	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.				4	
9	a recognition of the need for, and an ability to engage in life-long learning.				4	
10	a knowledge of contemporary issues.				4	
11	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.					5

What do you plan to do after graduation at TIET? Tick (√) whichever is applicable

(a) Employment (give details like employer name): ✓ Not employed yet.

(b) Higher education (give the title of degree): N.A.

(c) Entrepreneur (specify):

Student Name: Shubham Saini Regd. No: 10195004

Graduating Year: 2023

Suggestion, if any: – N.A. –

Signature: Shubham

SAMPLE FILLED EMPLOYER SURVEY FORMS:

TU/sur-Form/EE/03

Survey form to assess the level of attainment of student outcomes – Employer

Dear Sir,

We express our sincere thanks for continually employing our graduate students over the years. We are sure our student are sufficiently equipped not only to take on the real world but also make a better place to live in through responsible and innovative use of technology.

We solicit your feedback on attainment of the student outcomes (the knowledge, skills and attitudes that students develop during the course of study at TU) of the **BE Electrical Engineering program**. Please answer the following questions on a scale of 1 to 5 where 1 indicates little achievement of skill, and 5 indicates great deal of achievement.

	Survey questionnaire	Level of attainment (answer on a scale of 1 to 5)		
		Your engineers need	TU preparation	Overall
1	Do our students have an ability to apply knowledge of mathematics, science, and engineering?	4	4	4
2	Do our students have an ability to design and conduct experiments, as well as to analyze and interpret data?	4	4	4
3	Do our students have an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability?	3	3	3
4	Do our students have an ability to function on multidisciplinary teams?	4	4	4
5	Do our students have an ability to identify, formulate, and solve engineering problems?	4	4	4
6	Do our students have an understanding of professional and ethical responsibility?	3	3	3
7	Do our students have an ability to communicate effectively?	4	4	4
8	Do our students have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context?	4	4	4
9	Do our students have recognition of the need for, and an ability to engage in life-long learning?	4	4	4
10	Do our students have knowledge of contemporary issues?	4	4	4
11	Do our students have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice?	4	4	4

(1) What courses/topics would you like to see offered as UG course at TIET or for continuing education to your staff.

Power System Analysis, Power System Protection

(2)Overall how satisfied are you with BE Electrical Engineering program at TIET and in your opinion how well is the specific program meeting its stated educational objectives. Cross-out whichever not applicable.

~~Excellent~~ / ~~Very good~~ / Good / ~~Average~~ / ~~Poor~~

Your Name and Signature with date: Er. Lakhbir Singh 8.5.23

Your Organization Name: PSPCL (RSD, Shahpur Kandi Dam Project).

Suggestion, if any: — NA —

8/5/23

ਸਹਾ.ਕਾ.ਕਾ ਇੰਜੀ.
ਈ.ਐਮ.ਸੀ.,ਰ.ਸ.ਡ.,
ਪੀ.ਸ.ਪ.ਕ.ਲਿਮ.,ਸ਼ਾਹਪੁਰਕੰਡੀ

Survey form to assess the level of attainment of student outcomes – Alumni

Dear Alumni

It is wonderful to reconnect with you after a few years. We hope you have been doing exceedingly well in your career. We are sure that your stay with TIET has enabled you to imbibe the process of life-long learning and to take up challenging careers. We are sure you were sufficiently equipped not only to take on the real world but also make it a better place to live in through responsible and innovative use of technology. We need your support to keep the TIET flag flying high.

We solicit your feedback on attainment of the student outcomes (the knowledge, skills and attitude that you developed during the course of study at TIET and subsequent work experience) of the BE Electrical Engineering program. Please answer the following questions on a scale of 1 to 5 where 1 indicates little achievement or skill, and 5 indicates great deal of achievement.

	Survey questionnaire	**Level of attainment (answer on a scale of 1 to 5)**				
		1	**2**	**3**	**4**	**5**
	I achieved an ability to:					
1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.					
2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.					
3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations.					
4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.					
5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.					
6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.					
7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.					
8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.					
9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.					
10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and					

	receive clear instructions.					
11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.					
12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.					
PSO 1	To apply knowledge of mathematics, sciences, and professional subjects to formulate, interpret and analyze problems appropriate to Electrical Engineering.					
PSO 2	To employ appropriate engineering techniques, skills, tools, and research-based knowledge to accomplish electrical engineering and engage in life- long learning.					

Note: Cross-out whichever not applicable

(1) GATE exam after BE: Passed/Failed/Not taken

(2) Promotion since graduation: Yes/No

(3) Enrollment in higher studies: Yes/No, if yes please answer following

(i) Name of program:_____ (ii) Year of completion:_____

(4) Involvement in professional societies as a _____

(5) Community service, if any: _____

(6) Overall how satisfied are you with BE Electrical Engineering program at TU and in your opinion how well is the BE Electrical Engineering program meeting its stated educational objectives: Excellent/V. good/Good/Avg./Poor

	receive clear instructions.					
11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.					
12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.					
PSO 1	To apply knowledge of mathematics, sciences, and professional subjects to formulate, interpret and analyze problems appropriate to Electrical Engineering.					
PSO 2	To employ appropriate engineering techniques, skills, tools, and research-based knowledge to accomplish electrical engineering and engage in life- long learning.					

Note: Cross-out whichever not applicable

(1) GATE exam after BE: Passed/Failed/Not taken

(2) Promotion since graduation: Yes/No

(3) Enrollment in higher studies: Yes/No, if yes please answer following

(i) Name of program:_____ (ii) Year of completion:_____ .

(4) Involvement in professional societies as a _____

(5) Community service, if any: _____

(6) Overall how satisfied are you with BE Electrical Engineering program at TU and in your opinion how well is the BE Electrical Engineering program meeting its stated educational objectives: Excellent/V. good/Good/Avg./Poor

Process of Program outcome attainment:

The Program Outcomes (PO) or the Program Specific Outcomes (PSO) are achieved through curriculum that offers a number of mandatory courses as well as elective courses. Each course in the curriculum has defined course outcomes that are mapped to the program outcomes and a set of performance criteria that are used to provide quantitative measurement of how well course outcomes are achieved. The process of PO or PSO attainment level is shown by the following flowchart:

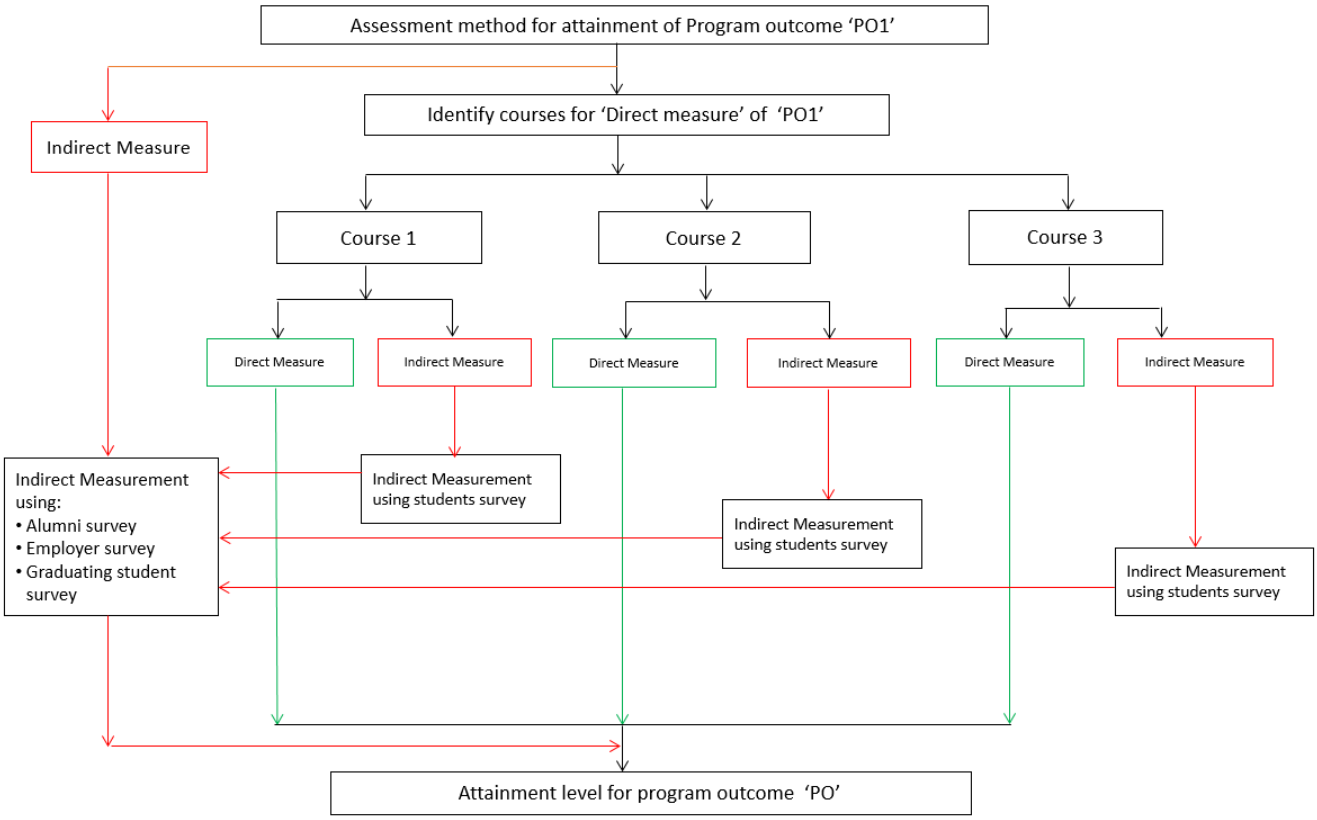

Figure 1 Flowchart showing the process of PO/PSO attainment level

As shown in the flowchart given above, each of the PO or the PSO are assessed using a direct and an indirect method.

This assessment is carried out using the following measurable and quantitative parameters and survey/questionnaire techniques/tools.

A. Assessment Tools used for measurement of Program Outcome attainment:

In the Outcome Based Education (OBE), the course outcome attainment scores measured using direct and indirect assessment tools is eventually used for measuring the attainment of Program Outcomes and Program specific outcomes. Thus, PO and PSO assessment process uses both direct and indirect measures to measure the attainment of each outcome. The examples of such measures are given below:

1. Direct Assessment tools:

After evaluating the attainment of course outcomes using direct assessment tools (as mentioned in Table2. (a)), average direct CO score for each course is computed. Direct assessment score for attainment of PO and PSO is computed by mapping the direct CO scores for all courses with corresponding PO's as defined in the Program articulation matrix. Following direct assessment tools are employed for measuring PO /PSO attainment:

- Mid Semester Examinations [Once during 8^{th} or 9^{th} week of a semester]
- End semester Examination [once during 15^{th} week of the semester]
- Tutorial Assignments [Varies depending on the tutorial engagement]
- Quizzes [Mostly once during semester, Varies and is decided by course coordinator]
- Projects [Mostly once during semester, Varies and is decided by course coordinator]

2. Indirect Assessment tools:

This includes feedbacks from all the stakeholders such as course exit survey, Graduating student survey, alumni feedback, Employer feedback etc.

Table: **Indirect Assessment Tools**

S. No.	Indirect Assessment Tool	Method Description
1	Course Survey [Twice before MST and EST]	Course Survey is completed for every course in each semester to get a formal feedback from students for the courses offered in a semester and provide objective information to the faculty for self-appraisal, self-improvement & development. The course survey is focussed on attainment of course outcomes. Formal student feedback is obtained online and it is mandatory for all students to participate in such surveys. The course survey results are compiled by the individual course instructors for his feedback.
2	Graduating student's survey [Once per year for the graduating batch]	A questionnaire survey is used to measure the level of achievement of expected program outcomes/program specific outcomes. It is mandatory for all graduating students to participate in this questionnaire. Each participant is asked to rate his/her perception of achievement of the program outcomes/program specific outcome on a scale of 1 to 5 where 1 signifies a poor outcome and 5 signifies a high level of achievement of objectives. The indirect CO scores measured through this tool are mapped to Likert scale of 1 to3. The assessment results are documented

		and discussed in the meeting of department faculty to make action points for initiating corrective and preventive actions. A sample filled copy of graduating students' survey form is provided in Annexure-I
3	Alumni survey [Once in three years]	It is believed that the perception of students changes from the time of graduation to some point in their respective careers as they get more mature and have learnt tricks of the trade on the job. At this point of time, they are in a better position to provide more valuable and objective feedback on the learning in their undergraduate program and also how much of the program outcomes (on some scale) have actually been possible. To obtain this information, a survey is conducted for practicing alumni who graduated during the last 2 to 5 years. This survey like the graduating student survey is targeted at the program outcomes & program specific outcomes achieved during the last 2 to 5 years. Again, the respondents are asked to rate each PO and PSO on a scale of 1 to 5. The indirect CO scores measured through this tool are mapped to Likert scale of 1 to3. The findings of the survey are processed and used for effecting improvements in the program to achieve the program educational objectives and program outcomes.
4	Employer survey [Once in three years]	All the students of program to be accredited are required to spend a full six month's semester in the industry completing an industrial project under the joint supervision of industry supervisors and TIET faculty. All the faculty members are required to visit one or two organizations two times during their six month's semester in the industry for evaluation of students placed for their work term in these organizations. This provides an opportunity to take feedback of our graduated students working in these organizations. During the course of interaction with the employer of our students, the employers provide information on their performance against POs &PSOs through survey form. This form, like the other forms, has questions related to the POs & PSOs. The rating is again given on a scale of 1 to 5 with 5 representing the best performance. The indirect CO scores measured through this tool are mapped to Likert scale of 1 to3. A sample copy of filled employer survey form is provided in Annexure-I

B. <u>Processes used for measurement of Program Outcome attainment:</u>

CO Attainment scores for each subject obtained by direct assessment tools is mapped to correlated PO or PSO using the course articulation matrix. Similarly, CO attainment scores achieved through indirect assessment tools are also mapped with the correlated PO or PSO.

PO/PSO Attainment (Direct Assessment) $= \left[\frac{\text{PO\_CO Mapping}}{3} \times CO\ Attainment\ (Direct\ Assessment\right]$

PO/PSO Attainment (Indirect Assessment) = $\left[\frac{\text{PO\_CO Mapping}}{3} \times CO\ Attainment\ (Indirect\ Assessment\right]$

Attainment for a program outcome is finally computed by taking weighted average of contributions of participating courses towards that particular PO or PSO.

Finally, program outcomes for entire course is assessed by taking weighted sum of direct and indirect assessment as

Overall PO/PSO = 80% weightage of direct PO Score + 20% weightage of Indirect PO Score

Table 1 below shows the frequency of data collection of each form.

Table 1: Assessment tools, frequency of data collection and weightage

Assessment Tool	When data is collected	Frequency of Data Analysis	Weightage
Course Portfolio	During the semester	Once in a year	**5**
Course Survey	End of the semester	Once in a year	**4**
Graduating Student's Survey	End of the program	Once in a year	**3**
Alumni Survey	After 2-5 year of graduation	Once in 3 years	
Employer Survey		Once in 3 years	

On the basis of results of assessment tools, the assessment of level of attainment of each PO or PSO outcome is carried out. The assessment loop for each program outcomes is shown in Figure 2.2

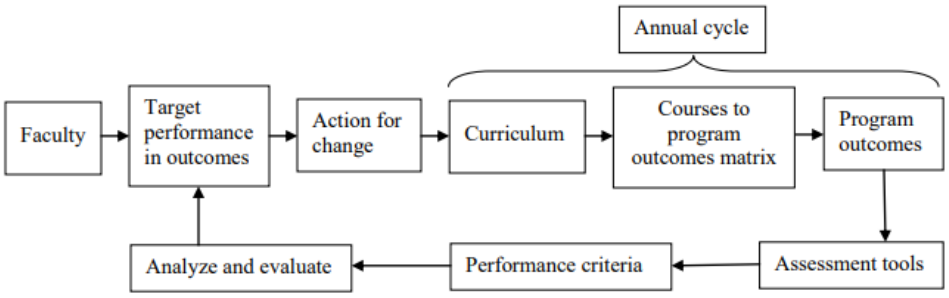

Figure 2 Assessment loop for PO/PSO

Actions taken based on the results of evaluation of each of the COs, POs & PSOs

Based on the CO, PO, and PSO attainment levels, subjects were identified whose CO attainment level was low but weightage towards calculation of a PO/PSO level was high. For such subjects, the concerned faculty prepared an Action Taken Report (ATR), providing details of reasons for the low attainment level and the actions to improve upon the same (please see Table 2).

Table 2: POs & PSOs Attainment Levels and Actions for improvement (2022-23)

POs	**Target Level**	**Attainment Level**	**Observations**
PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	**2.25**	**2.59**	For PO1, the target level has been achieved. Various art of learning methods will be included to develop the analytical skills for solving complex problems and individual attention is given to an individual student to solve the complex problems.
Though the target is achieved, in some courses the weighted average of PO1 contributed by these courses UEE505 (1.86/3.00), UEE504 (1.00/3.00), UEE401 (2.20/3.00), UEE509 (1.60/3.00), UCS414 (2.00/3.00) and UEE742 (1.67/3.00) have not been achieved and action plan and action to be taken is proposed. **Action Plan UEE505:** ● More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems. ● Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results. **Action plan UEE401:** ● Complex numerical problems will be related to real-time problems that are being looked upon by the industries.			

- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Action Plan UEE504:

- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action Plan UCS414:

- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class hours.
- More numerical problems will be introduced to improve basic engineering knowledge of target audience.

Other Actions:

- The student counsellors of the program are advised to sort the problems of the non-performers conducting regular counselling sessions.
- Students will be motivated to enrol in NPTEL courses to equip themselves to strengthen their foundation through repeated learning.
- Analytical subjects will be demonstrated to students through video lectures.
- The faculty will be encouraged to use active learning methods as learned in CAPSL for an interactive class.
- Faculty members are encouraged to take up online courses and faculty development programs for being updated on the recent technologies and shall act as mentors to guide the students in the online courses.
- Faculty will be encouraged to use flipped class room techniques, use of reflection and creativity in student centric teaching learning process.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex

engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.

PO2	**2.25**	**2.56**	For PO2, the target level was achieved. Design and analysis of various engineering problems in recent technology can be strengthened to improve students' ability.

Though the target is achieved, in some courses the weighted average of PO2 contributed by these courses UEE505 (1.80/3.00), UEE504 (0.92/3.00), UEE509 (1.40/3.00), UCS414 (2.00/3.00), UEE613 (2.00/3.00), UEE527 (1.5/3.00), UCS540 (2.22/3.00), UCS541 (2.18/3.00), UEE744 (2.00/3.00) and UEE742 (1.67/3.00) have not been achieved and action plan and action to be taken is proposed.

Action Plan UEE505:

- More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems.
- Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results.

Action plan UCS541:

- Focus on dataset understanding and exploitation will be given to strengthen the basics of the coding.
- Students will be motivated to participate in online challenges on artificial intelligence.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action Plan UCS414:

- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class

hours.

- More numerical problems will be introduced to improve basic engineering knowledge of target audience.

Action plan UEE613:

- Students will be encouraged to design solutions to various automation problems and try to perform it during laboratory hours.
- The above solution will be subject to an intensive research and mathematical formulations, which will be discussed with the students in the tutorial classes.

Action plan UEE504:

- Students are encouraged to learn from their surroundings so that they can understand the fundamentals of the course in order to find solutions for real-world power issues.
- More tutorial questions will be added to the tutorials sheet.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action plan UEE527:

- Industrial visits are expected to help students gain knowledge on complex engineering problems.
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action plan UEE744:

- Students will be given a group assignment on real-world problems to be carried out throughout the semester, and are encouraged to contact their teacher in order to discuss their solutions on a regular basis.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO3 .	**2.25**	**2.42**	For PO3, the achieved level was good. The scope for designing and developing components, systems, and similar activities including the constraints such as ethical, and safety needs lots of practice and obviously, is time-consuming.

Though the target is achieved, in some courses the weighted average of PO3 contributed by these courses UEE505 (2.00/3.00), UEE509 (1.00/3.00), UEE401 (1.00/3.00), UEE504 (1.00/3.00), UCS541 (2.00/3.00), UEE527 (2.00/3.00), UCS414 (1.63/3.00) and UEE742 (1.67/3.00) have not been achieved and action plan and action to be taken is proposed.

Action plan UEE505:

- Students will be encouraged to come up with minor project ideas and implement them in the semester. The problems faced during the system design will be discussed and help in gaining more knowledge.

Action plan UEE401:

- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action Plan UCS541

- Since the subject is entirely coding based, every concept that will be taught in the class will be shown practically in the class and practiced during the lab hours as well.
- More focus will be given on coding based learning for every concept in the syllabus.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action Plan UCS414:

- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class hours.
- More numerical problems will be introduced to improve basic engineering knowledge of target audience.

Action plan UEE527:

- Industrial visits are expected to help students gain knowledge on complex engineering problems.
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Other Actions:

- The students will be motivated to include all the standard parameters and constraints according to National and International safety norms and to address environmental concerns.
- General discussions on the latest technology will be suggested to the students which create additional interest among them.
- The students will be persuaded to consider interacting with their teachers outside the class.
- Safety guidelines are available in every lab.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO4	**2.25**	**2.56**	The target is achieved. Students are encouraged to implement projects with Industry standards.

Though the target is achieved, in some courses the weighted average of PO4 contributed by these courses UEE401 (2.00/3.00), UEE504 (1.00/3.00), UEE509 (1.00/3.00), UCS541 (1.33/3.00), UEE527 (1.56/3.00), UCS540 (2.00/3.00), UCS414 (1.75/3.00), UEE742 (1.67/3.00) and UEE744 (2.00/3.00) have not been achieved and action plan and action to be taken is proposed.

Action plan UEE401:

- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action plan UCS541:

- Focus on dataset understanding and exploitation will be given to strengthen the basics of the coding.
- Students will be motivated to participate in online challenges on artificial intelligence.

Action plan UEE527:

- Students are encouraged to develop small experimental kits that may be used to educate their juniors. This provides students with first exposure to hardware implementation, allowing them to be more productive during their final year project

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action Plan UCS414:

- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class hours.
- More numerical problems will be introduced to improve basic engineering knowledge of target audience.

Action plan UEE744:

- Students will be given a group assignment on real-world problems to be carried out throughout the semester, and are encouraged to contact their teacher in order to discuss their solutions on a regular basis.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO5	**2.25**	**2.51**	The target is achieved. Students are made to be familiar with recent technologies and are exposed open source tools.

Though the target is achieved, in some courses the weighted average of PO5 contributed by these courses UEE505 (2.00/3.00), UEE504 (1.00/3.00), UEE509 (1.40/3.00), UEE527 (1.33/3.00), UCS540 (2.00/3.00) and UCS414 (1.00/3.00) have not been achieved and action plan and action to

be taken is proposed.

Action Plan UEE505:

- More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems.
- Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action plan UEE509:

- Regular evaluations will be taken during practicals so that the students are able to think and analyze power systems in the real-world.
- More research based numerical problems will be introduced.

Action plan UEE527:

- Students are taught simulation tools like MATLAB/Simulink, and simulation of circuits is encouraged.
- Industrial visits are expected to help students gain knowledge on complex engineering problems.
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action Plan UCS414:

- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class hours.
- More numerical problems will be introduced to improve basic engineering knowledge of target audience

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

Other Actions:

- Apart from following the strategy used in PO2, the students will be given an introductory session on different simulators for performing programming operations in their first class.

- Demonstration of modern software tools and their applications in industries will be carried out.
- Workshops will also be conducted on the usage of modern tools in industries.
- Students will be advised to use open source tools like Google Classroom, Edmodo, etc. for student monitoring.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	**2.25**	**2.58**	Target achieved. Students are trained with various soft skills techniques by the trained faculty members to meet the Industry standard in multidisciplinary areas.

Though the target is achieved, in some courses the weighted average of PO6 contributed by the courses UEE401 (2.00/3.0), UEE509 (1.40/3.00) UEE504 (1.00/3.00), UCS540 (2.00/3.00), UCS653 (2.00/3.00) has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE401:

- In the course contents an emphasis is given on the relation between the technical concepts and their effects in terms of societal and environmental context.
- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action plan UCS653:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed for the applications in data mining and visiualization.
- Students will be motivated to participate in various hackathons.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will

be also looked into for better insight.

Other Actions:

- Students' will be provided with the needful space around a semester to take up internships in the industry to understand the aspects of an engineer's work and its impact in multiple directions.
- Club activities, Awareness programs, and interactive sessions on green energy utilization are to be organized to create an impact.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	**2.25**	**2.56**	The target is achieved.

Though the target is achieved, in some courses the weighted average of PO7 contributed by the course UEE502 (2.00/3.0), UEE504 (1.22/3.00), UEE509 (1.00/3.00), UEE527 (2.00/3.00) and UCS540 (2.00/3.00) has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE502:

- Students will be given insights on adopting work ethics that contribute toward protecting the environment and leading to sustainability.
- Local visits will be arranged for visiting the society and industry to develop innovative ideas for sustainable development.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action plan UEE527:

- Students are encouraged to participate in initiatives that solve global and environmental challenges related to the use of renewable energy resources and energy efficiency.
- Industrial visits are expected to help students gain knowledge on complex engineering problems**.**
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	**2.25**	**2.42**	For PO8, the attainment level was very good.

Though the target is achieved, in courses UEE304 (1.40/3.00), UEE509 (2.00/3.00), UEE504 (0.67/3.00), UEE527 (1.33/3.00) and UCS540 (2.00/3.00) the weighted average of PO8 has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE304:

- The research based concepts are added in the course. The students are advised to read the research based study material related to the course.
- Students are well informed regarding societal health and safety through this course. Also the course deals with the protection in the electrical system which is directly related with the safety of the people

Action plan UEE527:

- To address the aforementioned observations, a career preparedness programme, corporate lectures, and motivational presentations are planned.
- Industrial visits are expected to help students gain knowledge on complex engineering problems**.**
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different

criteria that need to be followed in solving a problem.
- Students will be motivated to participate in online challenges on artificial intelligence.

Other Actions:
- Sessions on ethical awareness and academic integrity may be regularly organized to inculcate ethical responsibilities among the students

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9	**2.25**	**2.68**	For PO9, the target level was well achieved.

Though the target is achieved, in the courses UEE304 (1.60/3.00), UEE504 (1.00/3.00) and UCS414 (1.5/3.00) the weighted average of PO9 has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE304:
- Students are informed through lectures on how to become a special individual, and as a member or leader in diverse teams. Extra hours are arranged for them to make them aware of the importance of becoming a member or leader in diverse teams.

Action Plan UCS414:
- A change in pedagogical initiatives is proposed, which would be taken up when the courses will be taught to the next batch (e.g., changing from teaching pedagogy with the assistance of animated PowerPoint presentations and providing other supporting learning materials in advance to students, etc.)
- The students are persuaded to consider interaction with their teacher other than the class hours.
- More numerical problems will be introduced to improve basic engineering knowledge of target audience

Action plan UEE504:
- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Other Actions:
- Participation in Co-curricular and Extracurricular activities will be encouraged.
- Group activities like symposiums, Intra & inter-department meet will be organized for effective team building.
- The institute hosts cultural events and alumni gatherings, and students are invited to serve as organizers. This gives them a platform to work as individuals as well as in groups, allowing students to develop abilities such as leadership and team spirit via group discussions.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	**2.25**	**2.66**	For PO10, the target level was achieved. Effective communication methods are inevitable for students of Engineering and Technology. Emphasis on domain-specific aspects of communication and related training is given to students.

Though the target is achieved, in the course UEE509 (1.40/3.00), UEI501 (2.22/3.00), UEE301 (2.20/3.00) and UCS414 (1.75/3.00), the weighted average of PO10 has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE509:

- Regular vivas in the lab will help in knowledge building as well as better communication skills.
- Students will be encouraged to make practical reports based on their own experiments and experience so as to improve their technical writing skills.

Action Plan UEI501:

- More numerical problems practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos lectures will be introduced for the basic concepts to the students to get more insight into the subject.

Action plan UEE301:

- Students are told the importance of lifelong learning. More practicals are conducted and demonstrated and students are asked to perform the experiment.
- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action plan UCS414:

- Students are given some time in the lectures focusing on effective communication, report writing and making effective presentation.
- Students are encouraged to deliver lectures in between so as to build confidence along with the revision of the course.

Other Actions:

- Professional training is given to students by various experts.
- Soft skill training programs will be provided for the improvement of communication and presentation skills.
- Seminars will be given for the students in classes to know the importance of communication and its related skills

PO11: Project management and finance: Demonstrate knowledge and understanding of the

engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO11	**2.25**	**2.76**	Target achieved. Engineers can be superior managers and this is shown in Project-based learning, consultancy, and mini projects which contribute fully to the attainment of this PO. Students are trained to do projects like how it is performed in companies

Though the target is achieved, in course UEE502(2.00/3.00), UEE509 (1.00/3.00) and UCS540 (2.00/3.00), the weighted average of PO11 has not been achieved and an action plan and action to be taken is proposed.

Action plan UEE502:

- Regular vivas in the lab will help in knowledge building as well as better communication skills.
- Students will be encouraged to make practical reports based on their own experiments and experience so as to improve their technical writing skills.

Action Plan UEE509:

- More numerical and related practice will be carried out in tutorials.
- Students will be encouraged to solve questions in the class itself so that they gain confidence in the subject from the very beginning.
- Videos related to the concepts will be shown to the students to get more insight into the subject.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.

Other Actions:

- Students are made to work on projects starting from the concept of evolution to prototype development.
- Students are encouraged to select electives from other domains.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO12	**2.25**	**2.51**	For PO12, the target level was achieved. Though the target is achieved, it is possible to induce the habit of life-long learning among the students.

Though the target is achieved, in some courses the weighted average of PO12 contributed by these courses UEE304 (0.40/3.00), UEE401 (2.00/3.00), UEE504 (1.00/3.00), UEE505 (1.75/3.00), UEE527 (2.00/3.00), UCS540 (2.00/3.00), UCS414 (1.75/3.00), UEE742 (1.67/3.00) and UEE509 (1.40/3.00) have not been achieved and action plan and action to be taken is proposed.

Action plan UEE304:

- Since the syllabus of the course is very wide, we plan to increase the number of teaching hours for the subject so as to include more open discussions on the subject.

Action plan UEE401:

- Students are told the importance of lifelong learning. More practicals are conducted and demonstrated and students are asked to perform the experiment.
- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action plan UCS414:

- Students are given some time in the lectures focusing on effective communication, report writing and making effective presentation.
- Students are encouraged to deliver lectures in between so as to build confidence along with the revision of the course.

Action plan UEE504:

- Students are encouraged to incorporate all standard criteria and limits in accordance with National and International safety standards, as well as to address environmental problems in their minor/major projects, while focusing on unique solutions
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action Plan UEE505:

- More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems.
- Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results.

Action plan UEE509:

- The students will be encouraged to prepare papers for technical journals and take part in knowledge- enhancing domain-specific seminars, workshops, and conferences.

Action plan UEE527:

- Students are taught simulation tools like MATLAB/Simulink, and simulation of circuits is encouraged.
- Industrial visits are expected to help students gain knowledge on complex engineering problems**.**
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Action plan UCS540:

- Students will be encouraged to apply algorithms practiced in class on real-time datasets by collecting the data by themselves. This will give them insight on understanding different criteria that need to be followed in solving a problem.

Other Actions:
Life-long learning is attained when an interest in the specialization is kindled in the student's mind through several activities.

PSO1. To apply knowledge of mathematics, sciences, and professional subjects to formulate, interpret and analyze problems appropriate to Electrical Engineering.

PSO1	**2.25**	**2.62**	For PSO1, the target level was achieved. Students insisted to learn the basics of computing and mathematics for their enhancement in analyzing the problems related to Electronics (Instrumentation and Control) Engineering. They are also motivated to do online courses in basics.

Though the target is achieved, in some courses the weighted average of PSO1 contributed by these courses UEE505 (1.75/3.00), UEE504 (1.09/3.00), UEE509 (1.40/3.00), UEE613 (1.67/3.00), UCS414 (2.00/3.00) UEE742 (1.67/3.00) and UEE527 (1.43/3.00) have not been achieved and action plan and action to be taken is proposed.

Action plan UEE613:
- The course contents are taken in the lectures so that the students can understand the course contents with the understanding of mathematics and basic sciences. The slow learner students are asked to focus more on understanding the basic fundamentals. More numericals are given in addition to tutorial numerical.

Action plan UCS414:
- Students are given some time in the lectures focusing on effective communication, report writing and making effective presentation.
- Students are encouraged to deliver lectures in between so as to build confidence along with the revision of the course.

Action plan UEE504:
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action Plan UEE505:
- More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems.
- Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results.

Action plan UEE509:

- The students will be encouraged to prepare papers for technical journals and take part in knowledge- enhancing domain-specific seminars, workshops, and conferences.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Action plan UEE527:

- Workshops for technical writing and electrical system modelling are being planned. More hardware-related projects are being developed.
- Industrial visits are expected to help students gain knowledge on complex engineering problems**.**
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Other Actions:

- Students are encouraged to take online courses related to Electrical Engineering.

PSO2. To employ appropriate engineering techniques, skills, tools, and research-based knowledge to accomplish electrical engineering and engage in life- long learning.

PSO2	**2.25**	**2.58**	For PSO2, the target level was very well achieved. Open electives are introduced to students so that they get knowledge in various domains.

Though the target is achieved, in some courses the weighted average of PSO2 contributed by these courses UEE505 (1.57/3.00), UEE401 (2.00 /3.00), UEE504 (1.00/3.00), UEE527 (2.00/3.00), UCS414 (1.5/3.00), UEE742 (1.67/3.00) and UEE509 (1.40/3.00) have not been achieved and action plan and action to be taken is proposed.

Action plan UEE401:

- The students are told the importance of obtaining technical skills and research abilities. They are told the different technical tools and skills to enhance their research abilities.
- Complex numerical problems will be related to real-time problems that are being looked upon by the industries.
- Industrial visits will be encouraged where students can be shown working of various models to clear their basics of different motors and generators on a larger scale.

Action plan UEE504:

- The students will be encouraged to prepare papers for technical journals and take part in knowledge- enhancing domain-specific seminars, workshops, and conferences.
- Mathematical evaluation is promoted so that students may acquire basic principles and implement them for real time issues.
- More numerical and related practice questions will be given and taught to the students.
- Additional focus on the numerical solving and its correlation with the laboratory work will be also looked into for better insight.

Action plan UCS414:

- Students are given some time in the lectures focusing on effective communication, report writing and making effective presentation.
- Students are encouraged to deliver lectures in between so as to build confidence along with the revision of the course.

Action Plan UEE505:

- More focus will be given on the numerical problems so that the student is able to understand the working concepts of different analog and digital systems.
- Experimental performance for every problem will be carried out in the lab component to compare numerical problems with experimental results.

Action plan UEE527:

- Workshops for technical writing and electrical system modelling are being planned. More hardware-related projects are being developed
- Industrial visits are expected to help students gain knowledge on complex engineering problems**.**
- Students are encouraged to observe their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems.

Action plan UEE509:

- The students will be encouraged to prepare papers for technical journals and take part in knowledge- enhancing domain-specific seminars, workshops, and conferences.

Action Plan UEE742:

- More numerical and difficult portions are covered in tutorial classes. Complex problems are taken and given to the students for practice.
- Additional classes may be included to revise the fundamentals and pre-requisites related to the course.

Other Actions:

- Life-long learning is attained when an interest in the specialization is kindled in a student's mind through several activities

Students are encouraged to select the electives from other domains and integrate their knowledge in the field of Electrical Engineering systems.

Program Outcomes once mapped to the learning outcomes of a particular course gives us an insight of the level of achievement of students in that particular PO. Given this broaden picture of new understanding, we get an opportunity to improvise through initiatives and also implement certain changes that can be lead us to have better performances. For example, in an outcome measurement related to ability to identify and formulate problems for engineering system was assessed through courses that basically require an understanding of engineering problems and its formulation which may lead to problem solving. Therefore, in order to further strengthen student learning, we implemented a paradigm shift in teaching from **Teacher Centric to Student Centric Learning Approach**. This concept was introduced to the faculty through **Centre for Academic Practices and Student Learning (CAPSL)** training workshop which started in year 2016. All faculty from the department have been completed the basic course of New Direction Program and benefitted through this workshop. Faculty was trained to adopt academic practices such as outcome based learning, creative thinking, introducing assessment methods involving students, and many more. With these approaches, students were more open to creatively formulate problem.

On the other hand, where student is assessed for his/her ability to solve complex engineering problems, role of problem solving through tutorials becomes very important. While student centric approach did help in 2018-2019 but a marginal fall was visible in 2019-2020. One of the main reasons for this can be attributed to a shift to an **Online Mode of Teaching because of COVID pandemic**. Faculty was still in a learning mode to teach online and conduct tutorials. Lecture/Tutorial sessions needed to be channelized in less time. As a result, **Thapar Learning Management System (TIET-LMS)** was developed and effective July 2020, all academic activities are conducted through it, and reviewing tutorials has also now become seamless. It is anticipated that with the coming up of TIET-LMS, we foresee a positive improvement in this regard in the future.

We strongly believe that a static curriculum cannot bring in changes in the understanding and applying engineering design to produce solutions in the context of global, cultural, social, environmental and economic factors. Keeping this in view, our scheme and syllabi are updated from time to time. A Board of Studies (BOS) meeting is held on a regular basis wherein an expert opinion is sought from Industry and Academic experts in the field of civil engineering. Based on their suggestions, curriculum is modified and updated to match with the latest market trends. The scheme is then sent to the Senate for approval. One of the recent and major changes that we have incorporated in our Curriculum includes:

- Three Elective Baskets (Data Analytics, Real Time Systems, and Smart Electrical Networks) were introduced in the curriculum of Electrical Engineering to cater industry demand. These focused areas are:
    - Data Analytics

- Real Time Systems
- Smart Electrical Networks

- A course on **Machine Learning Techniques (UEE612)**, which is essential in Electrical Engineering because it not only enables automation, predictive maintenance, energy efficiency, control systems, and signal processing, but also focuses on research opportunities, interdisciplinary applications, competitive advantage, and global relevance, was introduced in the curriculum.

- The course **Electric Vehicle and Sustainable Energy Systems (UEE704)**, introduced in the curriculum, holds significant relevance in the Electrical Engineering curriculum

- The course **Data Structure and Algorithm (UCS540)** was introduced as a compulsory course to strengthen the placements of the students in software organizations

- The courses like **Database Management System (UCS312)** and **Computer Networks (UCS414)** are also offered as elective subjects to support students seeking placements in the software field.

Over the past three years, particularly, we are laying **more stress on writing and presentation skills**. Casual, unprofessional writing is no more accepted in project report, capstone, or laboratory reports etc. This is keeping in view the need to communicate effectively with range of audiences through writing, with peers and with people in professional organizations. Now Students have to undertake several proof reading before the final report is accepted for evaluation purposes. Several templates of project writing have been prepared by the faculty and are circulated to students much before the submission time. Students are encouraged to read research papers and asked to bring in a small write up, which becomes useful in undertaking a Capstone Project (UEE 795). Students who go for project semester are exclusively judged for their writing and communications skills by their Industrial Mentor, which in itself is a motivation for students to work harder even when outside the campus. The **Centre for Training & Development (CTD) on campus** has been established to build upon the communication skills through lecture series, workshops and several other activities. We do see several benefits emanating from this Centre and we expect that a positive change will be reflected in the PO score over the next few years.

We have managed to continuously improve in our outcomes related to experimentation, analyzing and interpreting data for making informed engineering judgments. **Experiential Learning Centre (ELC)** activities have been introduced recently and at very early stage in the curriculum. Several activities have been accomplished successfully as ELC activities in the last 2 years such as:

- **Arduino based Embedded system**
- **IOT based Home automation**
- **DC motor rewinding and Testing of performance Characteristics**
- **Robotic ARM Control**
- **Designing converter for Automobile Horn/Design and control of 1-phase Inverter**

Many more such Experiential activities are lined up for all Ist –IVth Year BE Electrical Engineering students to give them Hands-On-Training as well as experience of real life problems and applications. Few glimpses of the experiential learning centre events held at Electrical Department are shown in **Fig. 3**. These activities do not contribute to the total credits earned, rather are an initiative to inculcate team spirit and make students learn to design, fabricate and commission a real world problem while working in a team. This puts the students in a practice to do more similar projects (e.g. Capstone project, group design project, project semester) in their latter part of the curriculum.

Fig. 3: Students involved in various ELC activities organised by the Electrical Department

Over the past 5 years we have worked very hard in procuring best of equipment's for our core labs. For example, following Laboratories which have seen addition in major equipment's are as follows:

- *Structures Laboratory*: ACM corrosion analyzer, Cube Abrasion Testing Machine, Oscilloscope, 100T Displacement Sensor Strain Gauge, Precision LCR Meter, Penetrometer Make Humbolt, Marsh Cone Viscometer, Double Acting Hydraulic Jack with electric operated power unit
- *Geotechnical Laboratory*: Consolidation Test Apparatus, Liquid Limit App (Motorised), Proctor Compaction Mould with Hammer,
- *Transportation Laboratory*: Centrifugal Extractor, Mild Steel CBR Mould& Extension Collar, Light Weight Deflectometer, Modular Compact Rehometer

ANNEXURE-I