

# **Assessment of Attainment of Program outcome**

## **PO-01**

*An ability to apply knowledge of mathematics, science, and engineering*  
**(2016-17)**

*for the  
Bachelor of Engineering  
in  
Electrical Engineering*



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

**Electrical & Instrumentation Engineering Department  
Thapar Institute of Engineering & Technology,  
Patiala (Punjab) -INDIA**

## **Attainment of Program outcome ‘PO-01’**

The attainment of program outcome PO-01: *An ability to apply knowledge of mathematics, science, and engineering* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-01’ has been classified into following performance criteria:

**PO-01(A):** *Apply mathematics (partial differentiation, vector calculus, linear algebra, complex variables, Laplace transform, probability, discrete mathematics etc.) to obtain analytical, numerical and statistical solutions*

**PO-01(B):** *Demonstrate and apply knowledge of fundamentals, scientific and/or engineering principles towards solving engineering problems*

**PO-01(C):** *Apply numerical and statistical methods in analyzing data*

The program assessment committee identified the following courses for the assessment of program outcome ‘PO-01’. The courses used for the assessment during last three academic years are marked bold:

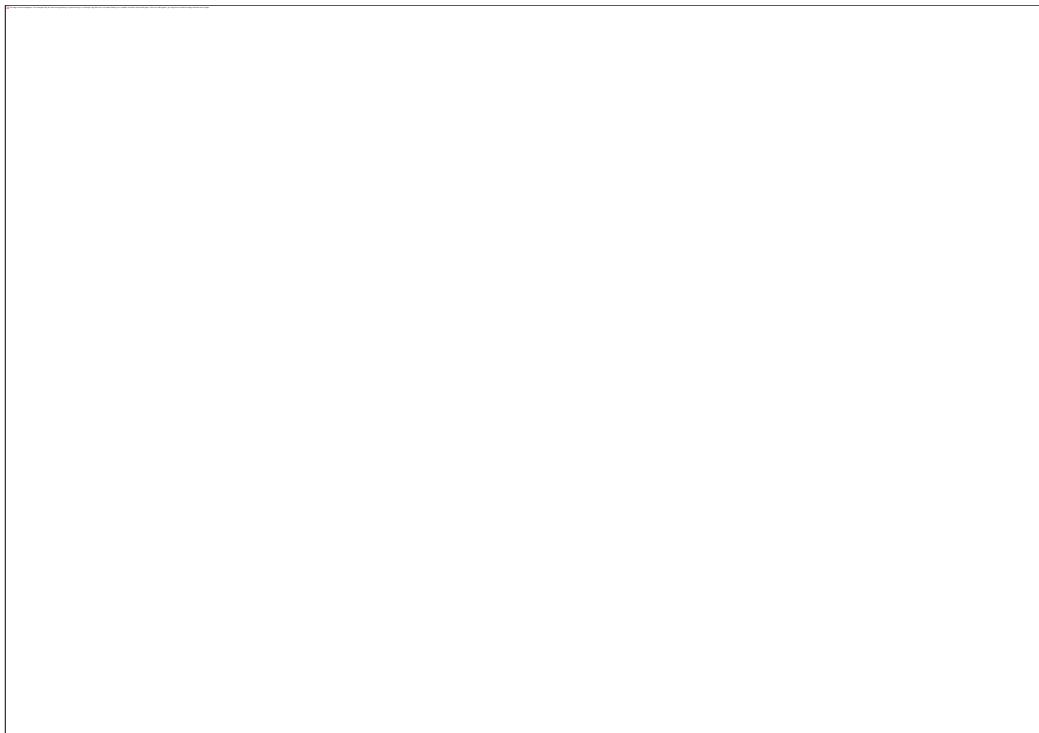
- UEE001: Electrical Engineering
- **UEE301: Direct Current Machines and Transformers**
- **UEE302: Electro Magnetic Field Theory**
- **UEI303: Techniques on Signals and Systems**
- **UEE401: Alternating Current Machines**
- **UEE402: Transmission and Distribution of Power**
- UEE403: Measurement and Transducers
- **UMA032: Numerical and Statistical Methods**
- **UEI501:Control Systems**
- **UEE501: Generalized Theory of Electrical Machine**
- **UEI503: Digital Signal Processing and Applications**
- **UEE503: Network Analysis and Synthesis**
- UEE504: Power Electronics
- **UEE505:Analog and Digital Systems**
- UEE605: Power System Analysis and Stability
- **UEE603: Switchgear and Protection**
- **UEI841: Advance Control Systems**

- UEE801:Electric Drives
- **UEE802: Intelligent Algorithms in Power Systems**
- **UEE804: Operation and Control of Power Systems**
- **UEE843: Power System Planning**

Outcome PO-01 has been assessed through three performance criteria PO-01(A) , PO-01(B) and PO-01(C). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-01(A)’, ‘PO-01(B)’ and ‘PO-01(C)’ for the academic year 2016-17.

<b>Performance Criteria</b>	<b>Course -1</b>	<b>Course-2</b>
PO-01(A)	UEI501:Control Systems	UEI503: Digital Signal Processing and Applications
PO-01(B)	UEE505: Analog and Digital systems	UEE603: Switchgear and Protection
PO-01(C)	UEE802: Intelligent Algorithms in Power Systems	UEE804: Operation and Control of Power Systems

The step by step methodology used to measure the attainment of program outcome ‘PO-01’ is shown in Fig. PO-01.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome PO-01 for all the three academic years under consideration.



**Fig. PO-01.1: Process for measurement of attainment of outcome ‘PO-01’ for the year 2016-17**

The following Rubric has been used to convert marks obtained by the students to a scale in the range of 1 to 5 and is described in Table PO-01.1 in most cases unless specifically mentioned.

**Table PO-01.1: Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the courses mentioned.

## **Assessment of outcome ‘PO-01’ using Performance Criterion ‘PO-01(A)’**

**PO-01(A): Apply mathematics (partial differentiation, vector calculus, linear algebra, complex variables, Laplace transform, probability, discrete mathematics etc.) to obtain analytical, numerical and statistical solutions.**

The performance criteria ‘ PO-01(A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

### **a) Direct Measures:**

#### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEI501: Control Systems* and *UEI503: Digital Signal Processing and Applications* are used to assess performance criteria PO-01(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UEI501: Control Systems**

The performance of course *UEI501: Control Systems* is used to measure the attainment of outcome ‘PO-01(A)’ through the End Semester Examination (Question No. 2, July-Dec 2016, 20 marks).

#### **Question:**

Q.2	<p>Draw the complete root locus for the system</p> $G(S)H(S) = \frac{K}{S(S + 2)(S + 4)}$ <p>From the root locus plot, find the range of values of K for which the system will have damped oscillatory response. Also, determine the value of K for a damping ratio of <math>\zeta=0.5</math>. With this value of K, find the closed-loop transfer function.</p>	(20)
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The performance of the students in the above question is summarized in Table PO-01(A).1 using rubrics defined in Table PO-01.1.

**Table PO-01(A).1: Students’ performance in question targeting ‘ PO-01(A)’ : Course UEI501**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101404001	Abhay Mahipal	16	5
2	101404002	Abhijeet Singh Sankhla	10	3
3	101404004	Abhinav Arora	15	5
4	101404006	Abhishek Sharma	16	5

<b>S. No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (20)</b>	<b>Score (1-5)</b>
5	101404007	Ajay Singh	14	4
6	101404009	Alka Thakur	18	5
7	101404012	Ankush Goyal	17	5
8	101404013	Anmol Arjun Bharaj	7	2
9	101404014	Anmol Goyat	16	5
10	101404015	Anmol Rattan Kaur	8	3
11	101404017	Anubhav Kumar	8	3
12	101404018	Apeksha Goel	18	5
13	101404019	Arnish Jain	17	5
14	101404020	Arshiya	17	5
15	101404021	Arshjot Kaur	16	5
16	101404023	Ayush Jain	15	5
17	101404024	Bhawani Singh	10	3
18	101404025	Chirag Jain	12	4
19	101404026	Davileen Garg	19	5
20	101404027	Dilpreet Kaur	17	5
21	101404028	Divesh Kamdar	16	5
22	101404029	Divyam Aggarwal	19	5
23	101404031	Divyanshu Siddharth	15	5
24	101404032	Garima	15	5
25	101404033	Gav Chahar	12	4
26	101404035	Gaurav Rathore	14	4
27	101404036	Gurpreet Singh	16	5
28	101404037	Gursagar Singh	18	5
29	101404038	Gurupinder Pal Singh	16	5
30	101404039	Harmanpreet Singh	8	3
31	101404041	Harshit Kaushik	6	2
32	101404042	Harshvir Singh	19	5
33	101404043	Harsimarjot Kaur	10	3
34	101404044	Harsimran Singh	19	5
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	17	5
37	101404047	Hitesh Kumar	12	4
38	101404048	Ishita Mahindru	15	5
39	101404049	Jagmeet Singh Bawa	4	2
40	101404050	Jagnoor Kaur	17	5
41	101404051	Jashanpreet Singh	18	5
42	101404052	Jatin Bansal	12	4
43	101404053	Jatin Raheja	19	5
44	101404054	Kanishak Sharma	17	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
45	101404055	Karan Sanjeev Bajaj	14	4
46	101404056	Kirtish Madaan	16	5
47	101404057	Mahitosh Sharma	18	5
48	101404058	Manan Mittal	14	4
49	101404059	Mandeep Singh Panesar	17	5
50	101404060	Manisha Gupta	18	5
51	101404061	Manit Gupta	7	2
52	101404121	Siddharth Singh	12	4
53	101404129	Tarun Kumar	16	5
54	101404130	Tushar Goel	16	5
55	101404131	Utkarsh Apoorva	0	1
56	101404132	Utkarsh Atri	15	5
57	101404133	Vandana Gora	18	5
58	101404135	Vasu Mittal	17	5
59	101404136	Yashika Chopra	16	5
60	101404137	Yatin Gudwani	16	5
61	101404138	Yogesh Garg	10	3
62	101454001	Yatendra Agrawal	18	5
63	101454002	Yash Motwani	17	5
64	101584001	Amanjit Singh	16	5
65	101584002	Chetan Garg	18	5
66	101584004	Gurpreet Singh	16	5
67	101584005	Gurpreet Singh	0	1
68	101584006	Harman Preet Singh	10	3
69	101584008	Lakshay Garg	17	5
70	101584010	Rohit	5	2
71	101584012	Sharandeep Singh	15	5

The performance of students through the course UEI501 for criteria PO-01(A) is summarized in Table PO-01(A).2

**Table PO-01(A).2: Average score of student performance in the course UEI501 for criteria ‘PO-01(A)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEI501	64.79	12.68	11.27	7.04	4.23	4.27

### **UEI503: Digital Signal Processing and Applications**

The performance of course *UEI503: Digital Signal processing and Applications* is used to measure the attainment of outcome ‘PO-01(A)’ through the End Semester Examination (Question No. 4, Jan-June 2017, 15 marks).

#### **Question:**

Q.4	Obtain the Direct form I, Direct Form II and Cascade structure realization of the following system function  $H(z) = \frac{(1 + 1.5z^{-1} + 0.5z^{-2})(1 - 1.5z^{-1} + z^{-2})}{(1 + z^{-1} + 0.25z^{-2})(1 + 0.25z^{-1} + 0.5z^{-2})}$	(15)
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The performance of the students in the above question is summarized in Table PO-01(A).3 using rubrics defined in Table PO-01.1.

**Table PO-01(A).3: Students' performance in question targeting ‘PO-01(A)’: Course UEI503**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101404001	Abhay Mahipal	6	3
2	101404002	Abhijeet Singh Sankhla	15	5
3	101404004	Abhinav Arora	10	4
4	101404006	Abhishek Sharma	15	5
5	101404007	Ajay Singh	12	5
6	101404009	Alka Thakur	15	5
7	101404012	Ankush Goyal	15	5
8	101404013	Anmol Arjun Bharaj	6	3
9	101404014	Anmol Goyat	9	4
10	101404015	Anmol Rattan Kaur	10	4
11	101404017	Anubhav Kumar	10	4
12	101404018	Apeksha Goel	15	5
13	101404019	Arnish Jain	15	5
14	101404020	Arshiya	13	5
15	101404021	Arshjot Kaur	15	5
16	101404023	Ayush Jain	12	5
17	101404024	Bhawani Singh	13	5
18	101404025	Chirag Jain	13	5
19	101404026	Davileen Garg	15	5
20	101404027	Dilpreet Kaur	15	5
21	101404028	Divesh Kamdar	13	5
22	101404029	Divyam Aggarwal	15	5
23	101404031	Divyanshu Siddharth	7	3

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
24	101404032	Garima	4	2
25	101404033	Garv Chahar	15	5
26	101404035	Gaurav Rathore	6	3
27	101404036	Gurpreet Singh	15	5
28	101404037	Gursagar Singh	15	5
29	101404038	Gurupinder Pal Singh	14.5	5
30	101404039	Harmanpreet Singh	10	4
31	101404041	Harshit Kaushik	12	5
32	101404042	Harshvir Singh	14	5
33	101404043	Harsimarjot Kaur	15	5
34	101404044	Harsimran Singh	15	5
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	13	5
37	101404047	Hitesh Kumar	9	4
38	101404048	Ishita Mahindru	14	5
39	101404049	Jagmeet Singh Bawa	0.5	1
40	101404050	Jagnoor Kaur	15	5
41	101404051	Jashanpreet Singh	15	5
42	101404052	Jatin Bansal	15	5
43	101404053	Jatin Raheja	15	5
44	101404054	Kanishak Sharma	15	5
45	101404055	Karan Sanjeev Bajaj	15	5
46	101404056	Kirtish Madaan	15	5
47	101404057	Mahitosh Sharma	15	5
48	101404058	Manan Mittal	15	5
49	101404059	Mandeep Singh Panesar	14	5
50	101404060	Manisha Gupta	15	5
51	101404061	Manit Gupta	10	4
52	101404121	Siddharth Singh	0	1
53	101404129	Tarun Kumar	11	4
54	101404130	Tushar Goel	15	5
55	101404132	Utkarsh Atri	15	5
56	101404133	Vandana Gora	7	3
57	101404135	Vasu Mittal	11	4
58	101404136	Yashika Chopra	15	5
59	101404137	Yatin Gudwani	15	5
60	101404138	Yogesh Garg	10	4

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
61	101454001	Yatendra Agrawal	15	5
62	101454002	Yash Motwani	10	4
63	101584001	Amanjit Singh	13	5
64	101584002	Chetan Garg	15	5
65	101584004	Gurpreet Singh	0	1
66	101584005	Gurpreet Singh	0	1
67	101584006	Harman Preet Singh	0	1
68	101584008	Lakshay Garg	14	5
69	101584010	Rohit	0	1
70	101584012	Sharandeep Singh	11	4
71	101404062	Manjosh Singh Dhillon	12	5
72	101404063	Manpreet Singh Brar	13	5
73	101404064	Manvir Kaur	13	5
74	101404065	Mehak Bhatia	15	5
75	101404066	Mithilesh Kumar	5	2
76	101404067	Mohit Goyal	15	5
77	101404068	Mridul Marwaha	15	5
78	101404069	Mudit Arora	15	5
79	101404070	Naveen Parashar	1	1
80	101404072	Nigam Wadhwa	15	5
81	101404073	Nikhil Danodia	12	5
82	101404074	Nishita Kumari	8	3
83	101404075	Nitin Gupta	15	5
84	101404076	Nitish Arora	15	5
85	101404077	Nitish Bhardwaj	15	5
86	101404078	Omandeep Kaur	15	5
87	101404079	Pankaj Garg	11.5	5
88	101404080	Paramjot Singh	14	5
89	101404081	Parmar Adhiraj Singh	15	5
90	101404083	Prabhdeep Kaur	1	1
91	101404084	Prachur Maharwal	13	5
92	101404087	Prashant Khare	9	4
93	101404089	Pulkit Bansal	15	5
94	101404090	Pushpinder Singh	10	4
95	101404091	Rachit Verma	13	5
96	101404092	Rahul Gautam	4	2
97	101404093	Rahul Goyal	15	5

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
98	101404094	Rajshree Vaidya	1	1
99	101404096	Rishabh Gupta	3	2
100	101404099	Sagar Bansal	14	5
101	101404100	Sahajdeep Kaur	5	2
102	101404102	Sahil Singla	15	5
103	101404103	Samarth Gupta	15	5
104	101404104	Sambhav Jain	14	5
105	101404105	Samrat Kumar Gupta	0	1
106	101404106	Sanamdeep Singh	15	5
107	101404107	Sanket Gupta	14	5
108	101404108	Saurabh Kumar	3	2
109	101404109	Shailesh Verma	9	4
110	101404110	Shaiyya Thapliyal	10	4
111	101404111	Sher Mohammed	11	4
112	101404112	Shivam Dochania	15	5
113	101404113	Shivam Gera	4	2
114	101404114	Shivam Kumar Kedia	4	2
115	101404115	Shubham Bhardwaj	5	2
116	101404116	Shubham Chaturvedi	14	5
117	101404117	Shubham Garg	15	5
118	101404118	Shubham Kumar	4	2
119	101404119	Shubham Verma	5	2
120	101404120	Shubhdeep Singh	12	5
121	101404122	Simran Mehra	15	5
122	101404123	Sukhman	15	5
123	101404124	Swapnil Singla	14	5
124	101404125	Tanish Gupta	13	5
125	101404126	Taranjot Singh	8	3
126	101404127	Tarun Garg	15	5
127	101404128	Tarun Gupta	15	5
128	101454003	Harshwardhan Soni	1	1
129	101454004	Simardeep Kaur	15	5
130	101454005	Tejas Kapila	15	5
131	101454006	Nitish Dewan	3	2
132	101454007	Abhishek Nigam	15	5
133	101454008	Tarun Puri	15	5
134	101454009	Lariza Bansal	15	5

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
135	101454010	Tanish Goyal	15	5
136	101454011	Aditi	15	5
137	101584003	Devinder Kumar	0	1
138	101584007	Karamjeet Singh	7	3
139	101584009	Prince Kalia	13	5
140	101584011	Satvir Singh	0.5	1
141	101584013	Shashi Sharma	8	3
142	101584014	Sunnypreet Singh	7	3
143	101584015	Rajat Chandra	0	1
144	101584016	Gursimran Singh	0	1

The performance of students through the course UEI503 for criteria PO-01(A) is summarized in Table PO-01(A).4.

**Table PO-01(A).4: Average score of student performance in the course UEI503 for criteria PO-01(A)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEI503	61.81	11.81	6.94	8.33	11.11	4.05

The data from Table PO-01(A).2 and Table PO-01(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-01(A)’ and is summarised in Table PO-01(A).5.

**Table PO-01(A).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-01(A)’**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEI501	64.79	12.68	11.27	7.04	4.23	4.27
UEI503	61.81	11.81	6.94	8.33	11.11	4.05
Student class performance score	63.30	12.24	9.11	7.69	7.67	4.16

### b) Indirect Measures:

The indirect measurement of performance criteria ‘PO-01(A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-01(A).6 and Table PO-01(A).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-01(A)’.

<b>UEI501</b>	Analyse the stability of closed and open loop systems
<b>UEI503</b>	Design the structures of different types of digital filters

**Table PO-01(A).6: Weighted average score of performance criterion ‘PO-01(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEI501</b>	37.25	23.5	19.6	11.7	7.8	<b>3.70</b>
<b>UEI503</b>	15.63	39.06	34.83	7.81	3.13	<b>3.56</b>
<b>Course survey score</b>	<b>26.44</b>	<b>31.28</b>	<b>27.22</b>	<b>9.76</b>	<b>5.47</b>	<b>3.63</b>

- (ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-01’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An ability to apply knowledge of mathematics, science, and engineering
Alumni Survey	
Employer Survey	Do our students have an ability to apply knowledge of mathematics, science, and engineering?

**Table PO-01(A).7: Weighted average score of performance criterion ‘PO-01(A)’ based on Other Surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	33.80	53.52	12.68	0.00	0.00	<b>4.21</b>
<b>Employer survey</b>	40.00	46.67	13.33	0.00	0.00	<b>4.27</b>
<b>Alumni survey</b>	25.60	34.78	30.92	6.76	1.93	<b>3.75</b>
<b>Other surveys score</b>	<b>33.13</b>	<b>44.99</b>	<b>18.98</b>	<b>2.25</b>	<b>0.64</b>	<b>4.08</b>

### c) Overall weighted average score of performance criterion ‘PO-01(A)’

The overall weighted average score of performance criterion ‘PO-01(A)’ is summarised in Table PO-01(A).8 from the data given in Tables PO-01(A).5, PO-01(A).6 and PO-01(A).7.

**Table PO-01(A).8: Overall weighted average score of performance criterion ‘PO-01(A)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		

<b>Student class performance</b>	63.30	12.24	9.11	7.69	7.67	<b>4.16</b>	5
<b>Course surveys</b>	26.44	31.28	27.22	9.76	5.47	<b>3.63</b>	4
<b>Other surveys</b>	33.13	44.99	18.98	2.25	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>43.47</b>	<b>26.77</b>	<b>17.61</b>	<b>7.02</b>	<b>5.18</b>	<b>3.96</b>	-

### Assessment of outcome ‘PO-01’ using Performance Criterion ‘PO-01(B)’

#### **PO-01(B): Demonstrate knowledge of fundamentals, scientific and/or engineering principles towards solving engineering problems**

The performance criteria ‘PO-01(B)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

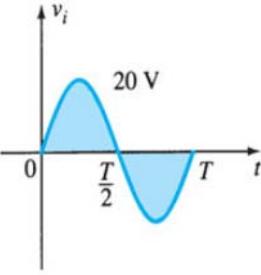
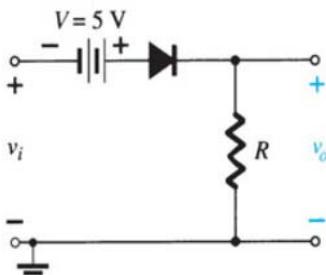
#### a.) Assessment Tool: Students’ performance using Course Portfolio

Two courses namely *UEE505: Analog and Digital Systems* and *UEE603: Switchgear and Protection* are used to assess performance criteria PO-01(B) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE505: Analog and Digital Systems**

The performance of course *UEE505: Analog and Digital Systems* is used to measure the attainment of outcome ‘PO-01(B)’ through the Mid Semester Test (Question No. 5, Jan-June 2016, 10 marks).

#### **Question:**

Q5	(a) Determine the output waveform for the sinusoidal waveform of the given figure.	(05)
	 	
	(b) Design a high pass filter for cut off frequency of 1kHz and pass band gain of 2.	(05)

The performance of the students in the above question is summarized in Table PO-01(B).1 using rubrics defined in Table PO-01.1.

**Table PO-01(B).1: Students' performance in question targeting 'PO-01(B)'; Course UEE505**

S.No.	Roll No.	Name	Marks(10)	Score(1-5)
1	101504046	Gurnoor Kaur	4	3
2	101504054	Himanshu Gupta	7.5	5
3	101504069	Mayank Kumar	9	5
4	101504070	Mehul Natu	4	3
5	101504073	Neha Bhargava	6	4
6	101504074	Neha Singla	5	3
7	101504075	Nihal Singh	9	5
8	101504076	Nikhil Sharma	10	5
9	101504078	Nitin Gupta	7.5	5
10	101504079	Nitish Kumar Soni	8	5
11	101504081	Osho	5	3
12	101504082	Pankaj Goyal	4	3
13	101504083	Parmeet Singh Sangha	6.5	4
14	101504084	Parth Gupta	0.5	1
15	101504085	Pinak Bhardwaj	8	5
16	101504086	Prabhav Pande	8.5	5
17	101504087	Pragati Sharma	1	1
18	101504088	Pranav Joshi	1	1
19	101504089	Pranav Mathur	4	3
20	101504094	Prateek Gupta	2.5	2
21	101504096	Praveen Kumar Yadav	0	1
22	101504097	Raghav Kumar Tiwari	2.5	2
23	101504098	Ramandeep Singh	3.5	2
24	101504099	Ramandeep Singh	6.5	4
25	101504100	Ramneet Kaur	4	3
26	101504101	Ravneet Sharma	2.5	2
27	101504103	Rohan Malhotra	4	3
28	101504104	Rohit Arora	4	3
29	101504105	Rushil Krishna	5.5	3
30	101504107	Sahil Bansal	1.5	1
31	101504108	Sahil Virk	4.5	3
32	101504109	Sainesh Karamchandani	2	2
33	101504114	Satyam Kumar	10	5
34	101504115	Shanun Randev	0	1

S.No.	Roll No.	Name	Marks(10)	Score(1-5)
35	101504116	Shaurya Gaba	5	3
36	101504117	Sheikh Mohd Najam Ul Sehar	0	1
37	101504118	Shrey Arora	5	3
38	101504119	Shubham Gupta	7	4
39	101504120	Stuti Sidhu	0	1
40	101504121	Suhas Mahajan	9	5
41	101504122	Swanav Swaroop	10	5
42	101504124	Utkarsh Verma	2	2
43	101504125	Vaibhav Chawla	3.5	2
44	101504126	Vaibhav Singh	5.5	3
45	101504127	Vikram Kumawat	10	5
46	101504128	Viraj Baswana	0	1
47	101504130	Vishal Bansal	4.5	3
48	101504131	Vishu Jain	7	4
49	101504133	Riya Gupta	0	1
50	101554006	Bhisham Mittal	4	3
51	101554008	Evan Garg	9	5
52	101554009	Gayatri Bansal	9	5
53	101554014	Himanshu Mittal	4.5	3
54	101554017	Kratika Agarwal	5.5	3
55	101554019	Mahima Goel	8	5
56	101554020	Mannat Batish	6	4
57	101554022	Prabhjot Singh Saini	7	4
58	101554024	Rajat Dixit	3	2
59	101554026	Ritunjay Gupta	5	3
60	101554027	Rohit Mehta	7.5	5
61	101554028	Romil Garg	3.5	2
62	101554029	Sahil Sharma	4.5	3
63	101554030	Sahil Virk	0	1
64	101554031	Sajan Goyal	3	2
65	101554032	Sanchit Sharma	1	1
66	101554033	Saransh Sehgal	1	1
67	101554035	Shishant Airon	8.5	5
68	101684007	Khushdeep Singh	3.5	2
69	101684008	Mandeep Sharma	2.5	2
70	101684010	Nikhil Dhiman	3	2
71	101684011	Nittin Garg	6	4

S.No.	Roll No.	Name	Marks(10)	Score(1-5)
72	101684012	Paras Arora	3	2
73	101684013	Pratik Bal	0	1
74	101684014	Simranjeet Singh	1	1
75	101684015	Sahib Singh	0	1
76	101684016	Sukhwinder Singh	0	1
77	101684017	Ketan Singla	9	5
78	101684018	Vaneet Kumar	2	2
79	401504007	Simarpreet Singh	0.5	1
80	401504008	Uday Bhandari	0	1
81	401554001	Kunal Gupta	5.5	3
82	101504002	Aastha Jain	0	1
83	101504004	Aayush Vohra	6	4
84	101504005	Aayush Rai Anand	6	4
85	101504006	Abhijeet Singh Bhatia	3.5	2
86	101504007	Abhinandan Narang	6	4
87	101504008	Abhishek Agarwal	9.5	5
88	101504009	Abhishek Pandey	1	1
89	101504010	Abhishek Prasad	0	1
90	101504011	Adarsh Agarwal	1	1
91	101504012	Aditi Mishra	0	1
92	101504013	Akshita Kamthan	0	1
93	101504014	Amandeep Singh Dhillon	3	2
94	101504015	Amarjot Singh	6.5	4
95	101504017	Amrit Kaler	2	2
96	101504018	Anahita	7.5	5
97	101504019	Ankit Gupta	3	2
98	101504020	Ankit Mahajan	7	4
99	101504021	Anmol Saluja	10	5
100	101504022	Anurag Dewangan	2.5	2
101	101504023	Arjun Garg	0	1
102	101504024	Ashish Nagpal	8.5	5
103	101504025	Ashish Kumar Yadav	6.5	4
104	101504026	Ashwini Anand Pateriya	7	4
105	101504027	Avantika Dhiman	1	1
106	101504028	Avinash Chaturvedi	7	4
107	101504029	Badshah Singh	0	1
108	101504030	Baninder Singh	7	4

S.No.	Roll No.	Name	Marks(10)	Score(1-5)
109	101504031	Bhanu Pratap	5	3
110	101504032	Bhavay Gudwani	6	4
111	101504034	Bikram Pathania	10	5
112	101504035	Charika Mehta	2	2
113	101504036	Daman Aggarwal	8.5	5
114	101504037	Deen Dayal	6	4
115	101504038	Deepak Goyal	9	5
116	101504039	Divanshu Garg	5	3
117	101504040	Divyam Soni	9	5
118	101504041	Fiza Singh Multani	7	4
119	101504043	Gurjot Singh Kocher	4	3
120	101504044	Gurleen Kang	7.5	5
121	101504045	Gurleen Kaur	5	3
122	101504047	Gursimratpal Singh Sidhu	10	5
123	101504049	Harnishan Singh Kang	3.5	2
124	101504050	Harshit Lohaan	3.5	2
125	101504052	Harshjot Singh Pahuja	8	5
126	101504053	Hashmeet Singh Ganda	0	1
127	101504055	Himanshu Sahwal	2	2
128	101504057	Jaideep Grover	6	4
129	101504059	Jasjit Singh	9	5
130	101504060	Jaskirat Kaur Gill	2	2
131	101504061	Jatinderpal Singh	8	5
132	101504063	Kuljeet Singh	0	1
133	101504064	Kunwar Achint Singh	0	1
134	101504065	Lakhan Sharma	5	3
135	101504132	Abhishek Singhal	4	3
136	101554001	Aditya	8.5	5
137	101554002	Aditya Kumar	4	3
138	101554004	Apoorv Gupta	0	1
139	101554005	Archit Rawat	4.5	3
140	101554007	Deepika Gandhi	0	1
141	101554010	Gurmehar Singh	0	1
142	101554011	Gursiddak Singh	5	3
143	101554012	Harmanjit Singh	1	1
144	101554013	Harshit Sethi	7	4
145	101554016	Ishan Kashyap	7	4

S.No.	Roll No.	Name	Marks(10)	Score(1-5)
146	101554018	Madhurbain Singh	6	4
147	101554021	Piyush Kumar Gupta	10	5
148	101554023	Prakhar Srivastava	6.5	4
149	101554034	Savi	1	1
150	101554036	Simran Saluja	1	1
151	101684001	Abhishek Kumar	1	1
152	101684002	Ajay Kumar	0	1
153	101684003	Deepak Bansal	3.5	2
154	101684004	Jashandeep Singh	5	3
155	101684005	Karanveer Singh	0	1
156	101684006	Khuaish Pandey	7	4
157	101684019	Hitesh Gulati	10	5
158	101684020	Kanishk Agarwal	10	5
159	401504001	Abhishek Garg	2.5	2
160	401504002	Divya Kumar Gupta	0	1
161	401684001	Abhinav Aggarwal	8.5	5

The performance of students through the course UEE505 for criteria PO-01(B) is summarized in Table PO-01(B).2.

**Table PO-01(B).2: Average score of student performance in the course UEE505 for criteria PO-01(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE505	22.36	16.15	19.25	16.77	25.47	2.93

### UEE603: Switchgear and Protection

The performance of course *UEE603: Switchgear and Protection* is used to measure the attainment of outcome ‘PO-01(B)’ through End Semester Examination (Question No.4, Jan-June 2017, 10 marks).

#### Question:

Q 4	A 50 Hz, 7.5 kV, 3-phase alternator with earthed neutral has a reactance of $4\Omega$ per phase and is connected to a bus-bar through a circuit breaker. The distributed capacitance upto circuit breaker between phase and neutral is $0.01 \mu F$ . Determine  1. peak re-striking voltage across the contacts of the breaker.	(10)
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	2. frequency of oscillations. 3. the average rate of rise of re-striking voltage up to the first peak.	
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The performance of the students in the above question is summarized in Table PO-01(B).3 using rubrics defined in Table PO-01.1.

**Table PO-01(B).3: Students' performance in question targeting 'PO-01(B)'; Course UEE603**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	10	5
2	101404002	Abhijeet Singh Sankhla	2	2
3	101404004	Abhinav Arora	4	3
4	101404006	Abhishek Sharma	10	5
5	101404007	Ajay Singh	10	5
6	101404009	Alka Thakur	6	4
7	101404012	Ankush Goyal	4	3
8	101404013	Anmol Arjun Bharaj	2	2
9	101404014	Anmol Goyat	5	3
10	101404015	Anmol Rattan Kaur	10	5
11	101404017	Anubhav Kumar	2	2
12	101404018	Apeksha Goel	10	5
13	101404019	Arnish Jain	4	3
14	101404020	Arshiya	10	5
15	101404021	Arshjot Kaur	6	4
16	101404023	Ayush Jain	6	4
17	101404024	Bhawani Singh	10	5
18	101404025	Chirag Jain	4	3
19	101404026	Davileen Garg	2	2
20	101404027	Dilpreet Kaur	2	2
21	101404028	Divesh Kamdar	8	5
22	101404029	Divyam Aggarwal	10	5
23	101404031	Divyanshu Siddharth	7	4
24	101404032	Garima	8	5
25	101404033	Garv Chahar	0	1
26	101404035	Gaurav Rathore	0	1
27	101404036	Gurpreet Singh	4	3
28	101404037	Gursagar Singh	10	5
29	101404038	Gurupinder Pal Singh	0	1
30	101404039	Harmanpreet Singh	0	1

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
31	101404041	Harshit Kaushik	4	3
32	101404042	Harshvir Singh	5	3
33	101404043	Harsimarjot Kaur	6	4
34	101404044	Harsimran Singh	10	5
35	101404046	Heema Gupta	0	1
36	101404047	Hitesh Kumar	6	4
37	101404048	Ishita Mahindru	0	1
38	101404049	Jagmeet Singh Bawa	10	5
39	101404050	Jagnoor Kaur	10	5
40	101404051	Jashanpreet Singh	10	5
41	101404052	Jatin Bansal	10	5
42	101404053	Jatin Raheja	8	5
43	101404054	Kanishak Sharma	10	5
44	101404055	Karan Sanjeev Bajaj	8	5
45	101404056	Kirtish Madaan	10	5
46	101404057	Mahitosh Sharma	10	5
47	101404058	Manan Mittal	10	5
48	101404059	Mandeep Singh Panesar	10	5
49	101404060	Manisha Gupta	10	5
50	101404061	Manit Gupta	6	4
51	101404062	Manjosh Singh Dhillon	10	5
52	101404063	Manpreet Singh Brar	2	2
53	101404064	Manvir Kaur	10	5
54	101404065	Mehak Bhatia	6	4
55	101404066	Mithilesh Kumar	6	4
56	101404067	Mohit Goyal	10	5
57	101404068	Mridul Marwaha	10	5
58	101404069	Mudit Arora	10	5
59	101404070	Naveen Parashar	10	5
60	101404072	Nigam Wadhwa	10	5
61	101404073	Nikhil Danodia	3	2
62	101404074	Nishita Kumari	8	5
63	101404075	Nitin Gupta	10	5
64	101404076	Nitish Arora	10	5
65	101404077	Nitish Bhardwaj	2	2
66	101404078	Omandeep Kaur	10	5
67	101404079	Pankaj Garg	8	5

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
68	101404080	Paramjot Singh	10	5
69	101404081	Parmar Adhiraj Singh	2	2
70	101404083	Prabhdeep Kaur	6	4
71	101404084	Prachur Maharwal	5	3
72	101404087	Prashant Khare	6	4
73	101404089	Pulkit Bansal	10	5
74	101404090	Pushpinder Singh	9	5
75	101404091	Rachit Verma	8	5
76	101404092	Rahul Gautam	0	1
77	101404093	Rahul Goyal	10	5
78	101404094	Rajshree Vaidya	6	4
79	101404096	Rishabh Gupta	10	5
80	101404099	Sagar Bansal	10	5
81	101404100	Sahajdeep Kaur	6	4
82	101404102	Sahil Singla	10	5
83	101404103	Samarth Gupta	8	5
84	101404104	Sambhav Jain	8	5
85	101404105	Samrat Kumar Gupta	4	3
86	101404106	Sanamdeep Singh	10	5
87	101404107	Sanket Gupta	2	2
88	101404108	Saurabh Kumar	10	5
89	101404109	Shailesh Verma	8	5
90	101404110	Shaivya Thapliyal	10	5
91	101404111	Sher Mohammed	10	5
92	101404112	Shivam Dochania	8	5
93	101404113	Shivam Gera	2	2
94	101404114	Shivam Kumar Kedia	10	5
95	101404115	Shubham Bhardwaj	10	5
96	101404116	Shubham Chaturvedi	10	5
97	101404117	Shubham Garg	10	5
98	101404118	Shubham Kumar	8	5
99	101404119	Shubham Verma	2	2
100	101404120	Shubhdeep Singh	3	2
101	101404121	Siddharth Singh	0	1
102	101404122	Simran Mehra	10	5
103	101404123	Sukhman	10	5
104	101404124	Swapnil Singla	2	2

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
105	101404125	Tanish Gupta	10	5
106	101404126	Taranjot Singh	10	5
107	101404127	Tarun Garg	10	5
108	101404128	Tarun Gupta	3	2
109	101404129	Tarun Kumar	5	3
110	101404130	Tushar Goel	6	4
111	101404132	Utkarsh Atri	10	5
112	101404133	Vandana Gora	0	1
113	101404135	Vasu Mittal	3	2
114	101404136	Yashika Chopra	10	5
115	101404137	Yatin Gudwani	10	5
116	101404138	Yogesh Garg	4	3
117	101454001	Yatendra Agrawal	4	3
118	101454002	Yash Motwani	10	5
119	101454003	Harshwardhan Soni	2	2
120	101454004	Simardeep Kaur	10	5
121	101454005	Tejas Kapila	6	4
122	101454006	Nitish Dewan	2	2
123	101454007	Abhishek Nigam	4	3
124	101454008	Tarun Puri	4	3
125	101454009	Lariza Bansal	8	5
126	101454010	Tanish Goyal	10	5
127	101454011	Aditi	0	1
128	101484003	Ashmeen Singh	0	1
129	101584001	Amanjit Singh	8	5
130	101584002	Chetan Garg	10	5
131	101584003	Devinder Kumar	8	5
132	101584007	Karamjeet Singh	5	3
133	101584008	Lakshay Garg	8	5
134	101584009	Prince Kalia	4	3
135	101584010	Rohit	0	1
136	101584011	Satvir Singh	0	1
137	101584012	Sharandeep Singh	5	3
138	101584013	Shashi Sharma	0	1
139	101584014	Sunnypreet Singh	3	2
140	101584015	Rajat Chandra	0	1
141	101584016	Gursimran Singh	8	5

The performance of students through the course UEE603 for criteria PO-01(B) is summarized in Table PO-01(B).4.

**Table PO-01(B).4: Average score of student performance in the course UEE603 for criteria PO-01(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE603	52.48	10.64	12.77	13.48	10.64	3.81

The data from Table PO-01(B).2 and Table PO-01(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-01(B)’, and is summarised in Table PO-01(B).5.

**Table PO-01(B).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-01(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE505	22.36	16.15	19.25	16.77	25.47	2.93
UEE603	52.48	10.64	12.77	13.48	10.64	3.81
Student class performance score	37.42	13.39	16.01	15.12	18.05	3.37

### b) Indirect Measures:

The indirect measurement of performance criteria ‘PO-01(B)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-01(B).6 and Table PO-01(A).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-01(B)’.

UEE505	Design different types of circuits such as rectifiers, clippers ,clampers, filters etc.
UEE603	Select the protection elements such as fuse, circuit breakers and relays etc. for a given configuration

**Table PO-01(B).6: Weighted average score of performance criterion ‘ PO-01(B)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE505	33.33	27.16	25.92	6.17	7.40	3.73
UEE603	23.29	46.58	27.40	0.00	2.74	3.87

<b>Course survey score</b>	<b>28.31</b>	<b>36.87</b>	<b>26.66</b>	<b>3.09</b>	<b>5.07</b>	<b>3.80</b>
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(ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-01’ through indirect measurement and is summarized in Table PO-01(A).7

**c) Overall weighted average score of performance criterion ‘PO-01(B)’**

The overall weighted average score of performance criterion ‘PO-01(B)’ is summarised in Table PO-01(B).7 from the data given in Tables 4. PO-01(B).5, 4. PO-01(B).6 and 4. PO-01(A).7.

**Table PO-01(B).7: Overall weighted average score of performance criterion ‘PO-01(B)’**

<b>Assessment Tool</b>	<b>% of students in each score</b>					<b>Average Score</b>	<b>Assessment Tool Weight</b>
	5	4	3	2	1		
<b>Student class performance</b>	37.42	13.39	16.01	15.12	18.05	<b>3.37</b>	5
<b>Course surveys</b>	28.31	36.87	26.66	3.09	5.07	<b>3.80</b>	4
<b>Other surveys</b>	33.13	44.99	18.98	2.25	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>33.31</b>	<b>29.12</b>	<b>20.30</b>	<b>7.89</b>	<b>9.37</b>	<b>3.69</b>	

**Assessment of outcome ‘PO-01’ using performance criterion PO-01(C)**

**PO-01(C): Apply numerical and statistical methods in analyzing data**

The performance criteria ‘PO-01(C)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

**a.) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE802: Intelligent Algorithms in Power system* and *UEE804: Operation and Control of Power* are used to assess performance criteria PO-01(C) as a direct measure. The analysis for each of these courses is provided below:

**UEE802: Intelligent Algorithms in Power system**

The performance of course *UEE802: Intelligent Algorithms in Power Systems* is used to measure the attainment of outcome ‘PO-01(C)’ through the End Semester Examination (Question No. 3, July- Dec 2016, 15 Marks).

**Question:**

<p>Q3.</p> <p>Consider the following feed forward network with one hidden layer of units as shown in <b>Fig. 1</b>. The input vector to the network is <math>\mathbf{x} = [x_1, x_2, x_3]^T</math>, the vector of hidden layer outputs is <math>\mathbf{y} = [y_1, y_2]^T</math>, the vector of actual outputs is <math>\mathbf{z} = [z_1, z_2, z_3]^T</math>, and the vector of desired outputs is <math>\mathbf{t} = [t_1, t_2, t_3]^T</math>. The network has the following weight vectors:</p> $\mathbf{v}_1 = \begin{bmatrix} 0.4 \\ -0.6 \\ 1.9 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} -1.2 \\ 0.5 \\ -0.7 \end{bmatrix}, \quad \mathbf{w}_1 = \begin{bmatrix} 1.0 \\ -3.5 \end{bmatrix}, \quad \mathbf{w}_2 = \begin{bmatrix} 0.5 \\ -1.2 \end{bmatrix} \quad \text{and} \quad \mathbf{w}_3 = \begin{bmatrix} 0.3 \\ 0.6 \end{bmatrix}.$	<p>Assume that all units have sigmoid activation functions and that each unit has a bias <math>\theta = 0</math> (zero). If the network is tested with an input vector <math>\mathbf{x} = [1.0, 2.0, 3.0]^T</math>. Update the weights in each layer with one forward pass and one backward pass. Use back propagation algorithm.</p>
	<p style="text-align: right;">(15)</p>

Fig. 1

The performance of the students in the above question is summarized in Table PO-01(C).1 using rubrics defined in Table PO-01.1.

**Table PO-01(C).1: Student's performance in question targeting 'PO-01(C)'; Course UEE802**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101254015	Kuldeep Singh Deora	0	1
2	101304001	Aarushi Bajaj	12	5
3	101304002	Abhey Arora	5	2
4	101304003	Abhishek Taksali	12	5
5	101304004	Adhikaansh Tayal	5	2
6	101304005	Aditi Narang	14	5
7	101304006	Aditya	4	2
8	101304007	Akshat	7	3
9	101304008	Akshay Kapoor	15	5
10	101304009	Akshay Kumar	10	4

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
11	101304010	Akshay Kumar Chaudhary	11	4
12	101304011	Akshay Sharma	2	1
13	101304012	Amandeep Kaur	12	5
14	101304013	Amandeep Singh	7	3
15	101304014	Amaninder Singh Randhawa	2	1
16	101304015	Angad Kapoor	12	5
17	101304016	Ankita Garg	13	5
18	101304018	Anmol Jawa	12	5
19	101304019	Anmolpreet Singh	7	3
20	101304020	Anyuti Tiwary	12	5
21	101304021	Arpit Sharma	0	1
22	101304022	Arsh Kundal	10	4
23	101304023	Arshbir Kaur	11	4
24	101304024	Arshdeep Singh Bagga	10	4
25	101304025	Ashish	5	2
26	101304026	Ashish Rajpal	7	3
27	101304028	Berry Lubana	10	4
28	101304029	Bhanu Duggal	7	3
29	101304030	Bhanu Marwaha	10	4
30	101304031	Chirag Gaba	11	4
31	101304032	Dipin Garg	13	5
32	101304033	Dishant Vanvari	12	5
33	101304034	Divyesh Pratap Singh	12	5
34	101304035	Elham Anwar	10	4
35	101304036	Gurseerat Singh Meen	0	1
36	101304037	Gursewak Singh	13	5
37	101304040	Hariansh Sehgal	7	3
38	101304041	Hartejdeep Singh	10	4
39	101304042	Himanshu Goyal	0	1
40	101304044	Jasjit Singh	2	1
41	101304045	Jassimran Singh Julka	3	2
42	101304046	Jessica Dhaliwal	15	5
43	101304047	Kanwarpal Singh	13	5
44	101304048	Karan Kumar	7	3
45	101304049	Karanjot Singh Kochhar	12	5
46	101304050	Kashish Aggarwal	13	5
47	101304052	Love Gaba	5	2

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
48	101304054	Manik Mittal	5	2
49	101304055	Maninderjit Singh	11	4
50	101304056	Mayank Singla	8	3
51	101304057	Mridul Bhutani	8	3
52	101304058	Naman Garg	15	5
53	101304059	Navdeep Singh	12	5
54	101304060	Navdeep Singh	8	3
55	101304062	Nishant Garg	15	5
56	101304094	Satripleen Kaur	12	5
57	101484001	Amandeep Singh	10	4
58	101484002	Amrinder Singh	13	5
59	101484003	Ashmeen Singh	12	5
60	101484004	Azad Singh	5	2
61	101484005	Chandan Garg	0	1
62	101484007	Deepak Singla	0	1
63	101484008	Diljeet Singh	13	5
64	101304051	Kritika Singla	11	4
65	101304061	Nazuk Aggarwal	13	5
66	101304063	Nishtha Raheja	8	3
67	101304064	Paras Bawa	5	2
68	101304065	Parth Ahuja	10	4
69	101304066	Parushi	11	4
70	101304067	Pency Goyal	8	3
71	101304068	Piyush Jindal	10	4
72	101304069	Piyush Tripathi	1	1
73	101304070	Prachi Garg	12	5
74	101304071	Prashant Kataria	1	1
75	101304072	Preeti Garg	12	5
76	101304073	Priyank Arora	5	2
77	101304074	Priyanka	1	1
78	101304075	Priyanka Singh	12	5
79	101304076	Priyansh Mahajan	15	5
80	101304077	Rahul Meena	0	1
81	101304078	Rajan	1	1
82	101304079	Rajat Sharma	11	4
83	101304080	Ratul Goyal	10	4
84	101304081	Ravinder Singh	2	1

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
85	101304082	Rishabh Juneja	13	5
86	101304083	Robin Manktala	5	2
87	101304084	Rohan Ghai	12	5
88	101304085	Rohan Singla	5	2
89	101304086	Rohan Wadhawan	7	3
90	101304087	Rohit Goyal	8	3
91	101304088	Rubina Bamba	10	4
92	101304089	Sagar Pulani	13	5
93	101304090	Sahil Kataria	2	1
94	101304091	Sakshi	12	5
95	101304092	Sandal Singh Sidhu	0	1
96	101304093	Sandeep Kaur	2	1
97	101304095	Saurabh Mohan	11	4
98	101304096	Shagundeepr Singh	0	1
99	101304097	Shailey Gupta	6	3
100	101304098	Shaina	4	2
101	101304099	Shivika Gupta	7	3
102	101304100	Shresth Rai	2	1
103	101304101	Shubham Goyal	8	3
104	101304102	Shubham Gupta	12	5
105	101304103	Shubham Sharma	10	4
106	101304104	Shubham Sharma	7	3
107	101304105	Shubham Soin	12	5
108	101304106	Siddharth Goyal	7	3
109	101304107	Sidharth Garg	12	5
110	101304108	Simran Kaur	12	5
111	101304109	Simranjit Singh	0	1
112	101304111	Sumit Dhingra	5	2
113	101304112	Sumit Kaushik	13	5
114	101304113	Tushar Dheer	15	5
115	101304114	Tushar Sharma	5	2
116	101304116	Utsav Chhabra	1	1
117	101304117	Vaibhav Gupta	8	3
118	101304118	Vaishali	11	4
119	101304119	Varun Bansal	12	5
120	101304120	Veni Jindal	12	5
121	101304121	Vishal Arora	12	5

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
122	101304122	Yugesh Goyal	4	2
123	101484009	Jyoti Kaushal	2	1
124	101484011	Pawan Kumar	12	5
125	101484012	Rajat Singla	10	4
126	101484013	Satveer Kaur	10	4
127	101484014	Saurabh Kumar Wadhawan	0	1
128	101484015	Shweta Sharma	6	3
129	101484016	Sukhjeet Singh	6	3

The performance of students through the course UEE802 for criteria PO-01(C) is summarized in Table PO-01(C).2.

**Table PO-01(C).2: Average score of student performance in the course UEE802 for criteria PO-01(C)**

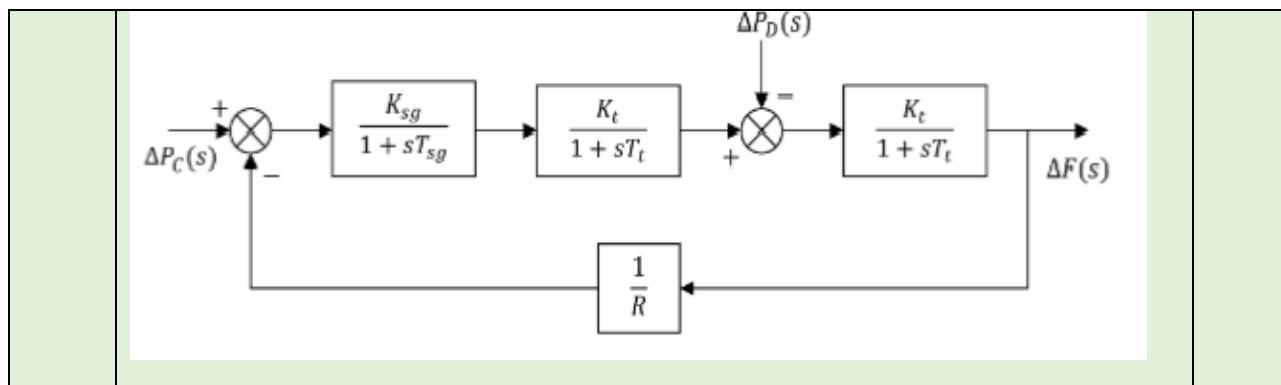
Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	33.33	18.60	17.05	12.40	18.60	3.36

### UEE804: Operation and Control of PowerSystems

The performance of course *UEE804: Operation and Control of Power Systems* is used to measure the attainment of outcome ‘PO-01(C)’ through Mid Semester Test (Question4(a), July-Dec 2016, 07 Marks)

#### Question:

Q4(a)	Consider the block diagram model of LFC given in Fig. 3. Make the following approximation.  $(1 + sT_{sg})(1 + sT_t) \cong 1 + s(T_{sg} + T_t) = 1 + sT_{eq}$	(07)
	Solve for $\Delta f(t)$ with parameters given below. Given $\Delta P_D = 0.01 \text{ pu}$ .  $T_{eq} = 0.4 + 0.5 = 0.9 \text{ sec}$ ; $T_{ps} = 20 \text{ sec}$  $K_{sg}K_t = 1$ ; $K_{ps} = 100$ ; $R = 3$ .	



The performance of the students in the above question is summarized in Table PO-01(C).2 using rubrics defined in Table PO-01.1.

**Table PO-01(C).2: Student's performance in question targeting 'PO-01(C)'; Course UEE804**

S. No	Roll No.	Name of Student	Marks (7)	Score (1-5)
1	101304001	Aarushi Bajaj	7	5
2	101304002	Abhey Arora	0	1
3	101304004	Adhikaansh Tayal	4	3
4	101304005	Aditi Narang	5	4
5	101304006	Aditya	7	5
6	101304007	Akshat	5	4
7	101304008	Akshay Kapoor	6	5
8	101304009	Akshay Kumar	2	2
9	101304010	Akshay Kumar Chaudhary	2	2
10	101304011	Akshay Sharma	3	3
11	101304012	Amandeep Kaur	3	3
12	101304013	Amandeep Singh	2	2
13	101304014	Amaninder Singh Randhawa	1	1
14	101304015	Angad Kapoor	2	2
15	101304016	Ankita Garg	7	5
16	101304018	Anmol Jawa	2	2
17	101304019	Anmolpreet Singh	5	4
18	101304020	Anyuti Tiwary	3	3
19	101304021	Arpit Sharma	5	4
20	101304022	Arsh Kundal	2	2
21	101304023	Arshbir Kaur	3	3
22	101304024	Arshdeep Singh Bagga	4	3
23	101304025	Ashish	6	5
24	101304026	Ashish Rajpal	6	5
25	101304028	Berry Lubana	2	2

26	101304029	Bhanu Duggal	3	3
27	101304030	Bhanu Marwaha	5	4
28	101304031	Chirag Gaba	3	3
29	101304032	Dipin Garg	5	4
30	101304033	Dishant Vanvari	3	3
31	101304034	Divyesh Pratap Singh	2	2
32	101304035	Elham Anwar	0	1
33	101304036	Gurseerat Singh Meen	0	1
34	101304037	Gursewak Singh	3	3
35	101304040	Hariansh Sehgal	3	3
36	101304041	Hartejdeep Singh	0	1
37	101304042	Himanshu Goyal	0	1
38	101304044	Jasjit Singh	0	1
39	101304045	Jassimran Singh Julka	0	1
40	101304046	Jessica Dhaliwal	7	5
41	101304047	Kanwarpal Singh	1	1
42	101304048	Karan Kumar	0	1
43	101304049	Karanjot Singh Kochar	4	3
44	101304050	Kashish Aggarwal	6	5
45	101304052	Love Gaba	3	3
46	101304054	Manik Mittal	0	1
47	101304055	Maninderjit Singh	6	5
48	101304056	Mayank Singla	3	3
49	101304057	Mridul Bhutani	2	2
50	101304058	Naman Garg	6	5
51	101304059	Navdeep Singh	6	5
52	101304062	Nishant Garg	4	3
53	101304094	Satripleen Kaur	4	3
54	101484001	Amandeep Singh	6	5
55	101484002	Amrinder Singh	0	1
56	101484003	Ashmeen Singh	0	1
57	101484004	Azad Singh	0	1
58	101484007	Deepak Singla	0	1
59	101484008	Diljeet Singh	4	3

The performance of students through the course UEE804 for criteria PO-01(C) is summarized in Table PO-01(C).4.

**Table PO-01(C).4: Average score of student performance in the course UEE804 for criteria PO-01(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE804	20.34	10.17	28.81	15.25	25.42	2.85

The data from Table PO-01(C).2 and Table PO-01(C).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-01(C)’ and is summarized in Table PO-01(C).5.

**Table PO-01(C).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-01(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	33.33	18.60	17.05	12.40	18.60	3.36
UEE804	20.34	10.17	28.81	15.25	25.42	2.85
Student class performance score	26.84	14.39	22.93	13.83	22.01	3.11

### b) Indirect Measures:

The indirect measurement of performance criteria ‘PO-01(C)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-01(C).6 and Table PO-01(A).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-01(C)’.

UEE802	Explain feed forward neural network and application
UEE804	Design and apply control for frequency and voltage of power system represented by single or multi-area

**Table PO-01(C).6: Weighted average score of performance criterion ‘PO-01(C)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	26.56	33.59	35.16	1.56	3.12	3.79
UEE804	34.09	20.45	36.36	4.50	4.50	3.74
Course survey score	30.33	27.02	35.76	3.03	3.81	3.77

(ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-01’ through indirect measurement and is summarized in Table PO-01(A).7.

**c) Overall weighted average score of performance criterion ‘PO-01(C)’**

The overall weighted average score of performance criterion ‘PO-01(C)’ is summarised in Table PO-01(C).7 from the data given in Tables PO-01(C).5, PO-01(C).6 and PO-01(A).7.

**Table PO-01(C).7: Overall weighted average score of performance criterion ‘PO-01(C)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	26.84	14.39	22.93	13.83	22.01	<b>3.11</b>	5
Course surveys	30.33	27.02	35.76	3.03	3.81	<b>3.77</b>	4
Other surveys	33.13	44.99	18.98	2.25	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>29.58</b>	<b>26.25</b>	<b>26.22</b>	<b>7.34</b>	<b>10.60</b>	<b>3.57</b>	

**Overall assessment of program outcome PO-01 using scores of PO-01(A), PO-01(B) and PO-01(C)**

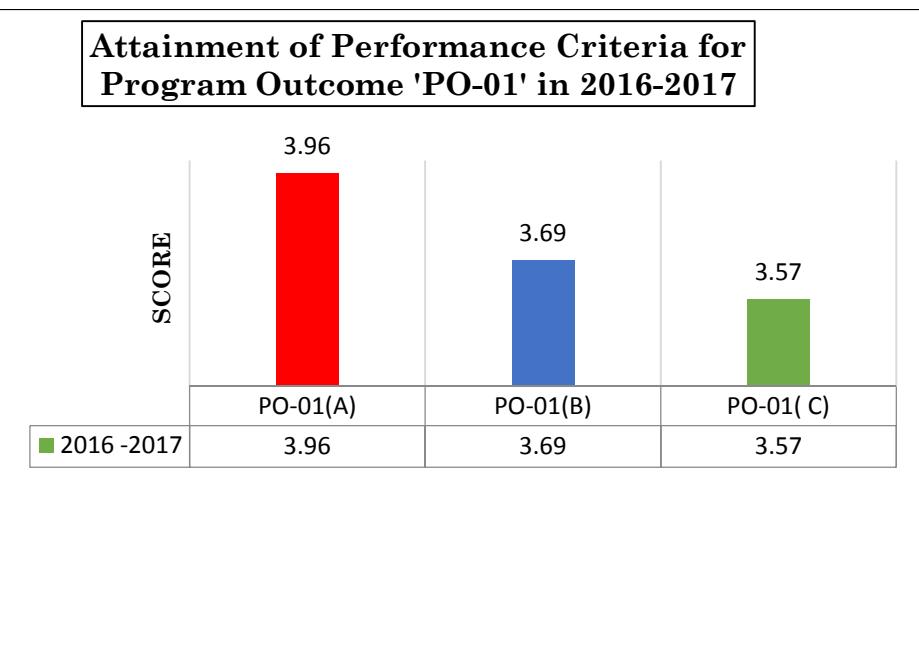
In the previous sections, each of the individual performance criteria PO-01(A), PO-01(B) and PO-01(C) have been assessed. The performance for attainment of outcome PO-01 has been completed using the attainment values for PO-01(A), PO-01(B) and PO-01(C)and is given below:

Table PO-01.2summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome PO-01.

**Table PO-01.2: Overall score for outcome PO-01 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-01(A)	43.47	26.77	17.61	7.02	5.18	<b>3.96</b>	5
PO-01(B)	33.31	29.12	20.30	7.89	9.37	<b>3.69</b>	5
PO-01(C)	29.58	26.25	26.22	7.34	10.60	<b>3.57</b>	5
<b>Overall score</b>	<b>35.45</b>	<b>27.38</b>	<b>21.38</b>	<b>7.42</b>	<b>8.38</b>	<b>3.74</b>	

The Performance criteria-wise assessment score distribution of outcome ‘PO-01’ is shown in figure PO-01.2.



**Figure PO-01.2: Performance criteria-wise assessment score distribution of outcome 'PO-01'**

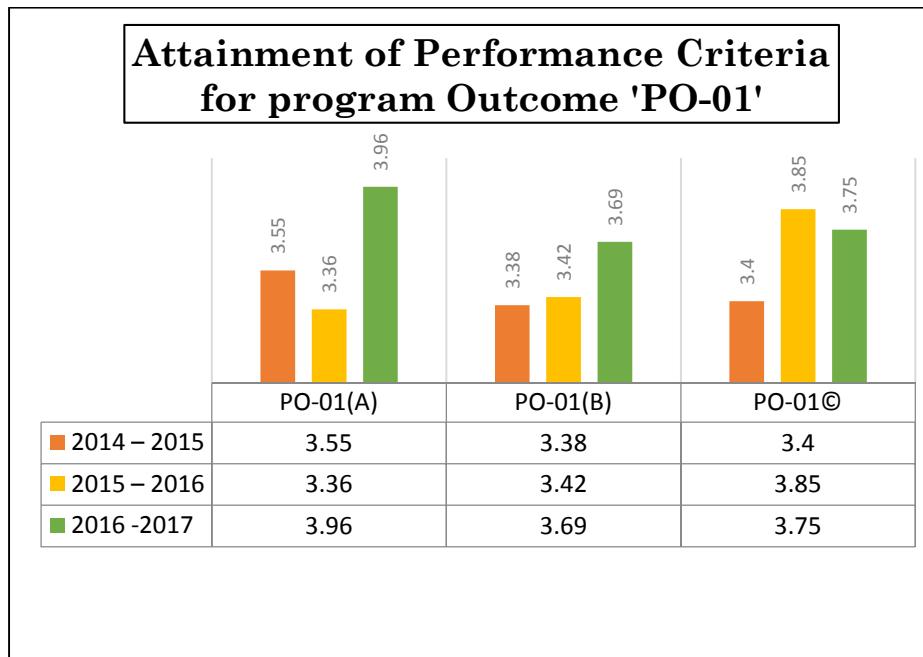
**Track Record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessment scores distribution and overall weighted score for outcome 'PO-01' for last three years, i.e. 2014-2015, 2015-2016, and 2016-2017 are presented in this section. The Table PO-01.3 presents the performance criteria-wise assessment score distribution for outcome 'PO-01'.

**Table PO-01.3 Performance criteria-wise assessment score distribution for each outcome 'PO-01'.**

Program outcome PO-01nd performance criteria	Academic year			Weight
	2014 – 2015	2015 – 2016	2016 -2017	
PO-01	PO-01(A)	3.55	3.36	3.96
	PO-01(B)	3.38	3.42	3.69
	PO-01(C)	3.40	3.85	3.57
<b>Overall weighted score of outcome PO-01</b>		<b>3.44</b>	<b>3.54</b>	<b>3.74</b>
				<b>5</b>

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome 'PO-01' over a period of last three years and is shown in figure PO-01.3.



**Figure PO-01.3: Performance criteria-wise assessment score distribution of outcome 'PO-01'**

#### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into five categories on a scale of 1 to 5 as given below:

- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$ .
- Very Good:** Overall weighted score for the outcome is between 4 and 4.5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4.0.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5.
- Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$ .

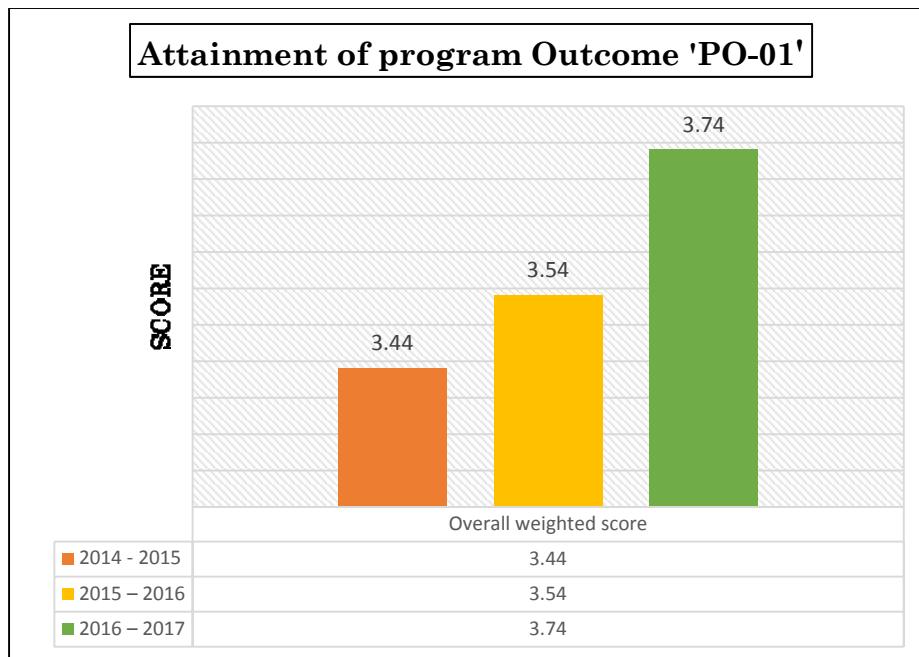
The Table PO-01.4 presents the overall weighted score of outcome 'PO-01' over the last three academic years.

**Table PO-01.4: Overall weighted score of the outcome 'PO-01' over a period of last three academic years.**

Academic year	Overall Weighted Score	Level of Attainment
2014 – 2015	3.44	Satisfactory

2015 – 2016	<b>3.54</b>	Good
2016 – 2017	<b>3.74</b>	Good

Figure PO-01.4 shows the overall weighted score of outcome ‘PO-01’ over a period of last three academic years.



**Figure PO-01.4: Overall weighted score of outcome ‘PO-01’ over a period of last three academic years.**

# **Assessment of Attainment of Program outcome**

## **PO-02**

*An ability to design and conduct experiments, as well as to analyze and interpret data*  
**(2016-17)**

*for the*  
*Bachelor of Engineering*  
*in*  
***Electrical Engineering***



**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering & Technology, Patiala**  
**(Punjab) -INDIA**

## **Attainment of Program outcome ‘PO-02’**

The attainment of program outcome **PO-02**: *An ability to design and conduct experiments, as well as to analyze and interpret data* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘B’ has been classified into following performance criteria:

**PO-02(A): Identify the constraints, assumptions and models for the experiments**

**PO-02(B): Utilize suitable hardware equipment for data collection**

**PO-02(C): Analyze and validate experimental results using appropriate techniques**

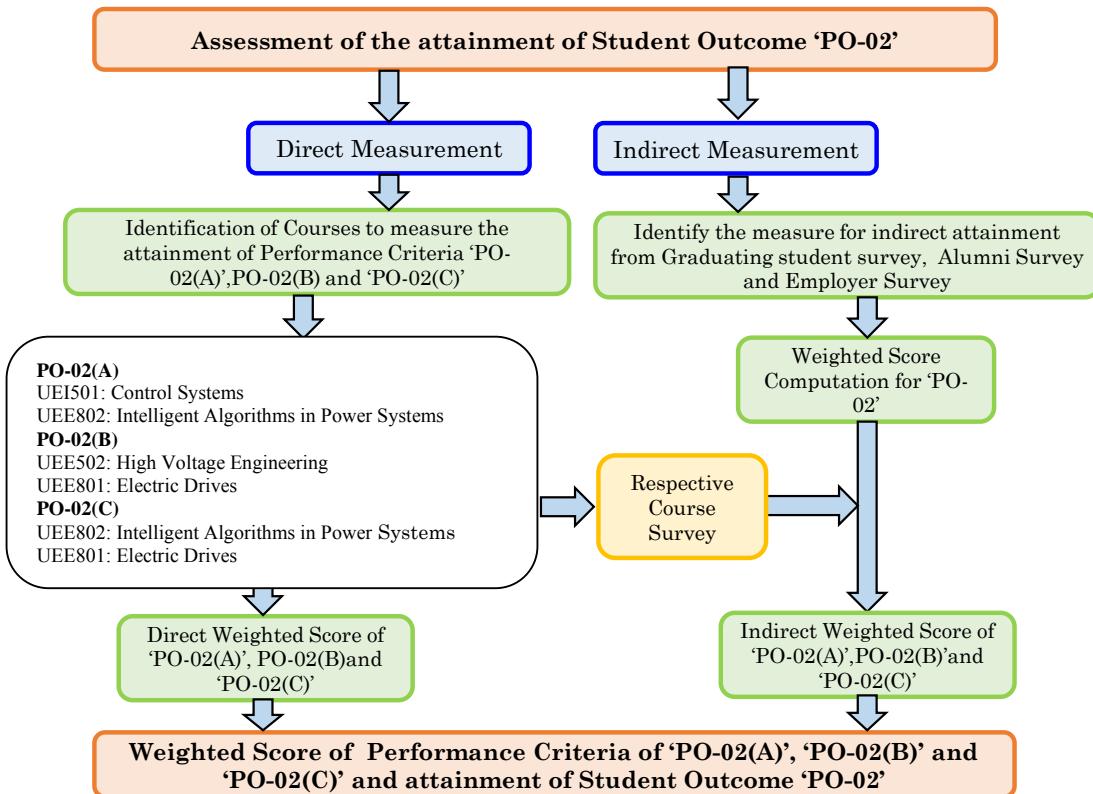
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-02’. The courses used for the assessment during last three academic years are marked bold:

- **UEE301: DC Machines and Transformers**
- **UEE401: Alternating Current machines**
- **UEI501: Control Systems**
- **UEE502: High Voltage Engineering**
- **UEI503: Digital Signal Processing and Applications**
- **UEE504: Power Electronics**
- UEE505: Analog and Digital Systems
- **UEE603: Switchgear and Protection**
- **UEE801: Electric Drives**
- **UEE802: Intelligent Algorithms in Power Systems**
- UEE804: Operation and Control of Power Systems

Outcome PO-02 has been assessed through three performance criteria PO-02(A), PO-02(B) and PO-02(C). The following courses have been considered by the program assessment committee for the assessment of performance criteria PO-02(A), PO-02(B) and PO-02(C) for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-02(A)	UEI501: Control Systems	UEE802: Intelligent Algorithms in Power Systems
PO-02(B)	UEE502: High Voltage Engineering	UEE801: Electric Drives
PO-02(C)	UEE802: Intelligent Algorithms in Power Systems	UEE801: Electric Drives

The step by step methodology used to measure the attainment of program outcome ‘PO-02’ is shown in Fig. PO-02.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-02’ for all three academic years under consideration.



**Fig. PO-02.1: Process for measurement of attainment of outcome 'PO-02' for the year 2016-17**

The following Rubric has been used to convert marks obtained by students to a scale in the range of 1 to 5 and is described in Table PO-02.1(a) and Table PO-02.1(b) in most cases unless specifically mentioned.

**Table PO-02.1 (a): Rubric for Outcome Measurement**

S. No.	Range of Marks for Theory Examination (%)	Score (1-5)
1	$75 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

**Table PO-02.1 (b): Rubric for Outcome Measurement**

S. No.	Range of Marks for Laboratory Examination (%)	Score (1-5)
1	$80 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the courses mentioned.

## ***Assessment of Outcome ‘PO-02’ using performance criterion ‘PO-02(A)’***

### ***PO-02(A): Identify the constraints, assumptions and models for the experiments.***

The performance criteria ‘PO-02(A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEI501: Control Systems* and *UEE802: Intelligent Algorithms in Power Systems* are used to assess performance criteria PO-02(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UEI 501: Control Systems**

The performance of course *UEI501: Control Systems* is used to measure the attainment of outcome ‘PO-02(A)’ through the End Semester Examination (Question No. 3, July-Dec 2016, 20 marks).

#### **Question:**

Q3.	Sketch the Bode Plot for the following transfer function and determine the system gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also determine the value of K for a phase margin of 45°. $G(s) = \frac{80(s+5)}{s^2(s+50)}$	(20)
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The performance of the students in the above question is summarized in Table PO-02(A).1 using rubrics defined in Table PO-02.1(a).

**Table PO-02(A).1: Student’s performance in question targeting ‘PO-02’; course: UEI501**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101404001	Abhay Mahipal	4	2
2	101404002	Abhijeet Singh Sankhla	2	1
3	101404004	Abhinav Arora	6	2
4	101404006	Abhishek Sharma	12	4
5	101404007	Ajay Singh	14	4
6	101404009	Alka Thakur	2	1
7	101404012	Ankush Goyal	14	4
8	101404013	Anmol Arjun Bharaj	3	1
9	101404014	Anmol Goyat	6	2
10	101404015	Anmol Rattan Kaur	4	2
11	101404017	Anubhav Kumar	2	1
12	101404018	Apeksha Goel	12	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
13	101404019	Arnish Jain	10	3
14	101404020	Arshiya	12	4
15	101404021	Arshjot Kaur	14	4
16	101404023	Ayush Jain	8	3
17	101404024	Bhawani Singh	3	1
18	101404025	Chirag Jain	15	5
19	101404026	Davileen Garg	15	5
20	101404027	Dilpreet Kaur	13	4
21	101404028	Divesh Kamdar	18	5
22	101404029	Divyam Aggarwal	17	5
23	101404031	Divyanshu Siddharth	12	4
24	101404032	Garima	6	2
25	101404033	Garv Chahar	2	1
26	101404035	Gaurav Rathore	2	1
27	101404036	Gurpreet Singh	14	4
28	101404037	Gursagar Singh	17	5
29	101404038	Gurupinder Pal Singh	6	2
30	101404039	Harmanpreet Singh	8	3
31	101404041	Harshit Kaushik	12	4
32	101404042	Harshvir Singh	14	4
33	101404043	Harsimarjot Kaur	14	4
34	101404044	Harsimran Singh	12	4
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	15	5
37	101404047	Hitesh Kumar	12	4
38	101404048	Ishita Mahindru	6	2
39	101404049	Jagmeet Singh Bawa	4	2
40	101404050	Jagnoor Kaur	16	5
41	101404051	Jashanpreet Singh	4	2
42	101404052	Jatin Bansal	2	1
43	101404053	Jatin Raheja	14	4
44	101404054	Kanishak Sharma	14	4
45	101404055	Karan Sanjeev Bajaj	13	4
46	101404056	Kirtish Madaan	8	3
47	101404057	Mahitosh Sharma	18	5
48	101404058	Manan Mittal	17	5
49	101404059	Mandeep Singh Panesar	14	4
50	101404060	Manisha Gupta	14	4
51	101404061	Manit Gupta	6	2
52	101404121	Siddharth Singh	0	1
53	101404129	Tarun Kumar	4	2
54	101404130	Tushar Goel	16	5
55	101404131	Utkarsh Apoorva	0	1

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
56	101404132	Utkarsh Atri	8	3
57	101404133	Vandana Gora	13	4
58	101404135	Vasu Mittal	14	4
59	101404136	Yashika Chopra	14	4
60	101404137	Yatin Gudwani	14	4
61	101404138	Yogesh Garg	10	3
62	101454001	Yatendra Agrawal	12	4
63	101454002	Yash Motwani	12	4
64	101584001	Amanjit Singh	8	3
65	101584002	Chetan Garg	18	5
66	101584004	Gurpreet Singh	6	2
67	101584005	Gurpreet Singh	0	1
68	101584006	Harman Preet Singh	2	1
69	101584008	Lakshay Garg	8	3
70	101584010	Rohit	0	1
71	101584012	Sharandeep Singh	13	4

The performance of students through the course UEI501 for criteria PO-02(A) is summarized in Table PO-02(A).2

**Table PO-02(A).2: Average score of student performance in the course UEI501 for criteria PO-02(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEI501	15.49	36.62	11.27	16.90	19.72	3.11

### UEE802: Intelligent Algorithms in Power Systems

The performance of course *UEE802: Intelligent Algorithms in Power Systems* is used to measure the attainment of outcome ‘PO-02(A)’ through the End Semester Examination (Question No. 1, July-Dec 2016, 15 marks).

#### Question:

Q.1	Assume we have the following function $f(x) = x^3 - 60 * x^2 + 900 * x + 100$	(15)
	Where, x is a decision variable and it should be less than 0.31. Maximize f(x). Use midpoint crossover and mutation to find the optimal value of x. Total iteration count should be 2. The initial population is 00101, 01010, 1101, 10010.	

The performance of the students in the above question is summarized in Table PO-02(A).3 using rubrics defined in Table PO-02.1(a).

**Table PO-02(A).3: Students' performance in question targeting 'PO-02(A)'; Course UEE802**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101304001	Aarushi Bajaj	10	4
2	101304002	Abhey Arora	7	3
3	101304003	Abhishek Taksali	2	1
4	101304004	Adhikaansh Tayal	0	1
5	101304005	Aditi Narang	15	5
6	101304006	Aditya	13	5
7	101304007	Akshat	7	3
8	101304008	Akshay Kapoor	10	4
9	101304009	Akshay Kumar	7	3
10	101304010	Akshay Kumar Chaudhary	1	1
11	101304011	Akshay Sharma	5	2
12	101304012	Amandeep Kaur	15	5
13	101304013	Amandeep Singh	15	5
14	101304014	Amaninder Singh Randhawa	8	3
15	101304015	Angad Kapoor	12	5
16	101304016	Ankita Garg	8	3
17	101304017	Ankur Malik	0	1
18	101304018	Anmol Jawa	15	5
19	101304019	Anmolpreet Singh	2	1
20	101304020	Anyuti Tiwary	7	3
21	101304021	Arpit Sharma	15	5
22	101304022	Arsh Kundal	5	2
23	101304023	Arshbir Kaur	5	2
24	101304024	Arshdeep Singh Bagga	3	2
25	101304025	Ashish	6	3
26	101304026	Ashish Rajpal	0	1
27	101304028	Berry Lubana	1	1
28	101304029	Bhanu Duggal	15	5
29	101304030	Bhanu Marwaha	11	4
30	101304031	Chirag Gaba	5	2
31	101304032	Dipin Garg	12	5
32	101304033	Dishant Vanvari	10	4
33	101304034	Divyesh Pratap Singh	14	5
34	101304035	Elham Anwar	10	4
35	101304036	Gurseerat Singh Meen	0	1
36	101304037	Gursewak Singh	1	1
37	101304040	Hariansh Sehgal	12	5
38	101304041	Hartejdeep Singh	4	2
39	101304042	Himanshu Goyal	9	4
40	101304044	Jasjit Singh	7	3
41	101304045	Jassimran Singh Julka	0	1

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
42	101304046	Jessica Dhaliwal	11	4
43	101304047	Kanwarpal Singh	7	3
44	101304048	Karan Kumar	1	1
45	101304049	Karanjot Singh Kochar	15	5
46	101304050	Kashish Aggarwal	15	5
47	101304051	Kritika Singla	15	5
48	101304052	Love Gaba	5	2
49	101304054	Manik Mittal	2	1
50	101304055	Maninderjit Singh	0	1
51	101304056	Mayank Singla	8	3
52	101304057	Mridul Bhutani	8	3
53	101304058	Naman Garg	15	5
54	101304059	Navdeep Singh	5	2
55	101304060	Navdeep Singh	15	5
56	101304061	Nazuk Aggarwal	12	5
57	101304062	Nishant Garg	8	3
58	101304063	Nishtha Raheja	9	4
59	101304064	Paras Bawa	6	3
60	101304065	Parth Ahuja	7	3
61	101304066	Parushi	12	5
62	101304067	Pency Goyal	7	3
63	101304068	Piyush Jindal	5	2
64	101304069	Piyush Tripathi	5	2
65	101304070	Prachi Garg	15	5
66	101304071	Prashant Kataria	0	1
67	101304072	Preeti Garg	8	3
68	101304073	Priyank Arora	8	3
69	101304074	Priyanka	5	2
70	101304075	Priyanka Singh	15	5
71	101304076	Priyansh Mahajan	15	5
72	101304077	Rahul Meena	0	1
73	101304078	Rajan	2	1
74	101304079	Rajat Sharma	10	4
75	101304080	Ratul Goyal	10	4
76	101304081	Ravinder Singh	13	5
77	101304082	Rishabh Juneja	15	5
78	101304083	Robin Manktala	2	1
79	101304084	Rohan Ghai	6	3
80	101304085	Rohan Singla	7	3
81	101304086	Rohan Wadhawan	6	3
82	101304087	Rohit Goyal	8	3
83	101304088	Rubina Bamba	7	3
84	101304089	Sagar Pulani	3	2

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
85	101304090	Sahil Kataria	13	5
86	101304091	Sakshi	10	4
87	101304092	Sandal Singh Sidhu	11	4
88	101304093	Sandeep Kaur	12	5
89	101304094	Satripleen Kaur	13	5
90	101304095	Saurabh Mohan	6	3
91	101304096	Shagundeepraj Singh	5	2
92	101304097	Shailey Gupta	12	5
93	101304098	Shaina	15	5
94	101304099	Shivika Gupta	15	5
95	101304100	Shresth Rai	13	5
96	101304101	Shubham Goyal	8	3
97	101304102	Shubham Gupta	13	5
98	101304103	Shubham Sharma	11	4
99	101304104	Shubham Sharma	15	5
100	101304105	Shubham Soin	15	5
101	101304106	Siddharth Goyal	12	5
102	101304107	Sidharth Garg	15	5
103	101304108	Simran Kaur	15	5
104	101304109	Simranjit Singh	0	1
105	101304111	Sumit Dhingra	5	2
106	101304112	Sumit Kaushik	15	5
107	101304113	Tushar Dheer	12	5
108	101304114	Tushar Sharma	4	2
109	101304116	Utsav Chhabra	0	1
110	101304117	Vaibhav Gupta	5	2
111	101304118	Vaishali	4	2
112	101304119	Varun Bansal	15	5
113	101304120	Veni Jindal	15	5
114	101304121	Vishal Arora	2	1
115	101304122	Yugesh Goyal	15	5
116	101484001	Amandeep Singh	2	1
117	101484002	Amrinder Singh	15	5
118	101484003	Ashmeen Singh	2	1
119	101484004	Azad Singh	12	5
120	101484005	Chandan Garg	0	1
121	101484007	Deepak Singla	4	2
122	101484008	Diljeet Singh	15	5
123	101484009	Jyoti Kaushal	1	1
124	101484011	Pawan Kumar	5	2
125	101484012	Rajat Singla	11	4
126	101484013	Satveer Kaur	12	5
127	101484014	Saurabh Kumar Wadhawan	6	3

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
128	101484015	Shweta Sharma	5	2
129	101484016	Sukhjeet Singh	2	1

The performance of students through the course UEE802 for criteria PO-02(A) is summarized in Table PO-02(A).4

**Table PO-02(A).4: Average score of student performance in the course UEE802 for criteria PO-02(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	34.88	10.85	19.38	15.50	19.38	3.26

The data from Table PO-02(A).2 and Table PO-02(A).4 is used to evaluate the weighted average of direct measure through course portfolio for criteria ‘PO-02(A)’ and is summarized in Table PO-02(A).5.

**Table PO-02(A).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-02(A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEI501	15.49	36.62	11.27	16.90	19.72	3.11
UEE802	34.88	10.85	19.38	15.50	19.38	3.26
Student class performance score	25.19	23.74	15.32	16.20	19.55	3.19

## b) Indirect Measures

The indirect measurement of performance criteria ‘PO-02(A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-02(A).6 and Table PO-02(A).7.

### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-02(A)’.

UEI501	Analyze the stability of the closed and open loop systems
UEE802	Obtain the optimum solution of well formulated optimisation problem using evolutionary approach

**Table PO-02(A).6: Weighted average score of performance criterion ‘PO-02(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	

<b>UEI501</b>	37.25	23.5	19.6	11.7	7.8	<b>3.7</b>
<b>UEE802</b>	27.34	34.38	31.25	2.34	4.69	<b>3.77</b>
<b>Course survey score</b>	<b>32.30</b>	<b>28.94</b>	<b>25.43</b>	<b>7.02</b>	<b>6.25</b>	<b>3.74</b>

- (ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome 'PO-02' through indirect measurement using following question in the respective surveys.

Graduating Survey	An ability to design and conduct experiments, as well as to analyze and interpret data.
Alumni Survey	
Employer Survey	Do our students have an ability to design and conduct experiments, as well as to analyze and interpret data?

**Table PO-02(A).7: Weighted average score of performance criterion 'PO-02(A)' based on Other Surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating Student Survey</b>	32.39	45.07	22.54	0	0	<b>4.1</b>
<b>Employer Survey</b>	33.33	60	6.67	0	0	<b>4.27</b>
<b>Alumni Survey</b>	28.02	43.48	20.77	4.83	1.93	<b>3.87</b>
<b>Other surveys score</b>	<b>31.25</b>	<b>49.52</b>	<b>16.66</b>	<b>1.61</b>	<b>0.64</b>	<b>4.08</b>

**c) Overall weighted average score of performance criterion 'PO-02(A)'**

The overall weighted average score of performance criterion 'PO-02(A)' is summarized in Table PO-02(A).8 from the data given in Tables PO-02(A).5, PO-02(A).6 and PO-02(A).7.

**Table PO-02(A).8: Overall weighted average score of performance criterion 'PO-02(A)'**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance</b>	25.19	23.74	15.32	16.20	19.55	<b>3.19</b>	5
<b>Course surveys</b>	32.30	28.94	25.43	7.02	6.25	<b>3.74</b>	4
<b>Other surveys</b>	31.25	49.52	16.66	1.61	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>29.07</b>	<b>31.92</b>	<b>19.02</b>	<b>9.49</b>	<b>10.39</b>	<b>3.59</b>	

**Assessment of Outcome 'PO-02' using performance criterion PO-02(B)**

**PO-02(B): Utilize suitable hardware equipment for data collection**

The performance criteria ‘PO-02(B)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

**a) Direct Measures:**

**(i) Assessment Tool: Students' performance using Course Portfolio**

Two courses namely *UEE502: High Voltage Engineering* and *UEE801: Electric Drives* are used to assess performance criteria PO-02(B) as a direct measure. The analysis for each of these courses is provided below:

**UEE502: High Voltage Engineering**

The performance of course *UEE502: High Voltage Engineering* is used to measure the attainment of outcome ‘PO-02(B)’ through the End Semester Lab performance (July-Dec 2016, 5 marks). The students used the equipments such as suspension insulator, transformer bridge, power frequency voltage source, 500 kV, 12.5 kJ five stage impulse generator, Megger, Auto oil test cell (0-100 kV) and were asked to perform any one experiments out of the following:

- Determination of the breakdown voltage of transformer oil.
- Measurement of Capacitance & Loss angle (tangent delta) using transformer ratio arm bridge for solid insulation.
- Determination of the level of partial discharge in the given equipment/sample using the partial discharge detector.
- Operation of high voltage construction kit for AC, DC & impulse voltages.

The performance of the students in the above criteria is summarized in Table PO-02(B).1 using rubrics defined in Table PO-02.1(b).

**Table PO-02(B).1: Student's performance in question targeting ‘PO-02(B)’; course: UEE502**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101404062	Manjosh Singh Dhillon	5	5
2	101404063	Manpreet Singh Brar	3.5	4
3	101404064	Manvir Kaur	4.5	5
4	101404065	Mehak Bhatia	4.5	5
5	101404066	Mithilesh Kumar	3.5	4
6	101404067	Mohit Goyal	5	5
7	101404068	Mridul Marwaha	4	5
8	101404069	Mudit Arora	4	5
9	101404070	Naveen Parashar	4.5	5
10	101404072	Nigam Wadhwa	3.5	4
11	101404073	Nikhil Danodia	2	3
12	101404074	Nishita Kumari	4.5	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
13	101404075	Nitin Gupta	3.5	4
14	101404076	Nitish Arora	4.5	5
15	101404077	Nitish Bhardwaj	4	5
16	101404078	Omandeep Kaur	4.5	5
17	101404079	Pankaj Garg	4	5
18	101404080	Paramjot Singh	4.5	5
19	101404081	Parmar Adhiraj Singh	4	5
20	101404083	Prabhdeep Kaur	4	5
21	101404084	Prachur Maharwal	4.5	5
22	101404087	Prashant Khare	4	5
23	101404089	Pulkit Bansal	4.5	5
24	101404090	Pushpinder Singh	4	5
25	101404091	Rachit Verma	3.5	4
26	101404092	Rahul Gautam	3.5	4
27	101404093	Rahul Goyal	3	4
28	101404094	Rajshree Vaidya	5	5
29	101404096	Rishabh Gupta	4	5
30	101404099	Sagar Bansal	4.5	5
31	101404100	Sahajdeep Kaur	5	5
32	101404102	Sahil Singla	4.5	5
33	101404103	Samarth Gupta	4.5	5
34	101404104	Sambhav Jain	3.5	4
35	101404105	Samrat Kumar Gupta	3	4
36	101404106	Sanamdeep Singh	4	5
37	101404107	Sanket Gupta	3.5	4
38	101404108	Saurabh Kumar	3.5	4
39	101404109	Shailesh Verma	2.5	3
40	101404110	Shaivya Thapliyal	3	4
41	101404111	Sher Mohammed	4	5
42	101404112	Shivam Dochania	2.5	3
43	101404113	Shivam Gera	3	4
44	101404114	Shivam Kumar Kedia	3	4
45	101404115	Shubham Bhardwaj	4	5
46	101404116	Shubham Chaturvedi	4	5
47	101404117	Shubham Garg	4	5
48	101404118	Shubham Kumar	3	4
49	101404119	Shubham Verma	4	5
50	101404120	Shubhdeep Singh	4	5
51	101404122	Simran Mehra	4.5	5
52	101404123	Sukhman	3	4
53	101404124	Swapnil Singla	3.5	4
54	101404125	Tanish Gupta	4	5
55	101404126	Taranjot Singh	3.5	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
56	101404127	Tarun Garg	3.5	4
57	101404128	Tarun Gupta	4	5
58	101454003	Harshwardhan Soni	4.5	5
59	101454004	Simardeep Kaur	4	5
60	101454005	Tejas Kapila	5	5
61	101454006	Nitish Dewan	3	4
62	101454007	Abhishek Nigam	3	4
63	101454008	Tarun Puri	3	4
64	101454009	Lariza Bansal	2.5	3
65	101454010	Tanish Goyal	3.5	4
66	101454011	Aditi	3	4
67	101584003	Devinder Kumar	4.5	5
68	101584009	Prince Kalia	2.5	3
69	101584011	Satvir Singh	3.5	4
70	101584013	Shashi Sharma	5	5
71	101584014	Sunnypreet Singh	4.5	5
72	101584015	Rajat Chandra	3	4
73	101584016	Gursimran Singh	4	5
74	101404001	Abhay Mahipal	4.5	5
75	101404002	Abhijeet Singh Sankhla	3	4
76	101404004	Abhinav Arora	2.5	3
77	101404006	Abhishek Sharma	3.5	4
78	101404007	Ajay Singh	2.5	3
79	101404009	Alka Thakur	3	4
80	101404012	Ankush Goyal	4	5
81	101404013	Anmol Arjun Bharaj	3.5	4
82	101404014	Anmol Goyat	3.5	4
83	101404015	Anmol Rattan Kaur	4	5
84	101404017	Anubhav Kumar	2.5	3
85	101404018	Apeksha Goel	4	5
86	101404019	Arnish Jain	4	5
87	101404020	Arshiya	4.5	5
88	101404021	Arshjot Kaur	5	5
89	101404023	Ayush Jain	4.5	5
90	101404024	Bhawani Singh	3.5	4
91	101404025	Chirag Jain	3.5	4
92	101404026	Davileen Garg	4	5
93	101404027	Dilpreet Kaur	3.5	4
94	101404028	Divesh Kamdar	4.5	5
95	101404029	Divyam Aggarwal	4	5
96	101404031	Divyanshu Siddharth	2.5	3
97	101404032	Garima	3.5	4
98	101404033	Garv Chahar	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
99	101404035	Gaurav Rathore	4	5
100	101404036	Gurpreet Singh	3.5	4
101	101404037	Gursagar Singh	4	5
102	101404038	Gurupinder Pal Singh	3.5	4
103	101404039	Harmanpreet Singh	4	5
104	101404041	Harshit Kaushik	3	4
105	101404042	Harshvir Singh	3	4
106	101404043	Harsimarjot Kaur	5	5
107	101404044	Harsimran Singh	2.5	3
108	101404045	Hartej Singh Bains	1	2
109	101404046	Heema Gupta	3.5	4
110	101404047	Hitesh Kumar	2.5	3
111	101404048	Ishita Mahindru	3.5	4
112	101404049	Jagmeet Singh Bawa	4	5
113	101404050	Jagnoor Kaur	4	5
114	101404051	Jashanpreet Singh	4	5
115	101404052	Jatin Bansal	4	5
116	101404053	Jatin Raheja	4	5
117	101404054	Kanishak Sharma	3.5	4
118	101404055	Karan Sanjeev Bajaj	3.5	4
119	101404056	Kirtish Madaan	3.5	4
120	101404057	Mahitosh Sharma	5	5
121	101404058	Manan Mittal	3	4
122	101404059	Mandeep Singh Panesar	4	5
123	101404060	Manisha Gupta	3	4
124	101404061	Manit Gupta	4	5
125	101404121	Siddharth Singh	2.5	3
126	101404129	Tarun Kumar	4	5
127	101404130	Tushar Goel	3.5	4
128	101404132	Utkarsh Atri	3	4
129	101404133	Vandana Gora	4	5
130	101404135	Vasu Mittal	5	5
131	101404136	Yashika Chopra	4	5
132	101404137	Yatin Gudwani	3.5	4
133	101404138	Yogesh Garg	3	4
134	101454001	Yatendra Agrawal	4.5	5
135	101454002	Yash Motwani	3	4
136	101584001	Amanjit Singh	3	4
137	101584002	Chetan Garg	5	5
138	101584004	Gurpreet Singh	3.5	4
139	101584005	Gurpreet Singh	4	5
140	101584006	Harman Preet Singh	2.5	3
141	101584008	Lakshay Garg	4.5	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
142	101584010	Rohit	2.5	3
143	101584012	Sharandeep Singh	4	5

The performance of students through the course UEE502 for criteria PO-02(B) is summarized in Table PO-02(B).2

**Table PO-02(B).2: Average score of student performance in the course UEE502 for criteria PO-02(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE502	52.45	37.06	9.79	0.70	0.00	4.41

### **UEE801: Electric Drives**

The performance of course *UEE801: Electric Drives* is used to measure the attainment of outcome ‘PO-02(B)’ through the End Semester Lab performance (July-Dec 2016, 5 marks). The students were asked to perform any one experiment out of the following:

- Single Phase Full converter to control DC drive.
- Three Phase Bridge Semi- Converter to control DC drive.
- Three Phase Bridge full Converter to control DC drive
- Three phase Dual Converter to control DC drive.
- Mc Murray Bridge Inverter to control AC drive.
- Operation & control of Vector control AC drive.

The performance of the students in the above criteria is summarized in Table PO-02(B).3 using rubrics defined in Table PO-02.1(b).

**Table PO-02(B).3: Students’ performance in question targeting ‘PO-02’; Course UEE801**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	4.5	5
2	101304002	Abhey Arora	4	5
3	101304003	Abhishek Taksali	4	5
4	101304004	Adhikaansh Tayal	3.5	4
5	101304005	Aditi Narang	4.5	5
6	101304006	Aditya	4	5
7	101304007	Akshat	4	5
8	101304008	Akshay Kapoor	4	5
9	101304009	Akshay Kumar	3.5	4
10	101304010	Akshay Kumar Chaudhary	4	5
11	101304011	Akshay Sharma	4	5
12	101304012	Amandeep Kaur	4	5
13	101304013	Amandeep Singh	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
14	101304014	Amaninder Singh Randhawa	3	4
15	101304015	Angad Kapoor	3.5	4
16	101304016	Ankita Garg	4.5	5
17	101304018	Anmol Jawa	4.5	5
18	101304019	Anmolpreet Singh	4.5	5
19	101304020	Anyuti Tiwary	4	5
20	101304021	Arpit Sharma	4	5
21	101304022	Arsh Kundal	3	4
22	101304023	Arshbir Kaur	4.5	5
23	101304024	Arshdeep Singh Bagga	4	5
24	101304025	Ashish	4	5
25	101304026	Ashish Rajpal	4	5
26	101304028	Berry Lubana	3	4
27	101304029	Bhanu Duggal	4.5	5
28	101304030	Bhanu Marwaha	4	5
29	101304031	Chirag Gaba	3.5	4
30	101304032	Dipin Garg	4.5	5
31	101304033	Dishant Vanvari	4	5
32	101304034	Divyesh Pratap Singh	3.5	4
33	101304035	Elham Anwar	4	5
34	101304036	Gurseerat Singh Meen	3	4
35	101304037	Gursewak Singh	4	5
36	101304040	Hariansh Sehgal	3.5	4
37	101304041	Hartejdeep Singh	3.5	4
38	101304042	Himanshu Goyal	4.5	5
39	101304044	Jasjit Singh	3.5	4
40	101304045	Jassimran Singh Julka	4	5
41	101304046	Jessica Dhaliwal	4.5	5
42	101304047	Kanwarpal Singh	4	5
43	101304048	Karan Kumar	4	5
44	101304049	Karanjot Singh Kochar	4	5
45	101304050	Kashish Aggarwal	4.5	5
46	101304052	Love Gaba	3.5	4
47	101304054	Manik Mittal	3.5	4
48	101304055	Maninderjit Singh	3	4
49	101304056	Mayank Singla	4	5
50	101304057	Mridul Bhutani	4.5	5
51	101304058	Naman Garg	4	5
52	101304059	Navdeep Singh	3.5	4
53	101304060	Navdeep Singh	4	5
54	101304062	Nishant Garg	4	5
55	101304094	Satripleen Kaur	4.5	5
56	101484001	Amandeep Singh	3.5	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
57	101484002	Amrinder Singh	4.5	5
58	101484003	Ashmeen Singh	3	4
59	101484004	Azad Singh	3.5	4
60	101484005	Chandan Garg	4.5	5
61	101484007	Deepak Singla	3.5	4
62	101484008	Diljeet Singh	4.5	5
63	101254002	Naman Kumar	2	3
64	101304051	Kritika Singla	5	5
65	101304061	Nazuk Aggarwal	3.5	4
66	101304063	Nishtha Raheja	5	5
67	101304064	Paras Bawa	3.5	4
68	101304065	Parth Ahuja	3.5	4
69	101304066	Parushi	5	5
70	101304067	Pency Goyal	4.5	5
71	101304068	Piyush Jindal	3	4
72	101304069	Piyush Tripathi	3.5	4
73	101304070	Prachi Garg	4.5	5
74	101304071	Prashant Kataria	3	4
75	101304072	Preeti Garg	5	5
76	101304073	Priyank Arora	4	5
77	101304074	Priyanka	4.5	5
78	101304075	Priyanka Singh	4.5	5
79	101304076	Priyansh Mahajan	3.5	4
80	101304077	Rahul Meena	2.5	3
81	101304078	Rajan	4	5
82	101304079	Rajat Sharma	3.5	4
83	101304080	Ratul Goyal	3.5	4
84	101304081	Ravinder Singh	3.5	4
85	101304082	Rishabh Juneja	3.5	4
86	101304083	Robin Manktala	3.5	4
87	101304084	Rohan Ghai	3.5	4
88	101304085	Rohan Singla	3.5	4
89	101304086	Rohan Wadhawan	4	5
90	101304087	Rohit Goyal	3	4
91	101304088	Rubina Bamba	3.5	4
92	101304089	Sagar Pulani	4.5	5
93	101304090	Sahil Kataria	3.5	4
94	101304091	Sakshi	4	5
95	101304092	Sandal Singh Sidhu	5	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
96	101304093	Sandeep Kaur	3.5	4
97	101304095	Saurabh Mohan	3.5	4
98	101304096	Shagundeepr Singh	3.5	4
99	101304097	Shailly Gupta	4.5	5
100	101304098	Shaina	3.5	4
101	101304099	Shivika Gupta	4.5	5
102	101304100	Shresth Rai	3	4
103	101304101	Shubham Goyal	4	5
104	101304102	Shubham Gupta	4.5	5
105	101304103	Shubham Sharma	3.5	4
106	101304104	Shubham Sharma	3.5	4
107	101304105	Shubham Soin	4	5
108	101304106	Siddharth Goyal	4	5
109	101304107	Sidharth Garg	3.5	4
110	101304108	Simran Kaur	4.5	5
111	101304109	Simranjit Singh	2	3
112	101304111	Sumit Dhingra	4	5
113	101304112	Sumit Kaushik	4	5
114	101304113	Tushar Dheer	3	4
115	101304114	Tushar Sharma	4	5
116	101304116	Utsav Chhabra	2.5	3
117	101304117	Vaibhav Gupta	3.5	4
118	101304118	Vaishali	4.5	5
119	101304119	Varun Bansal	4.5	5
120	101304120	Veni Jindal	4.5	5
121	101304121	Vishal Arora	3.5	4
122	101304122	Yugesh Goyal	4	5
123	101484009	Jyoti Kaushal	3.5	4
124	101484011	Pawan Kumar	3.5	4
125	101484012	Rajat Singla	3.5	4
126	101484013	Satveer Kaur	4	5
127	101484014	Saurabh Kumar Wadhawan	3.5	4
128	101484015	Shweta Sharma	4.5	5
129	101484016	Sukhjeet Singh	5	5

The performance of students through the course UEE801 for criteria PO-02(B) is summarized in Table PO-02(B).4.

**Table PO-02(B).4: Average score of student performance in the course UEE801 for criteria PO-02**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE801	56.59	40.31	3.10	0.00	0.00	4.53

The data from Table PO-02(B).2 and Table PO-02(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-02(B)’, and is summarised in Table PO-02(B).5.

**Table PO-02(B).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-02(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE502	52.45	37.06	9.79	0.70	0.00	4.41
UEE801	56.59	40.31	3.10	0.00	0.00	4.53
Student class performance Score	54.52	38.69	6.45	0.35	0.00	4.47

### b) Indirect Measures

The indirect measurement of performance criteria ‘PO-02(B)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-02(B).6 and Table PO-02(A).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-02(B)’.

UEE502	<ul style="list-style-type: none"> <li>Analyse the breakdown mechanism of solids, liquids and gases</li> <li>Measure direct, alternating and impulse high voltage signals.</li> <li>Measure the dielectric loss and partial discharge involved in non-destructive high voltage tests.</li> </ul>
UEE801	<ul style="list-style-type: none"> <li>Analyse the motor situation during starting and braking</li> </ul>

**Table PO-02(B).6: Weighted average score of performance criterion ‘PO-02(B)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE502	45.46	27.83	18.46	5.39	2.83	4.08
UEE801	38.32	26.16	17.75	7.47	10.28	3.74
Course survey score	41.75	27.28	18.10	6.29	6.56	3.91

(ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome 'PO-02' through indirect measurement and is summarized in Table PO-02(A).7.

**c) Overall weighted average score of performance criterion 'PO-02(B)'**

The overall weighted average score of performance criterion 'PO-02(B)' is summarized in Table PO-02(B).7 from the data given in Tables PO-02(B).5, PO-02(B).6 and PO-02(A).7.

**Table PO-02(B).7: Overall weighted average score of performance criterion 'PO-02(B)'**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance</b>	54.52	38.69	6.45	0.35	0.00	<b>4.47</b>	5
<b>Course surveys</b>	41.75	27.28	18.10	6.29	6.56	<b>3.91</b>	4
<b>Other surveys</b>	31.25	49.52	16.66	1.61	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>44.44</b>	<b>37.59</b>	<b>12.88</b>	<b>2.64</b>	<b>2.35</b>	<b>4.19</b>	

**Assessment of Outcome 'PO-02' using performance criterion PO-02(C)**

**PO-02(C): Analyze and validate experimental results using appropriate techniques**

The performance criteria 'PO-02(C)' has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

**b) Direct Measures:**

**(i) Assessment Tool: Students' performance using Course Portfolio**

Two courses namely *UEE802: Intelligent Algorithms in Power Systems* and *UEE801: Electric Drives* are used to assess performance criteria PO-02(C) as a direct measure. The analysis for each of these courses is provided below:

**UEE802: Intelligent Algorithms in Power Systems**

The performance of course *UEE802: Intelligent Algorithms in Power Systems* is used to measure the attainment of outcome 'PO-02(C)' by evaluating the day to day performance through lab reports (July- Dec 2016, 5 marks)

The performance of the students in the above criteria is summarized in Table PO-02(C).1 using rubrics defined in Table PO-02.1(b).

**Table PO-02(C).1: Student's performance in question targeting 'PO-02(C)'; course: UEE802**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101254015	Kuldeep Singh Deora	4	5
2	101304001	Aarushi Bajaj	4	5
3	101304002	AbheyArora	3	4
4	101304003	Abhishek Taksali	3.5	4
5	101304004	AdhikaanshTayal	3	4
6	101304005	AditiNarang	4	5
7	101304006	Aditya	5	5
8	101304007	Akshat	5	5
9	101304008	Akshay Kapoor	5	5
10	101304009	Akshay Kumar	5	5
11	101304010	Akshay Kumar Chaudhary	4.5	5
12	101304011	Akshay Sharma	4	5
13	101304012	Amandeep Kaur	4.5	5
14	101304013	Amandeep Singh	4	5
15	101304014	Amaninder Singh Randhawa	3	4
16	101304015	Angad Kapoor	5	5
17	101304016	AnkitaGarg	5	5
18	101304018	Anmol Jawa	4.5	5
19	101304019	Anmolpreet Singh	4	5
20	101304020	Anyuti Tiwary	5	5
21	101304021	Arpit Sharma	4.5	5
22	101304022	ArshKundal	3.5	4
23	101304023	ArshbirKaur	4.5	5
24	101304024	Arshdeep Singh Bagga	4	5
25	101304025	Ashish	4	5
26	101304026	AshishRajpal	5	5
27	101304028	Berry Lubana	5	5
28	101304029	BhanuDuggal	4.5	5
29	101304030	BhanuMarwaha	3.5	4
30	101304031	ChiragGaba	5	5
31	101304032	DipinGarg	4.5	5
32	101304033	DishantVanvari	5	5
33	101304034	DivyeshPratap Singh	5	5
34	101304035	Elham Anwar	4.5	5
35	101304036	Gurseerat Singh Meen	3	4
36	101304037	Gursewak Singh	3.5	4
37	101304040	HarianshSehgal	3	4
38	101304041	Hartejdeep Singh	3.5	4
39	101304042	HimanshuGoyal	5	5
40	101304044	Jasjit Singh	3	4
41	101304045	Jassimran Singh Julka	4.5	5
42	101304046	Jessica Dhaliwal	5	5
43	101304047	Kanwarpal Singh	3.5	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
44	101304048	Karan Kumar	3.5	4
45	101304049	Karanjot Singh Kochar	4.5	5
46	101304050	Kashish Aggarwal	4	5
47	101304052	Love Gaba	4.5	5
48	101304054	Manik Mittal	4	5
49	101304055	Maninderjit Singh	3	4
50	101304056	Mayank Singla	3	4
51	101304057	Mridul Bhutani	4.5	5
52	101304058	Naman Garg	5	5
53	101304059	Navdeep Singh	5	5
54	101304060	Navdeep Singh	4	5
55	101304062	Nishant Garg	4.5	5
56	101304094	Satripleen Kaur	4.5	5
57	101484001	Amandeep Singh	3.5	4
58	101484002	Amrinder Singh	5	5
59	101484003	Ashmeen Singh	4.5	5
60	101484004	Azad Singh	4.5	5
61	101484005	Chandan Garg	5	5
62	101484007	Deepak Singla	3	4
63	101484008	Diljeet Singh	3.5	4
64	101304051	Kritika Singla	4	5
65	101304061	Nazuk Aggarwal	3.5	4
66	101304063	Nishtha Raheja	4.5	5
67	101304064	Paras Bawa	3.5	4
68	101304065	Parth Ahuja	4.5	5
69	101304066	Parushi	4.5	5
70	101304067	Pency Goyal	4	5
71	101304068	Piyush Jindal	3	4
72	101304069	Piyush Tripathi	2.5	3
73	101304070	Prachi Garg	4	5
74	101304071	Prashant Kataria	3	4
75	101304072	Preeti Garg	4.5	5
76	101304073	Priyank Arora	4.5	5
77	101304074	Priyanka	4.5	5
78	101304075	Priyanka Singh	5	5
79	101304076	Priyansh Mahajan	3	4
80	101304077	Rahul Meena	2.5	3
81	101304078	Rajan	3	4
82	101304079	Rajat Sharma	3	4
83	101304080	Ratul Goyal	3	4
84	101304081	Ravinder Singh	1.5	2
85	101304082	Rishabh Juneja	1.5	2
86	101304083	Robin Manktala	1.5	2

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
87	101304084	Rohan Ghai	1.5	2
88	101304085	Rohan Singla	1.5	2
89	101304086	Rohan Wadhawan	1.5	2
90	101304087	Rohit Goyal	1.5	2
91	101304088	Rubina Bamba	1.5	2
92	101304089	Sagar Pulani	1.5	2
93	101304090	Sahil Kataria	1.5	2
94	101304091	Sakshi	1.5	2
95	101304092	Sandal Singh Sidhu	1.5	2
96	101304093	Sandeep Kaur	1.5	2
97	101304095	Saurabh Mohan	1.5	2
98	101304096	Shagundeepr Singh	1.5	2
99	101304097	Shailly Gupta	1.5	2
100	101304098	Shaina	1.5	2
101	101304099	Shivika Gupta	1.5	2
102	101304100	Shresth Rai	1.5	2
103	101304101	Shubham Goyal	3.5	4
104	101304102	Shubham Gupta	3.5	4
105	101304103	Shubham Sharma	3.5	4
106	101304104	Shubham Sharma	3	4
107	101304105	Shubham Soin	3	4
108	101304106	Siddharth Goyal	2.5	3
109	101304107	Sidharth Garg	3.5	4
110	101304108	Simran Kaur	3.5	4
111	101304109	Simranjit Singh	2.5	3
112	101304111	Sumit Dhingra	4.5	5
113	101304112	Sumit Kaushik	4.5	5
114	101304113	Tushar Dheer	2.5	3
115	101304114	Tushar Sharma	2.5	3
116	101304116	Utsav Chhabra	3	4
117	101304117	Vaibhav Gupta	4	5
118	101304118	Vaishali	4	5
119	101304119	VarunBansal	3	4
120	101304120	Veni Jindal	5	5
121	101304121	Vishal Arora	2.5	3
122	101304122	YugeshGoyal	2.5	3
123	101484009	JyotiKaushal	3.5	4
124	101484011	Pawan Kumar	3	4
125	101484012	RajatSingla	3.5	4
126	101484013	SatveerKaur	4	5
127	101484014	Saurabh Kumar Wadhawan	1.5	2
128	101484015	Shweta Sharma	3.5	4
129	101484016	Sukhjeet Singh	1.5	2

The performance of students through the course UEE802 for criteria PO-02(C) is summarized in Table PO-02(C).2.

**Table PO-02(C).2: Average score of student performance in the course UEE802 for criteria PO-02(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	47.29	30.23	6.20	16.28	0.00	4.09

### **UEE801: Electric Drives**

The performance of course *UEE801: Electric Drives* is used to measure the attainment of outcome ‘PO-02(C)’ by evaluating day to day performance through lab reports (July-Dec 2016, 5 marks).

The performance of the students in the above criteria is summarized in Table PO-02(C).3 using rubrics defined in Table PO-02.1(b).

**Table PO-02(C).3: Students’ performance in question targeting ‘PO-02(C)’; Course UEE801**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1.	101304001	Aarushi Bajaj	5	5
2.	101304002	Abhey Arora	4	5
3.	101304003	Abhishek Taksali	3	4
4.	101304004	Adhikaansh Tayal	3	4
5.	101304005	Aditi Narang	5	5
6.	101304006	Aditya	4	5
7.	101304007	Akshat	3	4
8.	101304008	Akshay Kapoor	3	4
9.	101304009	Akshay Kumar	3	4
10.	101304010	Akshay Kumar Chaudhary	3	4
11.	101304011	Akshay Sharma	4	5
12.	101304012	Amandeep Kaur	4	5
13.	101304013	Amandeep Singh	4	5
14.	101304014	Amaninder Singh Randhawa	3	4
15.	101304015	Angad Kapoor	4	5
16.	101304016	Ankita Garg	5	5
17.	101304017	Ankur Malik	0	1
18.	101304018	Anmol Jawa	4	5
19.	101304019	Anmolpreet Singh	4	5
20.	101304020	Anyuti Tiwary	5	5
21.	101304021	Arpit Sharma	4	5
22.	101304022	Arsh Kundal	3	4
23.	101304023	Arshbir Kaur	4	5
24.	101304024	Arshdeep Singh Bagga	3	4
25.	101304025	Ashish	4	5
26.	101304026	Ashish Rajpal	3	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
27.	101304028	Berry Lubana	4	5
28.	101304029	Bhanu Duggal	4	5
29.	101304030	Bhanu Marwaha	4	5
30.	101304031	Chirag Gaba	3	4
31.	101304032	Dipin Garg	4	5
32.	101304033	Dishant Vanvari	4	5
33.	101304034	Divyesh Pratap Singh	4	5
34.	101304035	Elham Anwar	3	4
35.	101304036	Gurseerat Singh Meen	3	4
36.	101304037	Gursewak Singh	3	4
37.	101304040	Hariansh Sehgal	3	4
38.	101304041	Hartejdeep Singh	3	4
39.	101304042	Himanshu Goyal	4	5
40.	101304044	Jasjit Singh	3	4
41.	101304045	Jassimran Singh Julka	3	4
42.	101304046	Jessica Dhaliwal	4	5
43.	101304047	Kanwarpal Singh	3	4
44.	101304048	Karan Kumar	3	4
45.	101304049	Karanjot Singh Kochar	3	4
46.	101304050	Kashish Aggarwal	4	5
47.	101304051	Kritika Singla	4.5	5
48.	101304052	Love Gaba	4	5
49.	101304054	Manik Mittal	3	4
50.	101304055	Maninderjit Singh	3	4
51.	101304056	Mayank Singla	4	5
52.	101304057	Mridul Bhutani	4	5
53.	101304058	Naman Garg	4	5
54.	101304059	Navdeep Singh	4	5
55.	101304060	Navdeep Singh	4	5
56.	101304061	Nazuk Aggarwal	4	5
57.	101304062	Nishant Garg	4	5
58.	101304063	Nishtha Raheja	4	5
59.	101304064	Paras Bawa	3.5	4
60.	101304065	Parth Ahuja	3.5	4
61.	101304066	Parushi	5	5
62.	101304067	Pency Goyal	4	5
63.	101304068	Piyush Jindal	4	5
64.	101304069	Piyush Tripathi	3	4
65.	101304070	Prachi Garg	4.5	5
66.	101304071	Prashant Kataria	3	4
67.	101304072	Preeti Garg	4.5	5
68.	101304073	Priyank Arora	4	5
69.	101304074	Priyanka	4	5
70.	101304075	Priyanka Singh	4.5	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
71.	101304076	Priyansh Mahajan	3	4
72.	101304077	Rahul Meena	2.5	3
73.	101304078	Rajan	4	5
74.	101304079	Rajat Sharma	4	5
75.	101304080	Ratul Goyal	4	5
76.	101304081	Ravinder Singh	3.5	4
77.	101304082	Rishabh Juneja	4	5
78.	101304083	Robin Manktala	3.5	4
79.	101304084	Rohan Ghai	3.5	4
80.	101304085	Rohan Singla	4	5
81.	101304086	Rohan Wadhawan	3.5	4
82.	101304087	Rohit Goyal	3.5	4
83.	101304088	Rubina Bamba	3.5	4
84.	101304089	Sagar Pulani	4.5	5
85.	101304090	Sahil Kataria	4.5	5
86.	101304091	Sakshi	4	5
87.	101304092	Sandal Singh Sidhu	4.5	5
88.	101304093	Sandeep Kaur	3.5	4
89.	101304094	Satripleen Kaur	5	5
90.	101304095	Saurabh Mohan	4	5
91.	101304096	Shagundeepr Singh	3	4
92.	101304097	Shailly Gupta	4	5
93.	101304098	Shaina	4	5
94.	101304099	Shivika Gupta	4	5
95.	101304100	Shresth Rai	3.5	4
96.	101304101	Shubham Goyal	4	5
97.	101304102	Shubham Gupta	4	5
98.	101304103	Shubham Sharma	3.5	4
99.	101304104	Shubham Sharma	4.5	5
100.	101304105	Shubham Soin	4.5	5
101.	101304106	Siddharth Goyal	3.5	4
102.	101304107	Sidharth Garg	3.5	4
103.	101304108	Simran Kaur	4	5
104.	101304109	Simranjit Singh	2.5	3
105.	101304111	Sumit Dhingra	3.5	4
106.	101304112	Sumit Kaushik	3.5	4
107.	101304113	Tushar Dheer	3	4
108.	101304114	Tushar Sharma	4	5
109.	101304116	Utsav Chhabra	3	4
110.	101304117	Vaibhav Gupta	4	5
111.	101304118	Vaishali	4	5
112.	101304119	Varun Bansal	4	5
113.	101304120	Veni Jindal	5	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
114.	101304121	Vishal Arora	3.5	4
115.	101304122	Yugesh Goyal	3.5	4
116.	101484001	Amandeep Singh	5	5
117.	101484002	Amrinder Singh	5	5
118.	101484003	Ashmeen Singh	4	5
119.	101484004	Azad Singh	4	5
120.	101484005	Chandan Garg	3	4
121.	101484007	Deepak Singla	4	5
122.	101484008	Diljeet Singh	5	5
123.	101484009	Jyoti Kaushal	3.5	4
124.	101484011	Pawan Kumar	3.5	4
125.	101484012	Rajat Singla	3.5	4
126.	101484013	Satveer Kaur	4	5
127.	101484014	Saurabh Kumar Wadhawan	4	5
128.	101484015	Shweta Sharma	3.5	4
129.	101484016	Sukhjeet Singh	4	5

The performance of students through the course UEE801 for criteria PO-02(C) is summarized in Table PO-02(C).4.

**Table PO-02(C).4: Average score of student performance in the course UEE801 for criteria PO-02(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE801	58.14	39.53	1.55	0.00	0.78	4.54

The data from Table PO-02(C).2 and Table PO-02(C).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-02(C)’, and is summarised in Table PO-02(C).5.

**Table PO-02(C).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-02(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	47.29	30.23	6.20	16.28	0.00	4.09
UEE801	58.14	39.53	1.55	0.00	0.78	4.54
Student class performance score	52.71	34.88	3.88	8.14	0.39	4.31

### b) Indirect Measures

The indirect measurement of performance criteria ‘PO-02(C)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-02(C).6 and Table PO-02(A).7.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-02(C)’

UEE802	<ul style="list-style-type: none"> <li>Implement fuzzy controllers by modelling the human intelligence into mathematical model.</li> <li>Mathematically model the human learning capability and solve classification, control system and optimization problem.</li> <li>Obtain the optimum solution of well formulated optimisation problem using evolutionary approach.</li> <li>Formulate hybrid intelligent algorithms for typical electrical application.</li> </ul>
UEE801	<ul style="list-style-type: none"> <li>Conceptualize the basic drive system and analyse it for different types of loads.</li> <li>Analyse the motor situation during starting and braking.</li> <li>Develop control circuitry and devices for control of motor.</li> <li>Estimate the motor rating for different condition of load.</li> <li>Design the converter circuit for control purpose along with its different configuration.</li> </ul>

**Table PO-02(C).6: Weighted average score of performance criterion ‘PO-02(C)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	27.92	33.4	33.01	1.95	3.71	<b>3.79</b>
UEE801	38.88	25.03	18.81	7.1	10.1	<b>3.75</b>
<b>Weighted average score</b>	<b>33.40</b>	<b>29.22</b>	<b>25.91</b>	<b>4.53</b>	<b>6.91</b>	<b>3.77</b>

**(iii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-02’ through indirect measurement is summarized in Table PO-02(A).7.

**c) Overall weighted average score of performance criterion ‘PO-02(C)’**

The overall weighted average score of performance criterion ‘PO-02(C)’ is summarized in Table PO-02(C).7 from the data given in Tables PO-02(C).5, PO-02(C).6 and PO-02(A).7.

**Table PO-02(C).7: Overall weighted average score of performance criterion ‘PO-02(C)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	52.71	34.88	3.88	8.14	0.39	<b>4.31</b>	5
Course surveys	33.40	29.22	25.91	4.53	6.91	<b>3.77</b>	4

<b>Other surveys</b>	31.25	49.52	16.66	1.61	0.64	<b>4.08</b>	3
<b>Overall weighted score</b>	<b>40.91</b>	<b>36.65</b>	<b>14.42</b>	<b>5.30</b>	<b>2.62</b>	<b>4.07</b>	-



**Overall assessment of program outcome PO-02 using scores of PO-02(A), PO-02(B) and PO-02(C)**

In the previous sections, each of the individual performance criteria PO-02(A), PO-02(B) and PO-02(C) have been assessed. The performance for attainment of outcome PO-02 has been completed using the attainment values for PO-02(A), PO-02(B) and PO-02(C) and is given below:

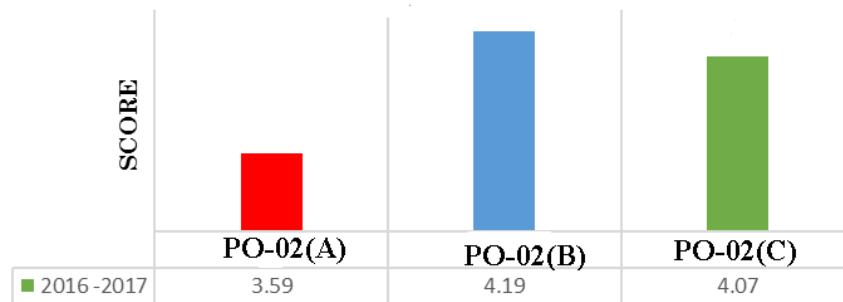
Table PO-02.2 summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome PO-02.

**Table PO-02.2: Overall score for outcome PO-02 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-02(A)	29.07	31.92	19.02	9.49	10.39	3.59	5
PO-02(B)	44.44	37.59	12.88	2.64	2.35	4.19	5
PO-02(C)	40.91	36.65	14.42	5.30	2.62	4.07	5
Overall score	38.14	35.39	15.44	5.81	5.12	3.95	

The performance criteria wise assessment score distribution of outcome ‘PO-02’ is shown in Figure PO-02.2.

**Attainment of Performance Criteria for Program Outcome ‘PO-02’ in 2016-2017**



**Figure PO-02.2: Performance criteria-wise assessment score distribution of outcome ‘PO-02’**

**Track record and assessment of attainment of program outcomes over the last three academic years**

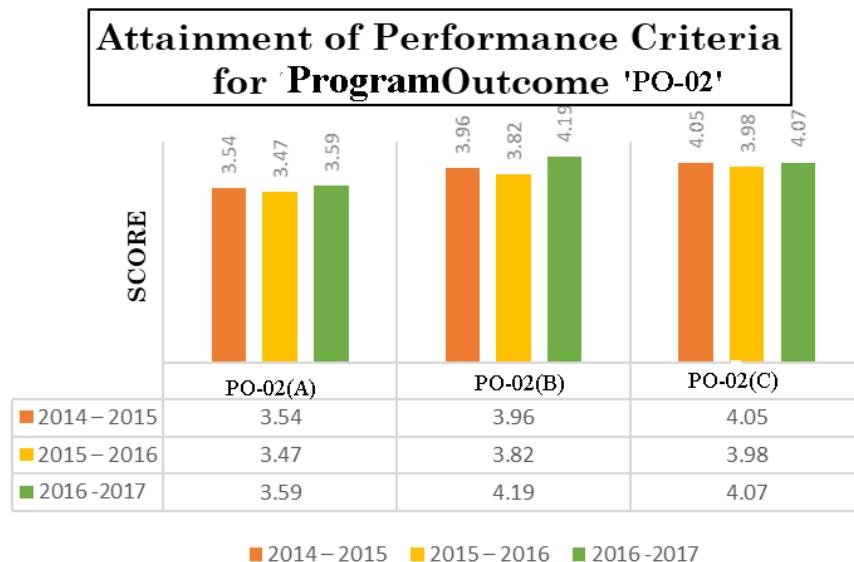
The performance criteria-wise assessment scores distribution and overall weighted score for outcome ‘PO-02’ for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section.

The Table PO-02.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-02’.

**Table PO-02.3 Performance criteria-wise assessment scores distribution for each outcome ‘PO-02’.**

Program outcome and performance criteria	Academic year			Weight
	2014 – 2015	2015 – 2016	2016 -2017	
PO-02	PO-02(A)	3.54	3.47	3.59
	PO-02(B)	3.96	3.82	4.19
	PO-02(C)	4.05	3.98	4.07
Overall weighted score of outcome PO-02		3.85	3.76	3.95

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-02’ over a period of last three years and is shown in Fig. PO-02.3.



**Figure PO-02.3: Performance criteria-wise assessment score distribution of outcome ‘PO-02’**

#### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$ .
- Very Good:** Overall weighted score for the outcome is between 4 and 4.5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4.0.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5.
- Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$ .

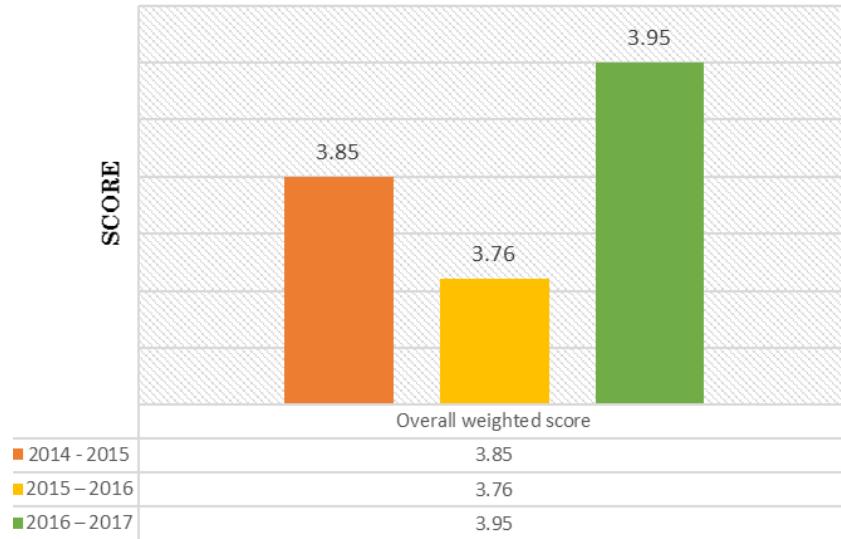
The Table PO-02.4 presents the overall weighted score of outcome ‘PO-02’ over the last three academic years.

**Table PO-02.4: Overall weighted score of the outcome ‘PO-02’ over a period of last three academic years.**

<b>Academic year</b>	<b>Overall weighted score</b>	<b>Level of attainment</b>
2014 – 2015	<b>3.85</b>	Good
2015 – 2016	<b>3.76</b>	Good
2016 – 2017	<b>3.95</b>	Good

Figure PO-02.4 shows the overall weighted score of outcome ‘PO-02’ over a period of last three academic years.

### **Attainment of Program Outcome ‘PO-02’**



**Figure PO-02.4: Overall weighted score of outcome ‘PO-02’ over a period of last three academic years.**

The data presented above pertains to the courses offered during the academic year 2016-17. Similar data is available for the previous two academic years (2014-15 and 2015-16) .

# **Assessment of Attainment of Program Outcome**

## **PO-03**

***Ability to design a sustainable system/Solution within realistic economic and environmental constraints***

**(2016-17)**

*for the*  
***Bachelor of Engineering***  
*in*  
***Electrical Engineering***



**Electrical & Instrumentation Engineering Department  
Thapar Institute of Engineering and Technology, Patiala  
(Punjab) –INDIA**

## **Attainment of Program Outcome ‘PO-03’**

The attainment of Program Outcome **PO-03**: *Ability to design a sustainable system/Solution within realistic economic and environmental constraints.* The Program Outcome ‘PO-03’ has been classified into following performance criteria:

***PO-03(A): Ability to formulate problems for electrical systems***

***PO-03(B): Design process to satisfy project objective for electrical systems***

***PO-03(C): Work with real time systems within realistic constraints***

***PO-03(D): Build prototypes, wherever needed, that meet design specifications***

The program assessment committee identified the following courses for the assessment of Program Outcome ‘PO-03’. The courses used for the assessment during last three academic years are **marked bold**.

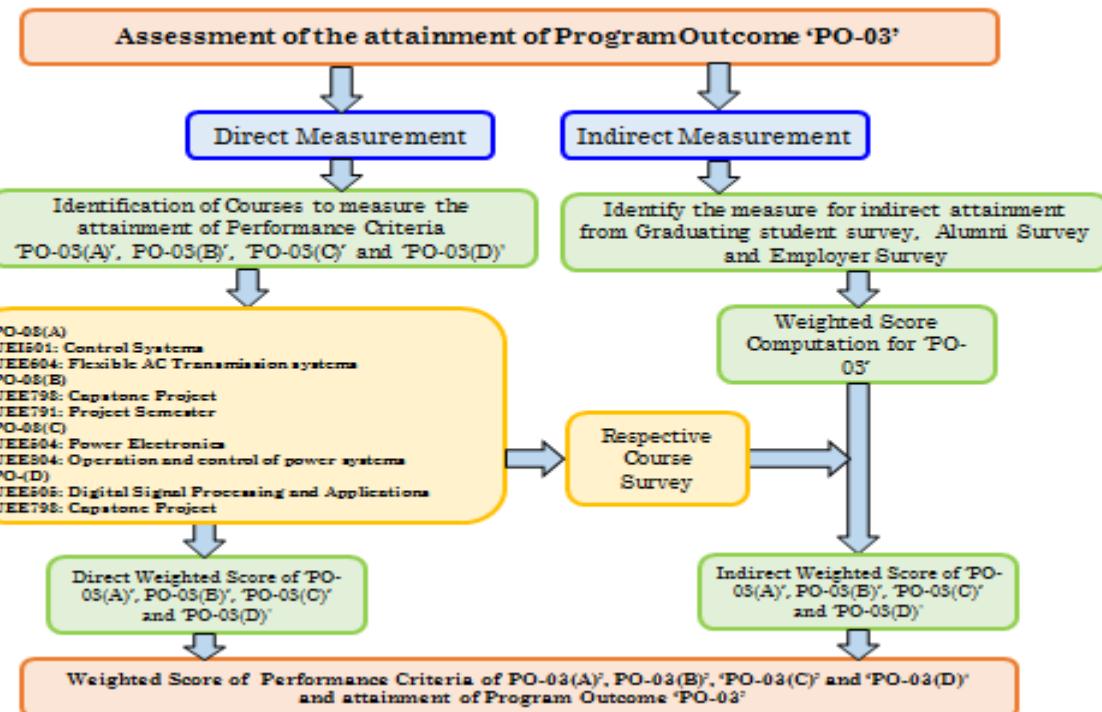
- **UEE402: Transmission and Distribution of Power**
- **UEI501: Control Systems**
- **UEE502: High Voltage Engineering**
- **UEE503: Network Analysis and Design**
- **UEI503: Digital Signal Processing and Applications**
- **UEE504: Power Electronics**
- UEI504: Microprocessor and Applications
- **UEE604: Flexible AC transmission systems**
- **UEE602: Power System Analysis and Stability**
- UEE603: Switchgear and Protection
- **UEE791: Project Semester**
- **UEE793: Capstone Project**
- **UEE801: Electric Drives**
- **UEE804: Operation and Control of Power Systems**
- UCS401: Computer System Architecture

Outcome C has been assessed through four performance criteria PO-03(A),PO-03( B),PO-03(C) and PO-03(D). The following courses have been considered by the program assessment

committee for the assessment of performance criteria ‘PO-03(A)’, ‘PO-03( B)’, ‘PO-03(C)’ and ‘PO-03(D)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-03(A)	UEI501: Control Systems	UEE604: Flexible AC Transmission Systems
PO-03(B)	UEE791: Project Semester	UEE793: Capstone Project
PO-03(C)	UEE504: Power Electronics	UEE804: Operation and Control of Power Systems
PO-03(D)	UEE793: Capstone Project	UEI503: Digital Signal Processing and Applications

The step by step methodology used to measure the attainment of Program Outcome ‘PO-03’ is shown in Fig. PO-03.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of Program Outcome ‘PO-03’ for all three academic years under consideration.



**Fig. PO-03.1: Process for measurement of attainment of outcome ‘PO-03’ for the year 2016-17**

The Rubric used to convert marks obtained by students to a scale in the range of 1 to 5 is described in Table PO-03.1 (a) and Table PO-03.1 (b) for theoretical and other sessional component respectively.

**Table PO-03.1 (a): Rubric for Outcome Measurement of Theoretical Component**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

**Table PO-03.1(b): Rubric for Outcome Measurement of Sessional Component**

S. No.	Range of Marks (%)	Score (1-5)
1	$80 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the courses mentioned.

## **Assessment of Outcome ‘PO-03’ using Performance Criterion ‘PO-03(A)’**

### **PO-03(A): Ability to formulate problems for electrical systems**

The performance criteria ‘PO-03(A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEI501: Control Systems* and *UEE604: Flexible AC Transmission System* are used to assess performance criteria A as a direct measure. The analysis for each of these courses is provided below:

#### **UEI501: Control Systems**

The performance of course *UEI501: Control Systems* is used to measure the attainment of outcome ‘PO-03(A)’ through the End Semester Examination (Question No. 5, July-Dec 2016, 20 marks).

#### **Question:**

Q.5	The Transfer function of a control system is given by $\frac{Y(s)}{U(s)} = \frac{s + 2}{(s^3 + 9s^2 + 26s + 24)}$ Check the controllability and observability.	(20)
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The performance of the students in the above question is summarized in Table PO-03(A).1 using rubrics defined in Table PO-03.1 (a).

**Table PO-03(A).1: Students’ performance in question targeting ‘PO-03(A)’: Course UEI501**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101404001	Abhay Mahipal	18	5
2	101404002	Abhijeet Singh Sankhla	1	1
3	101404004	Abhinav Arora	10	3
4	101404006	Abhishek Sharma	20	5
5	101404007	Ajay Singh	19	5
6	101404009	Alka Thakur	18	5
7	101404012	Ankush Goyal	20	5
8	101404013	Anmol Arjun Bharaj	8	3
9	101404014	Anmol Goyat	5	2
10	101404015	Anmol Rattan Kaur	0	1

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
11	101404017	Anubhav Kumar	18	5
12	101404018	Apeksha Goel	10	3
13	101404019	Arnish Jain	20	5
14	101404020	Arshiya	20	5
15	101404021	Arshjot Kaur	20	5
16	101404023	Ayush Jain	20	5
17	101404024	Bhawani Singh	18	5
18	101404025	Chirag Jain	19	5
19	101404026	Davileen Garg	20	5
20	101404027	Dilpreet Kaur	20	5
21	101404028	Divesh Kamdar	18	5
22	101404029	Divyam Aggarwal	4	2
23	101404031	Divyanshu Siddharth	20	5
24	101404032	Garima	18	5
25	101404033	Garv Chahar	2	1
26	101404035	Gaurav Rathore	13	4
27	101404036	Gurpreet Singh	20	5
28	101404037	Gursagar Singh	18	5
29	101404038	Gurupinder Pal Singh	20	5
30	101404039	Harmanpreet Singh	16	5
31	101404041	Harshit Kaushik	15	5
32	101404042	Harshvir Singh	20	5
33	101404043	Harsimarjot Kaur	20	5
34	101404044	Harsimran Singh	20	5
35	101404046	Heema Gupta	20	5
36	101404047	Hitesh Kumar	5	2
37	101404048	Ishita Mahindru	18	5
38	101404049	Jagmeet Singh Bawa	0	1
39	101404050	Jagnoor Kaur	20	5
40	101404051	Jashanpreet Singh	20	5
41	101404052	Jatin Bansal	18	5
42	101404053	Jatin Raheja	19	5
43	101404054	Kanishak Sharma	2	1
44	101404055	Karan Sanjeev Bajaj	6	2
45	101404056	Kirtish Madaan	20	5
46	101404057	Mahitosh Sharma	20	5
47	101404058	Manan Mittal	0	1
48	101404059	Mandeep Singh Panesar	20	5
49	101404060	Manisha Gupta	2	1
50	101404061	Manit Gupta	12	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
51	101404121	Siddharth Singh	20	5
52	101404129	Tarun Kumar	20	5
53	101404130	Tushar Goel	20	5
54	101404132	Utkarsh Atri	20	5
55	101404133	Vandana Gora	20	5
56	101404135	Vasu Mittal	18	5
57	101404136	Yashika Chopra	20	5
58	101404137	Yatin Gudwani	18	5
59	101404138	Yogesh Garg	16	5
60	101454001	Yatendra Agrawal	19	5
61	101454002	Yash Motwani	19	5
62	101584001	Amanjit Singh	19	5
63	101584002	Chetan Garg	20	5
64	101584004	Gurpreet Singh	2	1
65	101584006	Harman Preet Singh	0	1
66	101584008	Lakshay Garg	19	5
67	101584010	Rohit	5	2
68	101584012	Sharandeep Singh	20	5

The performance of students through the course UEI501 for criteria A is summarized in Table PO-03(A).2

**Table PO-03(A).2: Average score of student performance in the course UEI501 for criteria ‘PO-03(A)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEI501	72.06	2.94	4.41	7.35	13.24	4.13

## UEE604: Flexible AC Transmission Systems

The performance of course *UEE604: Flexible AC Transmission Systems* is used to measure the attainment of outcome ‘PO-03(A)’ through the End Semester Examination (Question No. 10, Jan-May 2017, 10 marks).

### Question:

Q.10	Discuss the “indirect” output voltage control of STATCOM by varying the dc capacitor voltage through the temporary phase shift of the output voltage. Explain with suitable wave diagram and block diagram.	(10)
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The performance of the students in the above question is summarized in Table PO-03(A).3 using rubrics defined in Table PO-03.1(a).

**Table PO-03(A).3: Students' performance in question targeting ‘PO-03(A)’: Course UEE604**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	7	4
2	101404002	Abhijeet Singh Sankhla	0	1
3	101404004	Abhinav Arora	7	4
4	101404006	Abhishek Sharma	10	5
5	101404009	Alka Thakur	8	5
6	101404012	Ankush Goyal	3	2
7	101404013	Anmol Arjun Bharaj	1	1
8	101404014	Anmol Goyat	6	4
9	101404015	Anmol Rattan Kaur	0	1
10	101404017	Anubhav Kumar	0	1
11	101404018	Apeksha Goel	8	5
12	101404019	Arnish Jain	1	1
13	101404020	Arshiya	3	2
14	101404021	Arshjot Kaur	9	5
15	101404023	Ayush Jain	10	5
16	101404024	Bhawani Singh	7	4
17	101404025	Chirag Jain	5	3
18	101404026	Davileen Garg	7	4
19	101404027	Dilpreet Kaur	3	2
20	101404028	Divesh Kamdar	7	4
21	101404029	Divyam Aggarwal	2	2
22	101404031	Divyanshu Siddharth	5	3
23	101404032	Garima	5	3
24	101404033	Garv Chahar	1	1
25	101404035	Gaurav Rathore	1	1

26	101404037	Gursagar Singh	3	2
27	101404038	Gurupinder Pal Singh	0	1
28	101404041	Harshit Kaushik	0	1
29	101404042	Harshvir Singh	5	3
30	101404043	Harsimarjot Kaur	0	1
31	101404044	Harsimran Singh	3	2
32	101404046	Heema Gupta	5	3
33	101404047	Hitesh Kumar	0	1
34	101404048	Ishita Mahindru	6	4
35	101404049	Jagmeet Singh Bawa	0	1
36	101404050	Jagnoor Kaur	0	1
37	101404051	Jashanpreet Singh	1	1
38	101404052	Jatin Bansal	0	1
39	101404054	Kanishak Sharma	4	3
40	101404055	Karan Sanjeev Bajaj	9	5
41	101404057	Mahitosh Sharma	7	4
42	101404058	Manan Mittal	7	4
43	101404059	Mandeep Singh Panesar	5	3
44	101404060	Manisha Gupta	0	1
45	101404061	Manit Gupta	3	2
46	101404062	Manjosh Singh Dhillon	9	5
47	101404063	Manpreet Singh Brar	8	5
48	101404064	Manvir Kaur	1	1
49	101404065	Mehak Bhatia	1	1
50	101404066	Mithilesh Kumar	0	1
51	101404067	Mohit Goyal	7	4
52	101404068	Mridul Marwaha	7	4
53	101404069	Mudit Arora	6	4
54	101404070	Naveen Parashar	1	1
55	101404072	Nigam Wadhwa	5	3
56	101404073	Nikhil Danodia	0	1
57	101404074	Nishita Kumari	6	4
58	101404075	Nitin Gupta	6	4
59	101404076	Nitish Arora	8	5
60	101404077	Nitish Bhardwaj	0	1
61	101404078	Omandeep Kaur	4	3
62	101404079	Pankaj Garg	2	2
63	101404080	Paramjot Singh	5	3
64	101404081	Parmar Adhiraj Singh	2	2
65	101404083	Prabhdeep Kaur	0	1

The performance of students through the course UEE604 for criteria A is summarized in Table PO-03(A).4.

**Table PO-03(A).4: Average score of student performance in the course UEE604 for criteria A**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
<b>UEE604</b>	13.85	21.54	15.38	13.85	35.38	<b>2.65</b>

The data from Table PO-03(A).2 and Table PO-03(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-03(A)’, and is summarised in Table PO-03(A).5.

**Table PO-03(A).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-03(A)’**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
<b>UEI501</b>	72.06	2.94	4.41	7.35	13.24	<b>4.13</b>
<b>UEE604</b>	13.85	21.54	15.38	13.85	35.38	<b>2.65</b>
<b>Student Class Performance Score</b>	<b>42.96</b>	<b>12.24</b>	<b>9.90</b>	<b>10.60</b>	<b>24.31</b>	<b>3.39</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-03(A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-03(A).6 and Table PO-03(A).7.

**Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-03(A)’.

UEI501	Analyze the stability of closed and open loop systems				
UEE604	Analyse system behaviour with hybrid shunt-series compensators.				

**Table PO-03(A).6: Weighted average score of performance criterion ‘PO-03(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEI501	37.71	29.82	14.91	6.14	11.4	3.77
UEE604	12	18	44	18	8	3.08
Course Survey Score	<b>24.86</b>	<b>23.91</b>	<b>29.46</b>	<b>12.07</b>	<b>9.70</b>	<b>3.43</b>

**Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of Program Outcome ‘PO-03’ through indirect measurement using following question in the respective surveys.

Graduating Survey	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.
Alumni Survey	
Employer Survey	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?

**Table PO-03(A).7: Weighted average score of performance criterion ‘PO-03(A)’ based on Other Surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
Graduating student survey	29.58	40.85	29.58	0.00	0.00	<b>4.00</b>
Employer survey	26.67	53.33	20.00	0.00	0.00	<b>4.07</b>
Alumni survey	34.30	31.88	26.09	5.80	1.93	<b>3.91</b>
Other Surveys Score	<b>30.18</b>	<b>42.02</b>	<b>25.22</b>	<b>1.93</b>	<b>0.64</b>	<b>3.99</b>

**c) Overall weighted average score of performance criterion ‘PO-03(A)’**

The overall weighted average score of performance criterion ‘PO-03(A)’ is summarised in Table PO-03(A).8 from the data given in Tables PO-03(A).5, PO-03(A).6 and PO-03(A).7.

**Table PO-03(A).8: Overall weighted average score of performance criterion ‘PO-03(A)’**

<b>Assessment Tool</b>	<b>% of students in each score</b>					<b>Average Score</b>	<b>Assessment Tool Weight</b>
	5	4	3	2	1		
<b>Student Class performance</b>	42.96	12.24	9.90	10.60	24.31	<b>3.39</b>	5
<b>Course Survey</b>	24.86	23.91	29.46	12.07	9.70	<b>3.43</b>	4
<b>Other Surveys</b>	30.18	42.02	25.22	1.93	0.64	<b>3.99</b>	3
<b>Overall Score</b>	<b>33.73</b>	<b>23.58</b>	<b>20.25</b>	<b>8.92</b>	<b>13.52</b>	<b>3.55</b>	-

## **Assessment of Outcome ‘PO-03’ using Performance Criterion ‘PO-03(B)’**

### **PO-03(B): Design process to satisfy project objective for electrical systems**

The performance criteria ‘PO-03(B)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE791: Project Semester* and *UEE793: Capstone Project* are used to assess performance criteria PO-03(B) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE791: Project Semester**

The performance through the goal report describing project formulation of course *UEE791: Project Semester* is used to measure the attainment of outcome ‘PO-03(B)’ for (Jan-May 2017, 05 marks). The students are expected to **demonstrate the understanding of design goals and constraints**.

The performance of the students in the above assessment process is summarized in Table PO-03(B).1 using rubrics defined in Table PO-03.1 (b).

**Table PO-03(B).1: Students’ performance in question targeting ‘PO-03(B)’: Course UEE791**

SI No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	3	4
2	101304002	Abhey Arora	2	3
3	101304003	Abhishek Taksali	4	5
4	101304004	Adhikaansh Tayal	4	5
5	101304005	Aditi Narang	4	5
6	101304006	Aditya	3	4
7	101304007	Akshat	1	2
8	101304008	Akshay Kapoor	2	3
9	101304009	Akshay Kumar	1	2
10	101304011	Akshay Sharma	2	3
11	101304012	Amandeep Kaur	3	4
12	101304013	Amandeep Singh	3	4
13	101304014	Amaninder Singh Randhawa	2	3
14	101304015	Angad Kapoor	3	4
15	101304016	Ankita Garg	3.5	4

<b>Sl No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (5)</b>	<b>Score (1-5)</b>
16	101304018	Anmol Jawa	4	5
17	101304019	Anmolpreet Singh	3.5	4
18	101304020	Anyuti Tiwari	5	5
19	101304021	Arpit Sharma	3	4
20	101304023	Arshbir Kaur	4	5
21	101304024	Arshdeep Singh Bagga	3	4
22	101304025	Ashish	2	3
23	101304026	Ashish rajpal	3	4
24	101304028	Berry lubana	2	3
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	3	4
28	101304032	Dipin Garg	2	3
29	101304033	Dishant Vanvari	5	5
30	101304034	Divyesh Pratap Singh	4	5
31	101304035	Elham Anwar	4	5
32	101304036	Gurseerat Singh Meen	3	4
33	101304037	Gursewak Singh	1	2
34	101304040	Hariansh Sehgal	2	3
35	101304041	Hartejdeep Singh	4	5
36	101304042	Himanshu Goyal	3.5	4
37	101304044	Jasjit Singh	3.5	4
38	101304045	Jassimran Singh Julka	2	3
39	101304046	Jessica Dhaliwal	4	5
40	101304047	Kanwarpal Singh	2	3
41	101304048	Karan Kumar	3.5	4
42	101304049	Karanjot	3.5	4
43	101304050	Kashish Aggarwal	3	4
44	101304051	Kritika Singla	2	3
45	101304052	Love Gaba	3	4
46	101304054	Manik Mittal	2	3
47	101304055	Maninderjit Singh	2	3
48	101304056	Mayank Singla	3	4
49	101304057	Mridul Bhutani	5	5
50	101304058	Naman Garg	3	4
51	101304059	Navdeep Singh	3	4
52	101304060	Navdeep Singh	3	4
53	101304061	Nazuk Aggarwal	4	5
54	101304062	Nishant garg	3	4
55	101304063	Nishtha Raheja	2	3

<b>Sl No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (5)</b>	<b>Score (1-5)</b>
56	101304064	Paras Bawa	2	3
57	101304065	Parth ahuja	3	4
58	101304066	Parushi	4.5	5
59	101304067	Pency goyal	4.5	5
60	101304068	Piyush Jindal	4	5
61	101304069	Piyush Tripathi	3	4
62	101304070	Prachi Garg	3	4
63	101304071	Prashant Kataria	1	2
64	101304072	Preeti Garg	5	5
65	101304073	PRIYANK ARORA	3	4
66	101304074	Priyanka	4	5
67	101304075	Priyanka Singh	2	3
68	101304076	Priyansh Mahajan	1	2
69	101304077	Rahul meena	4	5
70	101304079	Rajat Sharma	2	3
71	101304080	Ratul Goyal	3	4
72	101304081	Ravinder Singh	2	3
73	101304082	Rishabh juneja	4	5
74	101304083	Robin Manktala	3	4
75	101304084	Rohan Ghai	2	3
76	101304085	Rohan Singla	3	4
77	101304086	Rohan Wadhawan	2	3
78	101304087	Rohit Goyal	2	3
79	101304088	Rubina Bamba	4	5
80	101304089	Sagar Pulani	3	4
81	101304090	Sahil Kataria	3	4
82	101304091	Sakshi	1	2
83	101304092	Sandal Singh Sidhu	4	5
84	101304093	Sandeep Kaur	3	4
85	101304094	Satripleen Kaur	4	5
86	101304095	saurabh mohan	3	4
87	101304097	Shailly Gupta	4	5
88	101304098	Shaina	3	4
89	101304099	Shivika Gupta	4	5
90	101304100	Shresth Rai	1	2
91	101304101	Shubham goyal	4	5
92	101304102	Shubham Gupta	4	5
93	101304103	Shubham Sharma	4	5
94	101304104	Shubham Sharma	2	3
95	101304105	Shubham Soin	2	3

Sl No	Roll No.	Name of Student	Marks (5)	Score (1-5)
96	101304106	Siddharth goyal	1	2
97	101304107	Sidharth Garg	5	5
98	101304108	Simran Kaur	3	4
99	101304109	Simranjit Singh	1	2
100	101304111	Sumit Dhingra	3	4
101	101304112	Sumit Kaushik	4	5
102	101304113	Tushar Dheer	4	5
103	101304114	Tushar sharma	4	5
104	101304116	Utsav Chhabra	4	5
105	101304117	Vaibhav Gupta	3.5	4
106	101304118	Vaishali	4	5
107	101304119	Varun Bansal	5	5
108	101304120	Veni Jindal	5	5
109	101304121	Vishal Arora	3	4
110	101484001	Yugesh Goyal	4.5	5
111	101484002	Amandeep Singh	3	4
112	101484004	Amrinder singh	3	4
113	101484005	Azad Singh	2	3
114	101484007	Chandan Garg	2	3
115	101484008	Deepak Singla	4	5
116	101484009	Diljeet Singh	3	4
117	101484011	JyotiKaushal	3	4
118	101484012	Pawan Kumar	1	2
119	101484013	Rajat Singla	3	4
120	101484014	Satveer Kaur	3	4
121	101484015	Saurabh Kumar Wadhawan	3.5	4
122	101484016	Shweta Sharma	2	3
123	101484017	Sukhjeet Singh	2	3

The performance of students through the course UEE791 for criteria PO-03(B) is summarized in Table PO-03(B).2

**Table PO-03(B).2: Average score of student performance in the course UEE791 for criteria ‘PO-03(B)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEE791	32.52	37.40	21.95	8.13	0.00	3.94

## **UEE793: Capstone Project**

The performance of course *UEE793: Capstone Project* is used to measure the attainment of outcome ‘PO-03(B)’ through *the ability of students to design and simulation of process/system in capstone project*. The assessment of the criteria is based on one of the components of capstone project, “Design and simulation of process/system” (July-Dec. 2016, 5 marks).

The performance of the students in the above component is summarized in Table PO-03(B).3 using rubrics defined in TablePO-03.1 (b).

**Table PO-03(B).3: Students' performance in question targeting ‘PO-03(B)’: Course UEE793**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	2.5	3
2	101304002	Abhey Arora	2.5	3
3	101304003	Abhishek Taksali	2.5	3
4	101304004	Adhikaansh Tayal	2.5	3
5	101304005	Aditi Narang	2	3
6	101304006	Aditya	3	4
7	101304007	Akshat	2.5	3
8	101304008	Akshay Kapoor	3	4
9	101304009	Akshay Kumar	2.5	3
10	101304010	Akshay Kumar Chaudhary	4	5
11	101304011	Akshay Sharma	3	4
12	101304012	Amandeep Kaur	3	4
13	101304013	Amandeep Singh	4	5
14	101304014	Amaninder Singh Randhawa	2	3
15	101304015	Angad Kapoor	3	4
16	101304016	Ankita Garg	3	4
17	101304018	Anmol Jawa	3	4
18	101304019	Anmolpreet Singh	4	5
19	101304020	Anyuti Tiwary	3	4
20	101304021	Arpit Sharma	4	5
21	101304022	Arsh Kundal	3	4
22	101304023	Arshbir Kaur	3	4
23	101304024	Arshdeep Singh	2.5	3
24	101304025	Ashish	3	4
25	101304026	Ashish Rajpal	4	5
26	101304028	Berry	3.5	4
27	101304029	Bhanu	4.5	5
28	101304030	Bhanu	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
29	101304031	Chirag Gaba	2.5	3
30	101304032	Dipin	3	4
31	101304033	Dishant	3	4
32	101304034	Divyesh Pratap	4	5
33	101304035	Elham	3	4
34	101304036	Gurseerat	3.5	4
35	101304037	Gursewak Singh	2.5	3
36	101304040	Harvensh	4	5
37	101304041	Hartejdeep Singh	2.5	3
38	101304042	Himanshu Goyal	4	5
39	101304044	Jasjit Singh	2.5	3
40	101304045	Jassimran Singh	3.5	4
41	101304046	Jessica	4	5
42	101304047	Kanwarpal singh	2.5	3
43	101304048	Karan Kumar	2	3
44	101304049	Karamjot Singh	2.5	3
45	101304050	Kashish Agarwal	4	5
46	101304051	Kritika	3.5	4
47	101304052	Love gaba	2	3
48	101304054	Manik Mittal	4	5
49	101304055	Maninderjit Singh	2.5	3
50	101304056	Mayank Singla	2	3
51	101304057	Mridul	2.5	3
52	101304058	Naman Garg	4	5
53	101304059	Navdeep Singh	3	4
54	101304060	Navdeep Singh	2.5	3
55	101304061	Nazuk Agarwal	3	4
56	101304062	Nishant Garg	3.5	4
57	101304063	Nishtha Raheja	4	5
58	101304064	Paras Bawa	3	4
59	101304065	Parth Ahuja	2.5	3
60	101304066	Parushi	2.5	3
61	101304067	Pency Goyal	3.5	4
62	101304068	Piyush Jindal	3	4
63	101304069	Piyush Tripathi	4	5
64	101304070	Prachi Garg	2.5	3
65	101304071	Prashant Kataria	2.5	3
66	101304072	Preeti Garg	2.5	3
67	101304073	Priyank Arora	2.5	3
68	101304074	Priyanka	3.5	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
69	101304075	Priyanka Singh	4	5
70	101304076	Priyansh Mahajan	3	4
71	101304077	Rahul Meena	2.5	3
72	101304078	Rajan	2	3
73	101304079	Rajat Sharma	2.5	3
74	101304080	Ratul Goyal	4	5
75	101304081	Ravinder Singh	3	4
76	101304082	Rishabh Juneja	2	3
77	101304083	Robin Manktala	3	4
78	101304084	Rohan Ghai	4	5
79	101304085	Rohan Singla	4	5
80	101304086	Rohan Wadhawan	2.5	3
81	101304087	Rohit Goyal	4	5
82	101304088	Rubina Bamba	2.5	3
83	101304089	Sagar Pulani	4	5
84	101304090	Sahil Kataria	3	4
85	101304091	Sakshi	3.5	4
86	101304092	Sandal Singh Sidhu	2.5	3
87	101304093	Sandeep Kaur	2.5	3
88	101304094	SatRipleen kaur	4	5
89	101304095	Saurabh Mohan	2.5	3
90	101304096	Shagundeepraj Singh	3.5	4
91	101304097	Shailey Gupta	3	4
92	101304098	Shaina	4	5
93	101304099	Shivika Gupta	2.5	3
94	101304100	Shresth Rai	3.5	4
95	101304101	Shubham Goyal	3	4
96	101304102	Shubham Gupta	2.5	3
97	101304103	Shubham Sharma	4	5
98	101304104	Shubham Sharma	4	5
99	101304105	Shubham Soin	4	5
100	101304106	Siddharth Goyal	2.5	3
101	101304107	Sidharth Garg	3.5	4
102	101304108	Simran Kaur	3	4
103	101304109	Simranjit Singh	3	4
104	101304111	Sumit Dhingra	4	5
105	101304112	Sumit Kaushik	4	5
106	101304113	Tushar Dheer	3	4
107	101304114	Tushar Sharma	3.5	4
108	101304116	Utsav Chhabra	3	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
109	101304117	Vaibhav Gupta	3	4
110	101304118	Vaishali	3	4
111	101304119	Varun Bansal	3	4
112	101304120	Veni Jindal	3	4
113	101304121	Vishal Arora	3	4
114	101304122	Yugesh Goyal	3.5	4
115	101484001	Amandeep Singh	4	5
116	101484002	Amrinder Singh	4	5
117	101484003	Ashmeen Singh	3.5	4
118	101484004	Azad Singh	2.5	3
119	101484005	Chardan Garg	2.5	3
120	101484007	Deepak	3	4
121	101484008	Diljeet Singh	3	4
122	101484009	Jyoti Kaushal	3	4
123	101484011	Pawan Kumar	3	4
124	101484012	Rajat Singla	3	4
125	101484013	Satveer Kaur	3.5	4
126	101484014	Saurabh Kumar Wadhawan	2	3
127	101484015	Shweta Sharma	3	4
128	101484016	Sukhjeet Singh	2	3

The performance of students through the course UEE793 for criteria PO-03(B) is summarized in Table PO-03(B).4.

**Table PO-03(B).4: Average score of student performance in the course UEE793 for criteria PO-03(B)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE793	24.22	42.19	33.59	0	0	3.9

The data from Table PO-03(B).2 and Table PO-03(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-03(B)’, and is summarised in Table PO-03(B).5.

**Table PO-03(B).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-03(B)’**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE791	32.52	37.40	21.95	8.13	0.00	3.94

<b>UEE793</b>	24.22	42.19	33.59	0	0	<b>3.9</b>
<b>Student Class Performance Score</b>	<b>28.37</b>	<b>39.80</b>	<b>27.77</b>	<b>4.07</b>	<b>0.00</b>	<b>3.92</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-03(B)’ has been assessed through surveys such as Graduating Student Survey, Alumni Survey and Employer Survey. The weighted average score in respective surveys is summarised in PO-03(A).7.

**Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-03(B)’.

<b>UEE791</b>	Carry out design calculations and implementations in the area of project
<b>UEE793</b>	To design an electrical engineering project implementing an integrated design approach applying knowledge accrued in various professional courses

**Table PO-03(B).6: Weighted average score of performance criterion ‘PO-03(B)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE791</b>	29.27	35.77	29.27	2.44	3.25	<b>3.85</b>
<b>UEE793</b>	35.16	32.03	28.12	3.12	1.56	<b>3.96</b>
<b>Course Survey score</b>	<b>32.22</b>	<b>33.90</b>	<b>28.70</b>	<b>2.78</b>	<b>2.41</b>	<b>3.91</b>

**c) Overall weighted average score of performance criterion ‘PO-03(B)’**

The overall weighted average score of performance criterion ‘PO-03(B)’ is summarised in Table PO-03(B).7 from the data obtained in Tables PO-03(B).5, PO-03(B).6 and PO-03(A).7.

**Table PO-03(B).7: Overall weighted average score of performance criterion ‘PO-03(B)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student Class performance</b>	28.37	39.80	27.77	4.07	0.00	<b>3.92</b>	5
<b>Course Surveys</b>	32.22	33.90	28.70	2.78	2.41	<b>3.91</b>	4
<b>Other Surveys</b>	30.18	42.02	25.22	1.93	0.64	<b>3.99</b>	3
<b>Overall Score</b>	<b>30.11</b>	<b>38.39</b>	<b>27.44</b>	<b>3.11</b>	<b>0.96</b>	<b>3.93</b>	-

## **Assessment of Outcome ‘PO-03’ using Performance Criterion ‘PO-03(C)’**

### **PO-03(C): Work with real time systems within realistic constraints**

The performance criteria ‘PO-03(C)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE504: Power Electronics* and *UEE804: Operation and Control of Power Systems* are used to assess performance criteria PO-03(C) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE504: Power Electronics**

The performance of course *UEE504: Power Electronics* is used to measure the attainment of outcome ‘PO-03(C)’ through the End Semester Examination (Question No. 2, 4 and 6, July-Dec 2016, weightage 41 marks).

#### **Question:**

Q.2	A three phase, three pulse phase controlled rectifier is fed through delta-star transformer with ratio 1:1 to RL load requiring ripple free current. A freewheeling diode is connected across load. Sketch waveforms of source current, output voltage, load current, freewheeling diode current, voltage across one thyristor. Obtain expressions for average and RMS value of output voltage, thyristor current and freewheeling diode current and rectification efficiency. Take firing angle $\alpha=\pi/2$ .	(15)
Q.4	(a) For a step-down (type-A) chopper, with R-L-E load: $R = 0.25 \Omega$ , $L = 0.2 \text{ mH}$ , $E = 40 \text{ V}$ , is connected to a source voltage, $V_S = 110 \text{ V}$ . The chopping period, ( $T$ ) is $2500 \mu\text{s}$ , and on period, ( $T_{on}$ ) is $1250 \mu\text{s}$ . (i) Find whether load current is continuous or not. (ii) Derive the expressions for average output voltage, maximum and minimum values of steady state output current based on outcome of part (i) and calculate ripple current, average output voltage and average current.  (b) A step-up chopper has input voltage of $220 \text{ V}$ , and output voltage of $660 \text{ V}$ . If the non-conducting time of thyristor is $100 \mu\text{s}$ . Compute the pulse width of output voltage. If pulse width is halved for constant frequency operation, find new output voltage.  (c) Discuss voltage commutated chopper with relevant voltage and current waveforms. Obtain the design of commutating elements L and C. Also show that effective on-period of chopper is load dependent.	(20)
Q.6	(a) Discuss qualitative and quantitative analysis of three phase voltage source inverter in $120^\circ$ mode of operation feeding star connected load. Sketch the waveforms for three-phase output phase voltages ( $V_{AN}$ , $V_{BN}$ , $V_{CN}$ ) and output line voltages ( $V_{AB}$ ,	(06)

	$V_{BC}$ , $V_{CA}$ ). Derive the expression for R.M.S. value of fundamental component of line voltage ( $V_{AB}$ ) and utilization factor.	
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The performance of the students in the above questions is summarized in Table PO-03(C).1 using rubrics defined in Table PO-03.1 (a).

**Table PO-03(C).1: Students' performance in question targeting 'PO-03(C)': Course UEE504**

S. No	Roll No.	Name of Student	Marks (41)	Score (1-5)
1	101404001	Abhay Mahipal	17.5	3
2	101404002	Abhijeet Singh	7.5	1
3	101404004	Abhinav Arora	11.5	2
4	101404006	Abhishek Sharma	7	1
5	101404007	Ajay Singh	11.5	2
6	101404009	Alka Thakur	10	2
7	101404012	Ankush Goyal	15	2
8	101404014	Anmol Goyat	8.5	2
9	101404015	Anmol Rattan Kaur	6	1
10	101404018	Apeksha Goel	13.5	2
11	101404019	Arnish Jain	16	2
12	101404020	Arshiya	33	5
13	101404021	Arshjot Kaur	29	4
14	101404023	Ayush Jain	16.5	3
15	101404024	Bhawani Singh	22.5	3
16	101404025	Chirag Jain	24	3
17	101404026	Davileen Garg	22	3
18	101404027	Dilpreet Kaur	16.5	3
19	101404028	Divesh Kamdar	35	5
20	101404029	Divyam Aggarwal	23	3
21	101404031	Divyanshu Siddharth	17.5	3
22	101404032	Garima	16	2
23	101404033	Garv Chahar	7	1
24	101404035	Gaurav Rathore	9.5	2
25	101404036	Gurpreet Singh	1.5	1
26	101404037	Gursagar Singh	24.5	3
27	101404038	Gurupinder Pal Singh	18.5	3
28	101404041	Harshit Kaushik	18.5	3
29	101404042	Harshvir Singh	26	4
30	101404043	Harsimarjot Kaur	26.5	4
31	101404044	Harsimran Singh	11	2
32	101404046	Heema Gupta	25.5	4
33	101404047	Hitesh Kumar	8.5	2

S. No	Roll No.	Name of Student	Marks (41)	Score (1-5)
34	101404048	Ishita Mahindru	13	2
35	101404050	Jagnoor Kaur	15.5	2
36	101404051	Jashanpreet Singh	17.5	3
37	101404052	Jatin Bansal	13.5	2
38	101404053	Jatin Raheja	11.5	2
39	101404054	Kanishak Sharma	19.5	3
40	101404055	Karan Sanjeev Bajaj	23	3
41	101404056	Kirtish Madaan	15.5	2
42	101404057	Mahitosh Sharma	34	5
43	101404058	Manan Mittal	19.5	3
44	101404059	Mandeep Singh Panesar	26.5	4
45	101404060	Manisha Gupta	11.5	2
46	101404061	Manit Gupta	9	2
47	101404067	Mohit Goyal	27.5	4
48	101404068	Mridul Marwaha	33.5	5
49	101404076	Nitish Arora	26.5	4
50	101404089	Pulkit Bansal	36.5	5
51	101404093	Rahul Goyal	35.5	5
52	101404094	Rajshree Vaidya	7	1
53	101404099	Sagar Bansal	25.5	4
54	101404100	Sahajdeep Kaur	26	4
55	101404102	Sahil Singla	39.5	5
56	101404112	Shivam Dochania	7	1
57	101404128	Tarun Gupta	25	4
58	101404129	Tarun Kumar	18	3
59	101404130	Tushar Goel	25.5	4
60	101404132	Utkarsh Atri	3.5	1
61	101404133	Vandana Gora	10	2
62	101404135	Vasu Mittal	12.5	2
63	101404136	Yashika Chopra	14.5	2
64	101404137	Yatin Gudwani	13	2
65	101404138	Yogesh Garg	12	2
66	101454001	Yatendra Agrawal	28.5	4
67	101454002	Yash Motwani	10.5	2
68	101454005	Tejas Kapila	32.5	5
69	101584001	Amanjit Singh	23	3
70	101584002	Chetan Garg	31	5
71	101584006	Harman Preet Singh	17.5	3
72	101584008	Lakshay Garg	19	3
73	101584010	Rohit	5	1

S. No	Roll No.	Name of Student	Marks (41)	Score (1-5)
74	101584012	Sharandeep Singh	11.5	2

The performance of students through the course UEE504 for criteria C is summarized in Table PO-03(C).2

**Table PO-03(C).2: Average score of student performance in the course UEE504 for criteria ‘PO-03(C)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
<b>UEE504</b>	12.16	16.22	25.68	33.78	12.16	<b>2.82</b>

### **UEE804: Operation and Control of Power System**

The performance of course *UEE804: operation and control of power system* is used to measure the attainment of outcome ‘PO-03(C)’ through the Mid Semester Examination (Question No. 1, Jan-May 2017, 15 marks).

#### **Question:**

Q.1	<p>A system consists of two units to meet the daily load cycle as shown in Fig. 1. The cost curves of the two units are:</p> $C_1 = 0.15P_{G_1}^2 + 60P_{G_1} + 135 \text{ /hr}$ $C_2 = 0.25P_{G_2}^2 + 40P_{G_2} + 110 \text{ ₹/hr}$ <p>The maximum and minimum loads on a unit are to be 220MW and 30MW respectively.</p> <p>Find out:</p> <p>The economical distribution of a load during the light load period of 7 hr and during the heavy load periods of 17 hr. In addition, find the operation cost for this 24 hr period operation of two units.</p> <p>The operation cost when removing one of the units from service during 7 hr of light load period.</p> <p>Assume that a cost of ₹ 525 is incurred in taking a unit off the line and returning it to service after 7 hr.</p>	(15)

The performance of the students in the above question is summarized in Table PO-03(C).3 using rubrics defined in TablePO-03.1 (a).

**Table PO-03(C).3: Students' performance in question targeting 'PO-03(C)': Course UEE804**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101304001	Aarushi Bajaj	7	3
2	101304002	Abhey Arora	12	5
3	101304004	Adhikaansh Tayal	0	1
4	101304005	Aditi Narang	10	4
5	101304006	Aditya	11	4
6	101304007	Akshat	11	4
7	101304008	Akshay Kapoor	7	3
8	101304009	Akshay Kumar	4	2
9	101304010	Akshay Kumar Chaudhary	4	2
10	101304011	Akshay Sharma	10	4
11	101304012	Amandeep Kaur	5	2
12	101304013	Amandeep Singh	11	4
13	101304014	Amaninder Singh Randhawa	11	4
14	101304015	Angad Kapoor	5	2
15	101304016	Ankita Garg	13	5
16	101304018	Anmol Jawa	14	5
17	101304019	Anmolpreet Singh	4	2
18	101304020	Anyuti Tiwary	5	2
19	101304021	Arpit Sharma	5	2
20	101304022	Arsh Kundal	0	1
21	101304023	Arshbir Kaur	9	4
22	101304024	Arshdeep Singh Bagga	9	4
23	101304025	Ashish	7	3
24	101304026	Ashish Rajpal	10	4
25	101304028	Berry Lubana	3	2
26	101304029	Bhanu Duggal	15	5
27	101304030	Bhanu Marwaha	6	3
28	101304031	Chirag Gaba	9	4
29	101304032	Dipin Garg	4	2
30	101304033	Dishant Vanvari	5	2
31	101304034	Divyesh Pratap Singh	12	5
32	101304035	Elham Anwar	8	3
33	101304036	Gurseerat Singh Meen	6	3
34	101304037	Gursewak Singh	9	4
35	101304040	Hariansh Sehgal	5	2
36	101304041	Hartejdeep Singh	4	2

37	101304042	Himanshu Goyal	7	3
38	101304044	Jasjit Singh	4	2
39	101304045	Jassimran Singh Julka	4	2
40	101304046	Jessica Dhaliwal	9	4
41	101304047	Kanwarpal Singh	4	2
42	101304048	Karan Kumar	4	2
43	101304049	Karanjot Singh Kochhar	5	2
44	101304050	Kashish Aggarwal	15	5
45	101304052	Love Gaba	13	5
46	101304054	Manik Mittal	3	2
47	101304055	Maninderjit Singh	10	4
48	101304056	Mayank Singla	10	4
49	101304057	Mridul Bhutani	8	3
50	101304058	Naman Garg	13	5
51	101304059	Navdeep Singh	7	3
52	101304062	Nishant Garg	5	2
53	101304094	Satripleen Kaur	9	4
54	101484001	Amandeep Singh	9	4
55	101484002	Amrinder Singh	6	3
56	101484003	Ashmeen Singh	3	2
57	101484004	Azad Singh	7	3
58	101484007	Deepak Singla	4	2
59	101484008	Diljeet Singh	8	3

The performance of students through the course UEE804 for criteria C is summarized in Table PO-03(C).4.

**Table PO-03(C).4: Average score of student performance in the course UEE804 for criteria PO-03(C)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE804	13.56	27.12	20.34	35.59	3.39	<b>3.12</b>

The data from Table PO-03(C).2 and Table PO-03(C).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-03(C)’, and is summarised in Table PO-03(C).5.

**Table PO-03(C).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-03(C)’**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
<b>UEE504</b>	12.16	16.22	25.68	33.78	12.16	<b>2.82</b>
<b>UEE804</b>	13.56	27.12	20.34	35.59	3.39	<b>3.12</b>
<b>Student Class Performance Score</b>	<b>12.86</b>	<b>21.67</b>	<b>23.01</b>	<b>34.69</b>	<b>7.78</b>	<b>2.97</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-03(C)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-03(C).6 and Table PO-03(A).7.

**Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-03(C)’.

UEE504	Select and design appropriate converter configuration / topology for typical power application such as DC drive, AC drive, HVDC and FACTS.
UEE804	Decide the scheduling of thermal units and hydro-thermal units for overall economy.

**Table PO-03(C).6: Weighted average score of performance criterion ‘PO-03(C)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE504	24.11	26.78	16.07	7.14	25.89	<b>3.16</b>
UEE804	40.18	21.49	24.29	6.54	7.47	<b>3.80</b>
Course Survey Score	<b>32.15</b>	<b>24.14</b>	<b>20.18</b>	<b>6.84</b>	<b>16.68</b>	<b>3.48</b>

**c) Overall weighted average score of performance criterion ‘PO-03(C)’**

The overall weighted average score of performance criterion ‘PO-03’ is summarised in Table PO-03(C).7 from the data given in Tables PO-03(C).5, PO-03(C).6 and PO-03(A).7.

**Table PO-03(C).7: Overall weighted average score of performance criterion ‘PO-03(C)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student Class performance	12.86	21.67	23.01	34.69	7.78	<b>2.97</b>	5
Course Surveys	32.15	24.14	20.18	6.84	16.68	<b>3.48</b>	4
Other Surveys	30.18	42.02	25.22	1.93	0.64	<b>3.99</b>	3
Overall Score	<b>23.62</b>	<b>27.58</b>	<b>22.62</b>	<b>17.22</b>	<b>8.96</b>	<b>3.40</b>	-

## **Assessment of Outcome ‘PO-03’ using Performance Criterion ‘PO-03(D)’**

### **PO-03(D): Build prototypes wherever needed, that meet design specifications**

The performance criteria ‘PO-03(D)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEI503: Digital Signal Processing and Applications* and *UEE793: Capstone Project* are used to assess performance criteria D as a direct measure. The analysis for each of these courses is provided below:

#### **UEI503: Digital Signal Processing and Applications**

The performance of course *UEI503: Digital Signal Processing and Applications* is used to measure the attainment of outcome ‘PO-03(D)’ through the End Semester Examination (Question No. 8, May 2017, 15 marks).

#### **Question:**

Q.8	Design a FIR filter to meet the following specifications Pass band edge=1.5kHz, transition width=1kHz, stop band attenuation > 55dB, Sampling frequency $F_s$ =10kHz.	(15)
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The performance of the students in the above question is summarized in Table PO-03(D).1 using rubrics defined in Table PO-03(C).1 (a).

**Table PO-03(D).1: Students’ performance in question targeting ‘PO-03(D)’ :Course UEI503**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101404001	Abhay Mahipal	15	5
2	101404002	Abhijeet Singh Sankhla	6	3
3	101404004	Abhinav Arora	1	1
4	101404006	Abhishek Sharma	12	5
5	101404007	Ajay Singh	4	2
6	101404009	Alka Thakur	2	1
7	101404012	Ankush Goyal	9	4
8	101404013	Anmol Arjun Bharaj	0	1
9	101404014	Anmol Goyat	2	1

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
10	101404015	Anmol Rattan Kaur	0	1
11	101404017	Anubhav Kumar	0	1
12	101404018	Apeksha Goel	4	2
13	101404019	Arnish Jain	1	1
14	101404020	Arshiya	3.5	2
15	101404021	Arshjot Kaur	5	2
16	101404023	Ayush Jain	5	2
17	101404024	Bhawani Singh	0	1
18	101404025	Chirag Jain	4	2
19	101404026	Davileen Garg	13	5
20	101404027	Dilpreet Kaur	6	3
21	101404028	Divesh Kamdar	7	3
22	101404029	Divyam Aggarwal	15	5
23	101404031	Divyanshu Siddharth	0	1
24	101404032	Garima	3	2
25	101404033	Garv Chahar	2	1
26	101404035	Gaurav Rathore	0	1
27	101404036	Gurpreet Singh	5	2
28	101404037	Gursagar Singh	15	5
29	101404038	Gurupinder Pal Singh	1	1
30	101404039	Harmanpreet Singh	5	2
31	101404041	Harshit Kaushik	3	2
32	101404042	Harshvir Singh	6	3
33	101404043	Harsimarjot Kaur	3	2
34	101404044	Harsimran Singh	10	4
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	6	3
37	101404047	Hitesh Kumar	7	3
38	101404048	Ishita Mahindru	4	2
39	101404049	Jagmeet Singh Bawa	0	1
40	101404050	Jagnoor Kaur	4	2
41	101404051	Jashanpreet Singh	4	2
42	101404052	Jatin Bansal	3	2
43	101404053	Jatin Raheja	5	2
44	101404054	Kanishak Sharma	7	3
45	101404055	Karan Sanjeev Bajaj	13	5
46	101404056	Kirtish Madaan	6	3
47	101404057	Mahitosh Sharma	12	5
48	101404058	Manan Mittal	13	5
49	101404059	Mandeep Singh Panesar	15	5

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
50	101404060	Manisha Gupta	1	1
51	101404061	Manit Gupta	2	1
52	101404121	Siddharth Singh	0	1
53	101404129	Tarun Kumar	2	1
54	101404130	Tushar Goel	6	3
55	101404132	Utkarsh Atri	0	1
56	101404133	Vandana Gora	3	2
57	101404135	Vasu Mittal	1	1
58	101404136	Yashika Chopra	15	5
59	101404137	Yatin Gudwani	4	2
60	101404138	Yogesh Garg	2	1
61	101454001	Yatendra Agrawal	2	1
62	101454002	Yash Motwani	2.5	1
63	101584001	Amanjit Singh	1	1
64	101584002	Chetan Garg	13	5
65	101584004	Gurpreet Singh	0	1
66	101584005	Gurpreet Singh	0	1
67	101584006	Harman Preet Singh	0	1
68	101584008	Lakshay Garg	10	4
69	101584010	Rohit	0	1
70	101584012	Sharandeep Singh	8	3
71	101404062	Manjosh Singh Dhillon	0	1
72	101404063	Manpreet Singh Brar	0	1
73	101404064	Manvir Kaur	0	1
74	101404065	Mehak Bhatia	1	1
75	101404066	Mithilesh Kumar	0	1
76	101404067	Mohit Goyal	15	5
77	101404068	Mridul Marwaha	9	4
78	101404069	Mudit Arora	13	5
79	101404070	Naveen Parashar	6	3
80	101404072	Nigam Wadhwa	12	5
81	101404073	Nikhil Danodia	0	1
82	101404074	Nishita Kumari	8	3
83	101404075	Nitin Gupta	9	4
84	101404076	Nitish Arora	5	2
85	101404077	Nitish Bhardwaj	1	1
86	101404078	Omandeep Kaur	6	3
87	101404079	Pankaj Garg	2.5	1
88	101404080	Paramjot Singh	2.5	1
89	101404081	Parmar Adhiraj Singh	7	3

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
90	101404083	Prabhdeep Kaur	1	1
91	101404084	Prachur Maharwal	2	1
92	101404087	Prashant Khare	4.5	2
93	101404089	Pulkit Bansal	12.5	5
94	101404090	Pushpinder Singh	0	1
95	101404091	Rachit Verma	2	1
96	101404092	Rahul Gautam	1	1
97	101404093	Rahul Goyal	15	5
98	101404094	Rajshree Vaidya	1	1
99	101404096	Rishabh Gupta	0	1
100	101404099	Sagar Bansal	4	2
101	101404100	Sahajdeep Kaur	15	5
102	101404102	Sahil Singla	8	3
103	101404103	Samarth Gupta	7	3
104	101404104	Sambhav Jain	5	2
105	101404105	Samrat Kumar Gupta	1.5	1
106	101404106	Sanamdeep Singh	7	3
107	101404107	Sanket Gupta	1	1
108	101404108	Saurabh Kumar	0	1
109	101404109	Shailesh Verma	2	1
110	101404110	Shaivya Thapliyal	5	2
111	101404111	Sher Mohammed	4	2
112	101404112	Shivam Dochania	0	1
113	101404113	Shivam Gera	6	3
114	101404114	Shivam Kumar Kedia	0	1
115	101404115	Shubham Bhardwaj	15	5
116	101404116	Shubham Chaturvedi	5	2
117	101404117	Shubham Garg	2	1
118	101404118	Shubham Kumar	0	1
119	101404119	Shubham Verma	6.5	3
120	101404120	Shubhdeep Singh	2	1
121	101404122	Simran Mehra	1	1
122	101404123	Sukhman	3.5	2
123	101404124	Swapnil Singla	0	1
124	101404125	Tanish Gupta	2	1
125	101404126	Taranjot Singh	3	2
126	101404127	Tarun Garg	4	2
127	101404128	Tarun Gupta	5	2
128	101454003	Harshwardhan Soni	0	1
129	101454004	Simardeep Kaur	11	4

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
130	101454005	Tejas Kapila	5	2
131	101454006	Nitish Dewan	1	1
132	101454007	Abhishek Nigam	0	1
133	101454008	Tarun Puri	0	1
134	101454009	Lariza Bansal	4	2
135	101454010	Tanish Goyal	10	4
136	101454011	Aditi	7	3
137	101584003	Devinder Kumar	5	2
138	101584007	Karamjeet Singh	0	1
139	101584009	Prince Kalia	5	2
140	101584011	Satvir Singh	1	1
141	101584013	Shashi Sharma	0	1
142	101584014	Sunnypreet Singh	0	1
143	101584015	Rajat Chandra	2	1
144	101584016	Gursimran Singh	3	2

The performance of students through the course UEI503 for criteria D is summarized in Table PO-03(D).2

**Table PO-03(D).2: Average score of student performance in the course UEI503 for criteria ‘PO-03(D)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEI503	12.50	4.86	13.89	23.61	45.14	<b>2.16</b>

### UEE793: Capstone Project

The performance of course *UEE793: Capstone Project* is used to measure the attainment of outcome ‘PO-03(D)’ by evaluating the student performance as recommended from 2<sup>nd</sup> Evaluation of capstone project report. The performance of the students in the above assessment process is summarized in Table PO-03(D).3 using rubrics defined in TablePO-03(C).1 (b).

**Table PO-03(D).3: Students’ performance in question targeting ‘PO-03(D)’: Course UEE793**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	2	3
2	101304002	Abhey Arora	1.5	2
3	101304003	Abhishek Taksali	1.5	2

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
4	101304004	Adhikaansh Tayal	2	3
5	101304005	Aditi Narang	2	3
6	101304006	Aditya	2	3
7	101304007	Akshat	1	2
8	101304008	Akshay Kapoor	2	3
9	101304009	Akshay Kumar	2	3
10	101304010	Akshay Kumar Chaudhary	2.5	3
11	101304011	Akshay Sharma	2	3
12	101304012	Amandeep Kaur	2	3
13	101304013	Amandeep Singh	2	3
14	101304014	Amaninder Singh Randhawa	1	2
15	101304015	Angad Kapoor	2	3
16	101304016	Ankita Garg	2.5	3
17	101304018	Anmol Jawa	2	3
18	101304019	Anmolpreet Singh	2	3
19	101304020	Anyuti Tiwary	2	3
20	101304021	Arpit Sharma	2	3
21	101304022	Arsh Kundal	2	3
22	101304023	Arshbir Kaur	2.5	3
23	101304024	Arshdeep Singh	1.5	2
24	101304025	Ashish	1.5	2
25	101304026	Ashish Rajpal	2.5	3
26	101304028	Berry	2	3
27	101304029	Bhanu	2.5	3
28	101304030	Bhanu	2	3
29	101304031	Chirag Gaba	1.25	2
30	101304032	Dipin	1.5	2
31	101304033	Dishant	1.25	2
32	101304034	Divyesh Pratap	2	3
33	101304035	Elham	1.75	2
34	101304036	Gurseerat	2	3
35	101304037	Gursewak Singh	1.75	2
36	101304040	Harvensh	2	3
37	101304041	Hartejdeep Singh	1.5	2
38	101304042	Himanshu Goyal	2	3
39	101304044	Jasjit Singh	1.75	2
40	101304045	Jassimran Singh	1.75	2
41	101304046	Jessica	2	3
42	101304047	Kanwarpal singh	1.5	2
43	101304048	Karan Kumar	1.25	2

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
44	101304049	Karamjot Singh	1.75	2
45	101304050	Kashish Agarwal	2	3
46	101304051	Kritika	2	3
47	101304052	Love gaba	0.75	1
48	101304054	Manik Mittal	2	3
49	101304055	Maninderjit Singh	1.75	2
50	101304056	Mayank Singla	1	2
51	101304057	Mridul	1.75	2
52	101304058	Naman Garg	2	3
53	101304059	Navdeep Singh	1.5	2
54	101304060	Navdeep Singh	1	2
55	101304061	Nazuk Agarwal	1.5	2
56	101304062	Nishant Garg	2	3
57	101304063	Nishtha Raheja	2	3
58	101304064	Paras Bawa	0.75	1
59	101304065	Parth Ahuja	0.75	1
60	101304066	Parushi	1.75	2
61	101304067	Pency Goyal	1.75	2
62	101304068	Piyush Jindal	1.5	2
63	101304069	Piyush Tripathi	2	3
64	101304070	Prachi Garg	1.75	2
65	101304071	Prashant Kataria	1.75	2
66	101304072	Preeti Garg	1.75	2
67	101304073	Priyank Arora	1.5	2
68	101304074	Priyanka	2	3
69	101304075	Priyanka Singh	2	3
70	101304076	Priyansh Mahajan	1.75	2
71	101304077	Rahul Meena	0.75	1
72	101304078	Rajan	0.75	1
73	101304079	Rajat Sharma	1	2
74	101304080	Ratul Goyal	2	3
75	101304081	Ravinder Singh	1.5	2
76	101304082	Rishabh Juneja	1	2
77	101304083	Robin Manktala	1.75	2
78	101304084	Rohan Ghai	2	3
79	101304085	Rohan Singla	2	3
80	101304086	Rohan Wadhawan	1.5	2
81	101304087	Rohit Goyal	2	3
82	101304088	Rubina Bamba	1.75	2
83	101304089	Sagar Pulani	2	3

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
84	101304090	Sahil Kataria	1.5	2
85	101304091	Sakshi	2	3
86	101304092	Sandal Singh Sidhu	1	2
87	101304093	Sandeep Kaur	1.5	2
88	101304094	SatRipleen kaur	2	3
89	101304095	Saurabh Mohan	1.5	2
90	101304096	Shagundeepl Singh	1.75	2
91	101304097	Shailly Gupta	1.75	2
92	101304098	Shaina	2	3
93	101304099	Shivika Gupta	0.75	1
94	101304100	Shresth Rai	2	3
95	101304101	Shubham Goyal	1.75	2
96	101304102	Shubham Gupta	1.5	2
97	101304103	Shubham Sharma	2	3
98	101304104	Shubham Sharma	2	3
99	101304105	Shubham Soin	2	3
100	101304106	Siddharth Goyal	1.5	2
101	101304107	Sidharth Garg	2	3
102	101304108	Simran Kaur	1.75	2
103	101304109	Simranjit Singh	1.5	2
104	101304111	Sumit Dhingra	2	3
105	101304112	Sumit Kaushik	2	3
106	101304113	Tushar Dheer	1.5	2
107	101304114	Tushar Sharma	1.75	2
108	101304116	Utsav Chhabra	1.75	2
109	101304117	Vaibhav Gupta	1.75	2
110	101304118	Vaishali	1.5	2
111	101304119	Varun Bansal	1.5	2
112	101304120	Veni Jindal	1.75	2
113	101304121	Vishal Arora	1.5	2
114	101304122	Yugesh Goyal	1.75	2
115	101484001	Amandeep Singh	2.5	3
116	101484002	Amrinder Singh	2.5	3
117	101484003	Ashmeen Singh	2.5	3
118	101484004	Azad Singh	1.5	2
119	101484005	Chardan Garg	1.5	2
120	101484007	Deepak	1.75	2
121	101484008	Diljeet Singh	1.75	2
122	101484009	Jyoti Kaushal	1.5	2
123	101484011	Pawan Kumar	1.5	2

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
124	101484012	Rajat Singla	1.5	2
125	101484013	Satveer Kaur	1.75	2
126	101484014	Saurabh Kumar Wadhawan	1	2
127	101484015	Shweta Sharma	1.75	2
128	101484016	Sukhjeet Singh	1	2

The performance of students through the course UEE793 for criteria P0-03(D) is summarized in Table PO-03(D).4.

**Table PO-03(D).4: Average score of student performance in the course UEE793 for criteria PO-03(D)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE793	0.00	0.00	42.19	53.13	4.69	<b>2.38</b>

The data from Table PO-03(D).2 and Table PO-03(D).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-03(D)’, and is summarised in Table PO-03(D).5.

**Table PO-03(D).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-03(D)’**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UEI503	12.50	4.86	13.89	23.61	45.14	2.16
UEE793	0.00	0.00	42.19	53.13	4.69	2.38
<b>Student Class Performance Score</b>	<b>6.25</b>	<b>2.43</b>	<b>28.04</b>	<b>38.37</b>	<b>24.915</b>	<b>2.27</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-03(D)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-03(D).6 and Table PO-03(A).7.

**Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-03(D)’.

UEI503	Design and implementation digital filters
UEE793	To design an electrical engineering project implementing an integrated design approach applying knowledge accrued in various professional courses

**Table PO-03(D).6: Weighted average score of performance criterion ‘PO-03(D)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEI503	15.07	46.58	30.14	5.48	2.74	<b>3.66</b>
UEE793	35.16	32.03	28.12	3.12	1.56	<b>3.96</b>
Course Survey Score	<b>25.12</b>	<b>39.31</b>	<b>29.13</b>	<b>4.30</b>	<b>2.15</b>	<b>3.81</b>

**c) Overall weighted average score of performance criterion ‘PO-03(D)’**

The overall weighted average score of performance criterion ‘PO-03(D)’ is summarised in Table PO-03(D).7 from the data given in Tables PO-03(D).5, PO-03(D).6 and PO-03(A).7.

**Table PO-03(D).7: Overall weighted average score of performance criterion ‘PO-03(D)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student Class Performance	6.25	2.43	22.18	43.84	25.31	<b>2.21</b>	5
Course Surveys	25.12	39.31	29.13	4.30	2.15	<b>3.81</b>	4
Other Surveys	30.18	42.02	25.22	1.93	0.64	<b>3.99</b>	3
Overall Score	<b>18.52</b>	<b>24.62</b>	<b>25.26</b>	<b>20.18</b>	<b>11.42</b>	<b>3.19</b>	-

**Overall assessment of Program Outcome C using scores of PO-03(A), PO-03( B),PO-03( C) and PO-03(D)**

In the previous sections, each of the individual performance criteria PO-03(A),PO-03( B),PO-03( C) and PO-03(D) have been assessed. The performance for attainment of outcome PO-03 has been completed using the attainment values for PO-03(A), PO-03(B), PO-03(C) and PO-03(D) and is provided below:

Table PO-03.2 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome PO-03.

**Table PO-03.2: Overall score for outcome PO-03 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-03(A)	33.73	23.58	20.25	8.92	13.52	<b>3.55</b>	5
PO-03(B)	30.11	38.39	27.44	3.11	0.96	<b>3.93</b>	5
PO-03(C)	23.62	27.58	22.62	17.22	8.96	<b>3.40</b>	5
PO-03(D)	18.52	24.62	25.26	20.18	11.42	<b>3.19</b>	
<b>Overall score</b>	<b>26.50</b>	<b>28.54</b>	<b>23.89</b>	<b>12.36</b>	<b>8.72</b>	<b>3.52</b>	

## **Track record and assessment of attainment of Program Outcomes over the last three academic years**

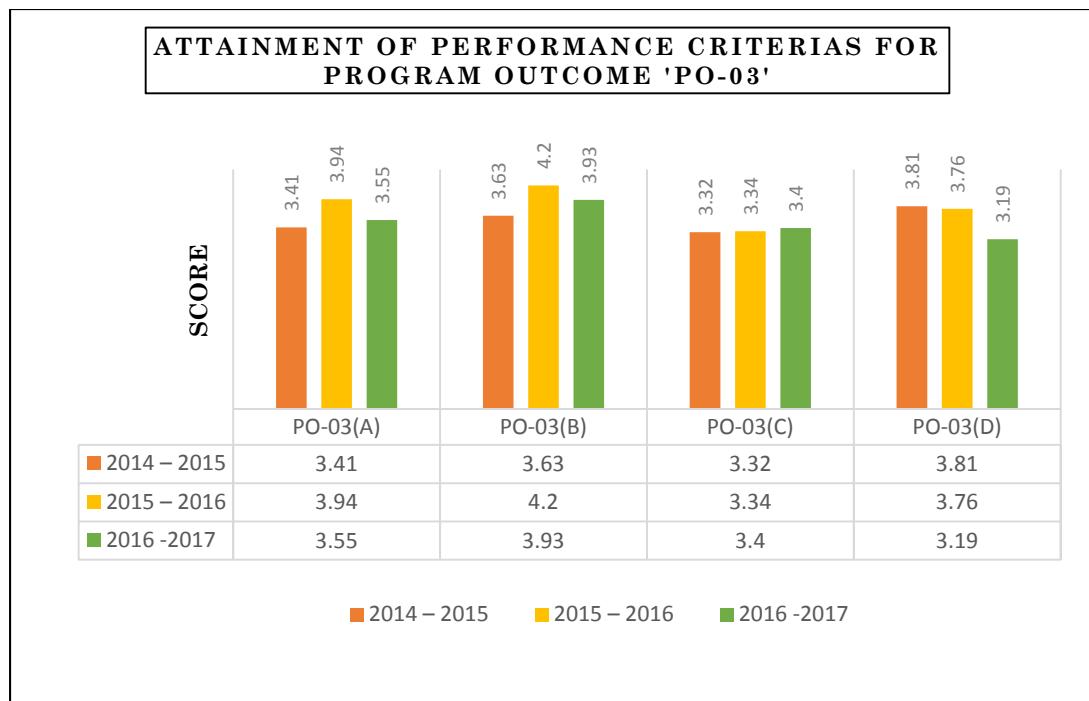
The performance criteria-wise assessments score distribution and overall weighted score for outcome ‘PO-03’ for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section.

The Table PO-03.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-03’.

**Table PO-03.3Performance criteria-wise assessment scores distribution for each outcome ‘PO-03’**

Program Outcome and performance criteria	Academic year			Weight
	2014 – 2015	2015 – 2016	2016 -2017	
<b>PO-03</b>	<b>PO-03(A)</b>	3.41	3.94	3.55
	<b>PO-03(B)</b>	3.63	4.20	3.93
	<b>PO-03(C)</b>	3.32	3.34	3.40
	<b>PO-03(D)</b>	3.81	3.76	3.19
<b>Overall score of outcome PO-03</b>	<b>3.54</b>	<b>3.81</b>	<b>3.52</b>	

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-03’ over a period of last three years.

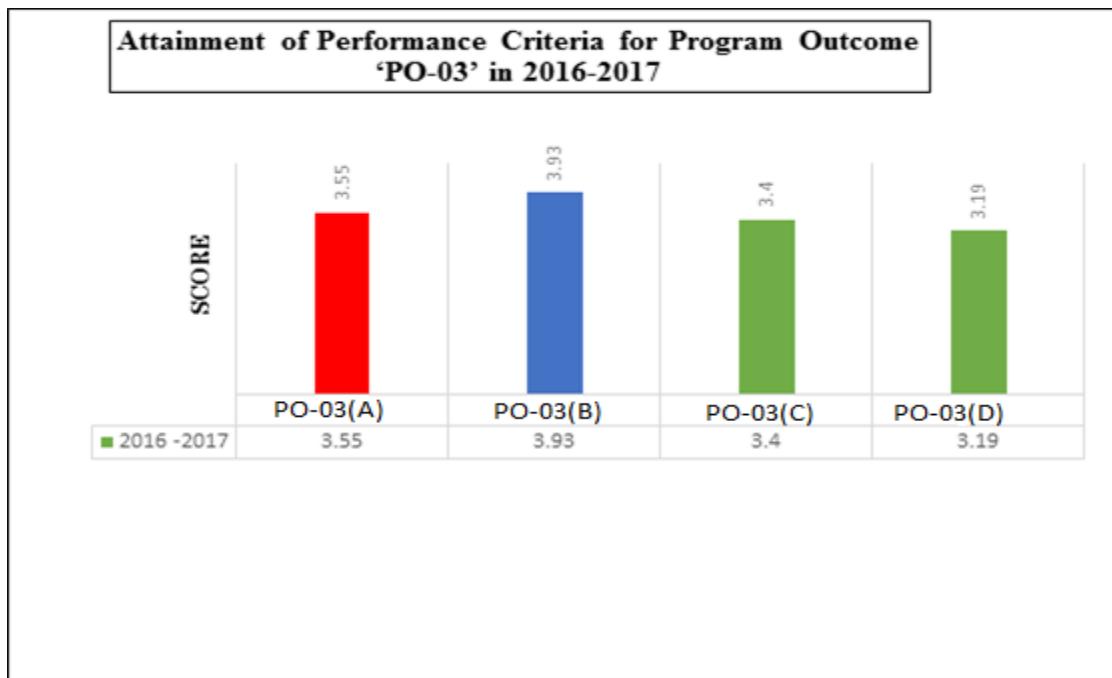


**Fig PO-03.3 Attainment of Program Outcome over the last three academic years**

#### **Level of attainment of Program Outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$ .
- Very Good:** Overall weighted score for the outcome is between 4 and 4.5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5.
- Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$ .

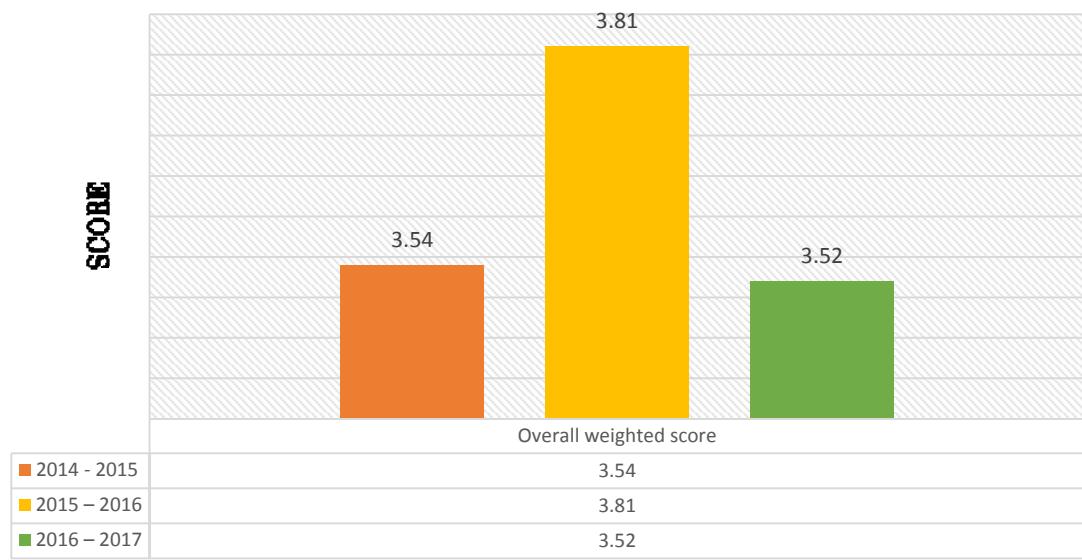


**Figure PO-03(C).2:** weighted score of the outcome 'PO-03' in the year 2016-17

**Table PO-03(C).4:** Overall weighted score of the outcome 'PO-03' over a period of last three academic years.

Academic year	Overall weighted score	Level of attainment
2014 – 2015	<b>3.54</b>	Good
2015 – 2016	<b>3.81</b>	Good
2016 – 2017	<b>3.52</b>	Good

### Attainment of Program Outcome ‘PO-03’



**Figure PO-03(C).3:** Overall weighted score of the outcome ‘PO-03’ over a period of last three academic years

# **Assessment of Attainment of Program Outcome**

## **PO-04**

*An ability to function in multidisciplinary teams*  
**(2016-2017)**

*for the*  
*Bachelor of Engineering*  
*in*  
***Electrical Engineering***



**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering and Technology, Patiala**  
**(Punjab) -INDIA**

## **Attainment of Program Outcome ‘PO-04’**

The attainment of program outcome **PO-04**: *An ability to function in multidisciplinary teams* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-04’ has been classified into following performance criteria:

**PO-04(A):** *Shares responsibility and information schedule with others in team*

**PO-04(B):** *Participates in the development and selection of ideas*

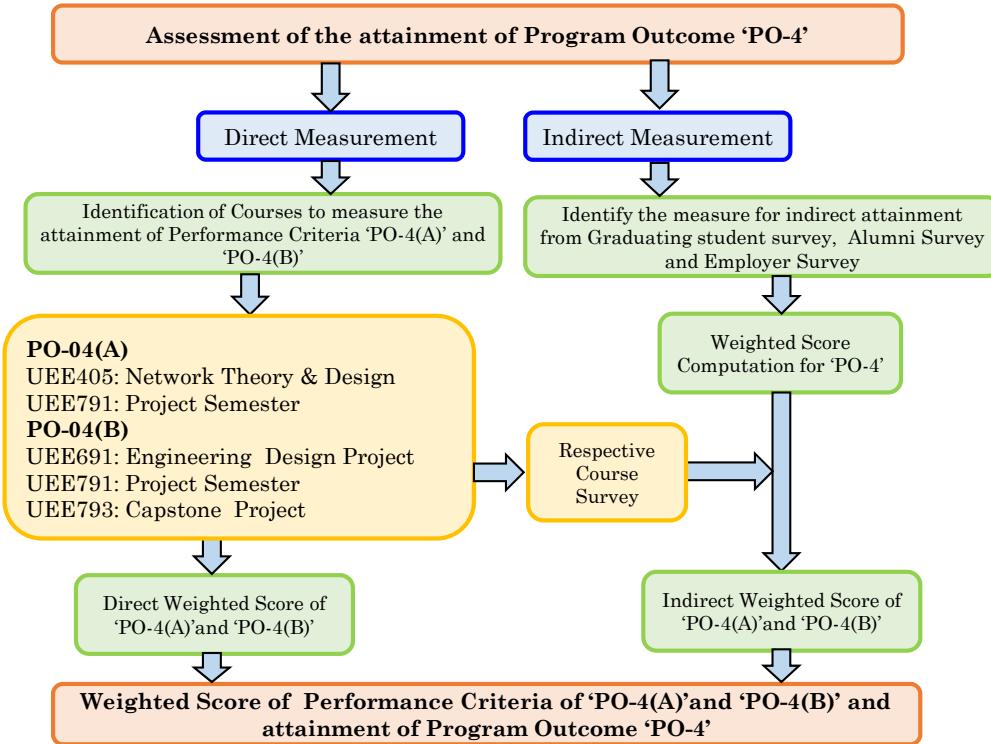
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-04’:

- UEE101: Electrical Engineering
- UHU001: Communication Skills
- UHU031: Organizational Behaviour
- **UEE405: Network Theory and Design**
- UEE502: High Voltage Engineering
- UEE504: Power Electronics
- UEE591: Summer Training
- **UEE691: Engineering Design Project**
- **UEE791: Project Semester**
- **UEE793: Capstone Project**
- UEE802: Intelligent Algorithms in Power Systems

Outcome PO-04 has been assessed through two performance criteria PO-04(A) and PO-04(B). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-04(A)’ and ‘PO-04(B)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2	Course-3
PO-04(A)	UEE405: Network Theory & Design	UEE791: Project Semester	--
PO-04(B)	UEE691: Engineering Design Project	UEE791: Project Semester	UEE793: Capstone Project

The step by step methodology used to measure the attainment of program outcome ‘PO-04’ is shown in Fig. PO-04.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-04’ for all three academic years under consideration.



**Fig. PO-04.1: Process for measurement of attainment of outcome 'PO-04' for the year 2016-17**

The Rubric used to convert marks obtained by students to a scale in the range of 1 to 5 is described in Table PO-04.1.

**Table PO-04.1: Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$80 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the subjects mentioned.

#### **Assessment of Outcome 'PO-04' using performance criterion PO-04(A)**

##### **PO-04(A): Shares responsibility and information schedule with others in team**

The performance criteria 'PO-04(A)' has been measured through direct assessment using the course portfolio and indirect assessment using course survey and other surveys (Graduating student survey, Alumni Survey and Employer survey)

**a) Direct Measures:**

**(i) Assessment Tool: Students' performance using Course Portfolio**

Two courses namely: *UEE405: Network Theory & Design* and *UEE791: Project Semester* are used to assess performance criteria PO-04(A) as a direct measure. The analysis for each of these courses is provided below:

**UEE405: Network Theory & Design**

The performance of course *UEE405: Network Theory & Design* is used to measure the attainment of ‘PO-04(A)’ through the evaluation of sharing responsibility and information schedule with others in team during the project work involving self-effort hours (5 marks) taught in Jan-June 2017. The performance of the students in the above question is summarized in Table PO-04(A).1 using rubrics defined in Table PO-04.1.

**Table PO-04(A).1: Students' performance in question targeting ‘PO-04(A)’; Course UEE405**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101504002	Aastha Jain	3.33	4
2	101504004	Aayush Vohra	5.00	5
3	101504005	Aayush Rai Anand	4.67	5
4	101504006	Abhijeet Singh Bhatia	4.67	5
5	101504007	Abhinandan Narang	4.00	5
6	101504008	Abhishek Agarwal	3.33	4
7	101504009	Abhishek Pandey	3.33	4
8	101504010	Abhishek Prasad	3.67	4
9	101504011	Adarsh Agarwal	3.33	4
10	101504012	Aditi Mishra	2.00	3
11	101504013	Akshita Kamthan	2.00	3
12	101504014	Amandeep Singh Dhillon	3.67	4
13	101504015	Amarjot Singh	4.67	5
14	101504017	Amrit Kaler	4.67	5
15	101504018	Anahita	5.00	5
16	101504019	Ankit Gupta	3.00	4
17	101504020	Ankit Mahajan	5.00	5
18	101504021	Anmol Saluja	5.00	5
19	101504022	Anurag Dewangan	3.67	4
20	101504023	Arjun Garg	0.00	1
21	101504024	Ashish Nagpal	4.00	5
22	101504025	Ashish Kumar Yadav	2.67	3
23	101504026	Ashwini Anand Pateriya	2.67	3
24	101504027	Avantika Dhiman	2.67	3
25	101504028	Avinash Chaturvedi	4.33	5
26	101504029	Badshah Singh	4.33	5
27	101504030	Baninder Singh Phull	3.67	4
28	101504031	Bhanu Pratap	3.67	4
29	101504032	Bhavay Gudwani	4.33	5
30	101504034	Bikram Pathania	3.67	4
31	101504035	Charika Mehta	4.00	5
32	101504036	Daman Aggarwal	4.67	5
33	101504037	Deen Dayal	4.33	5
34	101504038	Deepak Goyal	3.67	4
35	101504039	Divanshu Garg	3.67	4
36	101504040	Divyam Soni	4.67	5
37	101504041	Fiza Singh Multani	4.67	5
38	101504043	Gurjot Singh Kocher	3.33	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
39	101504044	Gurleen Kang	4.67	5
40	101504045	Gurleen Kaur	4.00	5
41	101504046	Gurnoor Kaur	3.33	4
42	101504047	Gursimratpal Singh Sidhu	4.67	5
43	101504049	Harnishan Singh Kang	2.33	3
44	101504050	Harshit Lohaan	4.33	5
45	101504052	Harshjot Singh Pahuja	5.00	5
46	101504053	Hashmeet Singh Ganda	2.00	3
47	101504054	Himanshu Gupta	3.67	4
48	101504055	Himanshu Sahwal	4.67	5
49	101504057	Jaideep Grover	2.33	3
50	101504059	Jasjit Singh	4.33	5
51	101504060	Jaskirat Kaur Gill	2.33	3
52	101504061	Jatinder Pal Singh	2.67	3
53	101504063	Kuljeet Singh	2.33	3
54	101504064	Kunwar Achint Singh	2.33	3
55	101504065	Lakhan Sharma	5.00	5
56	101504067	Malay Chand	3.33	4
57	101504069	Mayank Kumar	3.33	4
58	101504070	Mehul Natu	3.33	4
59	101504071	Mohit Goyal	4.00	5
60	101504073	Neha Bhargava	3.67	4
61	101504074	Neha Singla	4.00	5
62	101504075	Nihal Singh	4.00	5
63	101504076	Nikhil Sharma	3.67	4
64	101504078	Nitin Gupta	4.33	5
65	101504079	Nitish Kumar Soni	3.00	4
66	101504081	Osho	4.00	5
67	101504082	Pankaj Goyal	3.67	4
68	101504083	Parmeet Singh Sangha	3.67	4
69	101504084	Parth Gupta	3.67	4
70	101504085	Pinak Bhardwaj	3.33	4
71	101504086	Prabhav Pande	4.00	5
72	101504087	Pragati Sharma	4.00	5
73	101504088	Pranav Joshi	4.00	5
74	101504089	Pranav Mathur	3.00	4
75	101504091	Pranav Singh	2.00	3
76	101504094	Prateek Gupta	3.67	4
77	101504096	Praveen Kumar Yadav	4.00	5
78	101504097	Raghav Kumar Tiwari	2.00	3
79	101504098	Ramandeep Singh	3.33	4
80	101504099	Ramandeep Singh	3.67	4
81	101504100	Ramneet Kaur	4.00	5
82	101504101	Ravneet Sharma	4.00	5
83	101504103	Rohan Malhotra	3.67	4
84	101504104	Rohit Arora	3.67	4
85	101504105	Rushil Krishna	4.33	5
86	101504107	Sahil Bansal	3.67	4
87	101504108	Sahil Virk	4.00	5
88	101504109	Sainesh Karamchandani	3.67	4
89	101504114	Satyam Kumar	4.67	5
90	101504115	Shanun Randev	0.00	1
91	101504116	Shaurya Gaba	3.67	4
92	101504117	Sheikh Mohd Najam Ul Sehar	3.00	4
93	101504118	Shrey Arora	3.33	4
94	101504119	Shubham Gupta	4.00	5
95	101504120	Stuti Sidhu	4.00	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
96	101504121	Suhas Mahajan	4.00	5
97	101504122	Swanav Swaroop	4.00	5
98	101504124	Utkarsh Verma	3.33	4
99	101504125	Vaibhav Chawla	3.33	4
100	101504126	Vaibhav Singh	3.00	4
101	101504127	Vikram Kumawat	4.67	5
102	101504128	Viraj Baswana	2.67	3
103	101504130	Vishal Bansal	3.33	4
104	101504131	Vishu Jain	3.00	4
105	101504132	Abhishek Singhal	4.33	5
106	101504133	Riya Gupta	3.67	4
107	101554001	Aditya	3.33	4
108	101554002	Aditya Kumar	3.00	4
109	101554004	Apoory Gupta	3.67	4
110	101554005	Archit Rawat	3.00	4
111	101554006	Bhisham Mittal	4.00	5
112	101554007	Deepika Gandhi	4.67	5
113	101554008	Evan Garg	3.67	4
114	101554009	Gayatri Bansal	4.00	5
115	101554010	Gurmehar Singh	3.67	4
116	101554011	Gursiddak Singh	4.00	5
117	101554012	Harmanjit Singh	4.00	5
118	101554013	Harshit Sethi	3.67	4
119	101554014	Himanshu Mittal	3.33	4
120	101554015	Ipsita Sahoo	3.33	4
121	101554016	Ishan Kashyap	3.67	4
122	101554017	Kratika Agarwal	4.00	5
123	101554018	Madhurbain Singh	3.33	4
124	101554019	Mahima Goel	3.67	4
125	101554020	Mannat Batish	3.67	4
126	101554021	Piyush Kumar Gupta	3.67	4
127	101554022	Prabhjot Singh Saini	3.67	4
128	101554023	Prakhar Srivastava	2.33	3
129	101554024	Rajat Dixit	3.67	4
130	101554026	Ritunjay Gupta	4.00	5
131	101554027	Rohit Mehta	4.00	5
132	101554028	Romil Garg	4.00	5
133	101554029	Sahil Sharma	3.33	4
134	101554030	Sahil Virk	3.33	4
135	101554031	Sajan Goyal	3.67	4
136	101554032	Sanchit Sharma	3.33	4
137	101554033	Saransh Sehgal	3.33	4
138	101554034	Savi	4.00	5
139	101554035	Shishant Airon	4.00	5
140	101554036	Simran Saluja	4.00	5
141	101684001	Abhishek Kumar	4.33	5
142	101684002	Ajay Kumar	3.33	4
143	101684003	Deepak Bansal	3.67	4
144	101684004	Jashandeep Singh	3.33	4
145	101684005	Karanveer Singh	2.33	3
146	101684006	Khuhaiash Pandey	3.33	4
147	101684007	Khushdeep Singh	4.33	5
148	101684008	Mandeep Sharma	4.00	5
149	101684010	Nikhil Dhiman	3.67	4
150	101684011	Nittin Garg	3.67	4
151	101684012	Paras Arora	3.67	4
152	101684013	Pratik Bal	2.67	3

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
153	101684014	Simranjeet Singh	4.00	5
154	101684015	Sahib Singh	4.33	5
155	101684016	Sukhwinder Singh	4.00	5
156	101684017	Ketan Singla	4.33	5
157	101684018	Vaneet Kumar	3.67	4
158	101684019	Hitesh Gulati	4.67	5
159	101684020	Kanishk Agarwal	5.00	5
160	401504001	Abhishek Garg	4.00	5
161	401504002	Divya Kumar Gupta	2.67	3
162	401504007	Simarpreet Singh	4.00	5
163	401504008	Uday Bhandari	3.00	4
164	401554001	Kunal Gupta	3.33	4
165	401684001	Abhinav Aggarwal	5.00	5

The performance of students through the course UEE405 for criteria PO-04(A) is summarized in Table PO-04(A).2:

**Table PO-04(A).2: Average score of student performance in the course UEE405 for criteria PO-04(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	42.42	44.85	11.52	0.00	1.21	4.27

#### **UEE791: Project Semester**

The performance of course UEE791: Project Semester is used to measure the attainment of outcome ‘PO-04(A)’ through the ability of students to work in group(s) and take initiative for appropriate action. The evaluation of this is obtained by the marks in one of the components of Industry Mentor Assessment (5 marks) taught in Jan-Jun 2017.

The performance of the students in the above question is then summarized as given below in Table PO-04(A).3 using rubrics defined in Table PO-04.1.

**Table PO-04(A).3: Students’ performance in question targeting ‘PO-04(A)’; Course UEE791**

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	4	5
2	101304002	Abhey Arora	5	5
3	101304003	Abhishek Taksali	3	4
4	101304004	Adhikaansh Tayal	5	5
5	101304005	Aditi Narang	5	5
6	101304006	Aditya	5	5
7	101304007	Akshat	3	4
8	101304008	Akshay Kapoor	5	5
9	101304009	Akshay Kumar	5	5
10	101304011	Akshay Sharma	4	5
11	101304012	Amandeep Kaur	5	5
12	101304013	Amandeep Singh	4	5
13	101304014	Amaninder Singh Randhawa	5	5
14	101304015	Angad Kapoor	5	5
15	101304016	Ankita Garg	5	5
16	101304018	Anmol Jawa	5	5

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
17	101304019	Anmolpreet Singh	5	5
18	101304020	Anyuti Tiwari	4	5
19	101304021	Arpit Sharma	5	5
20	101304023	Arshbir Kaur	4	5
21	101304024	Arshdeep Singh Bagga	5	5
22	101304025	Ashish	5	5
23	101304026	Ashish Rajpal	5	5
24	101304028	Berry Lubana	4	5
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	3	4
28	101304032	Dipin Garg	5	5
29	101304033	Dishant Vanvari	4	5
30	101304034	Divyesh Pratap Singh	5	5
31	101304035	Elham Anwar	5	5
32	101304036	Gurseerat Singh Meen	5	5
33	101304037	Gursewak Singh	4	5
34	101304040	Hariansh Sehgal	5	5
35	101304041	Hartejdeep Singh	5	5
36	101304042	Himanshu Goyal	5	5
37	101304044	Jasjit Singh	5	5
38	101304045	Jassimran Singh Julka	5	5
39	101304046	Jessica Dhaliwal	5	5
40	101304047	Kanwarpal Singh	4	5
41	101304048	Karan Kumar	5	5
42	101304049	Karanjot	4	5
43	101304050	Kashish Aggarwal	3	4
44	101304051	Kritika Singla	5	5
45	101304052	Love Gaba	4	5
46	101304054	Manik Mittal	3.5	4
47	101304055	Maninderjit Singh	4	5
48	101304056	Mayank Singla	4	5
49	101304057	Mridul Bhutani	5	5
50	101304058	Naman Garg	5	5
51	101304059	Navdeep Singh	5	5
52	101304060	Navdeep Singh	5	5
53	101304061	Nazuk Aggarwal	5	5
54	101304062	Nishant Garg	5	5
55	101304063	Nishtha Raheja	4	5
56	101304064	Paras Bawa	5	5
57	101304065	Parth Ahuja	5	5
58	101304066	Parushi	3	4
59	101304067	Pency Goyal	4	5
60	101304068	Piyush Jindal	4	5
61	101304069	Piyush Tripathi	5	5
62	101304070	Prachi Garg	5	5
63	101304071	Prashant Kataria	5	5
64	101304072	Preeti Garg	4	5
65	101304073	Priyank Arora	4	5
66	101304074	Priyanka	4	5
67	101304075	Priyanka Singh	5	5
68	101304076	Priyansh Mahajan	5	5
69	101304077	Rahul Meena	4	5
70	101304079	Rajat Sharma	3	4
71	101304080	Ratul Goyal	5	5
72	101304081	Ravinder Singh	3	4
73	101304082	Rishabh Juneja	4	5

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
74	101304083	Robin Manktala	4	5
75	101304084	Rohan Ghai	5	5
76	101304085	Rohan Singla	3	4
77	101304086	Rohan Wadhawan	4	5
78	101304087	Rohit Goyal	5	5
79	101304088	Rubina Bamba	5	5
80	101304089	Sagar Pulani	4	5
81	101304090	Sahil Kataria	3	4
82	101304091	Sakshi	4	5
83	101304092	Sandal Singh Sidhu	5	5
84	101304093	Sandeep Kaur	5	5
85	101304094	Satripleen Kaur	4	5
86	101304095	Saurabh Mohan	5	5
87	101304097	Shaillary Gupta	5	5
88	101304098	Shaina	3	4
89	101304099	Shivika Gupta	5	5
90	101304100	Shresth Rai	5	5
91	101304101	Shubham Goyal	5	5
92	101304102	Shubham Gupta	5	5
93	101304103	Shubham Sharma	4	5
94	101304104	Shubham Sharma	5	5
95	101304105	Shubham Soin	5	5
96	101304106	Siddharth Goyal	5	5
97	101304107	Sidharth Garg	5	5
98	101304108	Simran Kaur	4	5
99	101304109	Simranjit Singh	4	5
100	101304111	Sumit Dhingra	5	5
101	101304112	Sumit Kaushik	5	5
102	101304113	Tushar Dheer	5	5
103	101304114	Tushar Sharma	5	5
104	101304116	Utsav Chhabra	5	5
105	101304117	Vaibhav Gupta	5	5
106	101304118	Vaishali	4	5
107	101304119	Varun Bansal	4	5
108	101304120	Veni Jindal	5	5
109	101304121	Vishal Arora	4	5
110	101304122	Yugesh Goyal	5	5
111	101484001	Amandeep singh	5	5
112	101484002	Amrinder Singh	5	5
113	101484004	Azad Singh	3	4
114	101484005	Chandan Garg	5	5
115	101484007	Deepak Singla	5	5
116	101484008	Diljeet Singh	4	5
117	101484009	Jyoti Kaushal	5	5
118	101484011	Pawan Kumar	4	5
119	101484012	Rajat Singla	4	5
120	101484013	Satveer Kaur	4.5	5
121	101484014	Saurabh Kumar Wadhawan	5	5
122	101484015	Shweta Sharma	4	5
123	101484016	Sukhjeet Singh	3	4

The overall performance of students for the above criterion is summarized as given below in Table PO-04(A).4:

**Table PO-04(A).4: Average score of student performance in the course UEE791 for criteria PO-04(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	89.43	10.57	0	0	0	4.89

The data from Table PO-04(A).2 and PO-04(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria PO-04(A), and is summarised in Table PO-04(A).5.

**Table PO-04(A).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-04(A)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	42.42	44.85	11.52	0.00	1.21	4.27
UEE791	89.43	10.57	0	0	0	4.89
Student class performance score	65.93	27.71	5.76	0	0.605	4.58

### b) Indirect Measures

The indirect measurement of performance criteria ‘PO-04(A)’ has been assessed through Student Course Surveys and other surveys (Graduating student survey, Alumni survey and Employer survey). The weighted average score in respective surveys is summarized in Table PO-04(A).6 and Table PO-04(A).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-04(A)’.

UEE405	Theory and designing of passive filters and attenuators.
UEE791	Associate with the implementation of the project requiring individual and teamwork skills

**Table PO-04(A).6: Weighted average score of performance criterion ‘PO-04(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	54.3	27.35	15.6	1.65	1.1	4.19
UEE791	29.27	31.71	35.77	1.63	4.07	3.86
Course Survey Score	41.79	29.53	25.69	1.64	2.59	4.03

**Assessment Tool :** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-04’ through indirect measurement using following question in the respective surveys.

Graduating Student Survey	an ability to function on multidisciplinary teams.				
Alumni Survey					
Employer Survey	Do our students have an ability to function on multidisciplinary teams?				

**Table PO-04(A).7: Weighted average score of performance criterion ‘PO-04(A)’ based on Other Surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
Graduating Student Survey	35.21	47.89	16.90	0.00	0.00	<b>4.18</b>
Employer Survey	66.67	33.33	0.0	0.00	0.00	<b>4.67</b>
Alumni Survey	32.85	37.2	22.71	4.83	2.42	<b>3.94</b>
<b>Other Survey Score</b>	<b>44.91</b>	<b>39.47</b>	<b>13.20</b>	<b>1.61</b>	<b>0.81</b>	<b>4.26</b>

### c) Overall weighted average score of performance criterion ‘PO-04(A)’

The overall weighted average score of performance criterion ‘PO-04(A)’ is summarised in Table PO-04(A).8 from the data given in Table PO-04(A).5, PO-04(A).6 and PO-04(A).7.

**Table PO-04(A).8: Overall weighted average score of performance criterion ‘PO-04(A)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student Class Performance</b>	65.93	27.71	5.76	0	0.61	<b>4.58</b>	5
<b>Course Surveys</b>	41.79	29.53	25.69	1.64	2.59	<b>4.03</b>	4
<b>Other Surveys</b>	44.91	39.47	13.20	1.61	0.81	<b>4.26</b>	3
<b>Overall Score</b>	<b>52.63</b>	<b>31.26</b>	<b>14.26</b>	<b>0.95</b>	<b>1.32</b>	<b>4.32</b>	

### Assessment of Outcome ‘PO-04’ using performance criterion PO-04(B)

#### ***PO-04(B): Participates in the development and selection of ideas***

##### a.) Assessment Tool: Students’ performance using Course Portfolio

Three courses namely *UEE691: Engineering Design Project*, *UEE791: Project Semester* and *UEE793: Capstone Project* were used to assess performance criteria PO-04(B) as a direct measure.

The analysis for each of these courses is provided below:

##### **UEE691 : Engineering Design Project**

The performance of course *UEE691: Engineering Design Project* is used to measure the attainment of outcome ‘PO-04(B)’ through the evaluation of Need Analysis (15 marks) taught in Jan-June 2017.

The performance of the students in the above question is summarized in Table PO-04(B).1 using rubrics defined in Table PO-04.1.

**Table PO-04(B).1: Students’ performance in question targeting ‘PO-04(B)’; Course UEE691**

S. No.	Roll Number	Name	Marks (15)	Score (1-5)
1	101404001	Abhay Mahipal	12.32	5
2	101404002	Abhijeet Singh	7.808	3
3	101404004	Abhinav Arora	11.22	4

S. No.	Roll Number	Name	Marks (15)	Score (1-5)
4	101404006	Abhishek Sharma	8.54	3
5	101404007	Ajay Singh	11.47	4
6	101404009	Alka Thakur	11.96	4
7	101404012	Ankush Goyal	12.32	5
8	101404013	Anmol Bharag	7.808	3
9	101404014	Anmol Goyat	11.83	4
10	101404015	Anmol Rattan	12.32	5
11	101404017	Anubhav Kumar	7.81	3
12	101404018	Apeksha Goyal	12.76	5
13	101404019	Arnish Jain	11.88	4
14	101404020	Arshiya Bansal	12.32	5
15	101404021	Arshjot Kaur	11.88	4
16	101404021	Siddharth Singh	8.8	3
17	101404023	Ayush Jain	11.10	4
18	101404024	Bhawani Singh	10.98	4
19	101404025	Chirag Jain	9.272	4
20	101404026	Davileen Garg	11.22	4
21	101404027	Dilpreet Kaur	11.47	4
22	101404028	Divesh Kumar	11.10	4
23	101404029	Divyam agarwal	11.83	4
24	101404031	Divyanshu	9.27	4
25	101404032	Garima	9.24	4
26	101404033	Gary Chahar	9.02	4
27	101404035	Gaurav Rathore	9.68	4
28	101404036	Gurpreet Singh	12.2	5
29	101404037	Gursagar Singh	12.69	5
30	101404038	Gurinder pal singh	11.96	4
31	101404039	Harmanpreet Singh	12.2	5
32	101404041	Harshit	11.96	4
33	101404042	Harshvir Singh	11.96	4
34	101404043	Harsimarjot kaur	11.47	4
35	101404044	Harsimran Singh	9.02	4
36	101404046	Heema Gupta	11.71	4
37	101404047	Hitesh Kumar	9.46	4
38	101404048	Ishita	11.71	4
39	101404049	Jagmeet Singh	8.8	3
40	101404050	Jagnoor Kaur	9.02	4
41	101404051	Jashanpreet Singh	9.02	4
42	101404052	Jatin Bansal	8.8	3
43	101404053	Jatin	10.66	4
44	101404054	K.Sharma	10.66	4
45	101404055	K.Bajaj	10.66	4
46	101404056	Kirtish Madaan	11.71	4
47	101404057	Mahitosh Sharma	9.882	4
48	101404058	Manan Mittal	9.76	4
49	101404059	Mandeep Singh	9.76	4
50	101404060	Manisha Gupta	8.58	3
51	101404061	Manit Gupta	9.46	4
52	101404062	M.Dhillon	9.33	4
53	101404063	M.Brar	9.33	4
54	101404064	Manvir Kaur	12.32	5
55	101404065	Mehak	8.54	3
56	101404066	Mithilesh Kumar	9.02	4
57	101404067	M. Goyal	10.33	4
58	101404068	Mridul Marwaha	9.46	4
59	101404069	Mudit Arora	9.68	4

S. No.	Roll Number	Name	Marks (15)	Score (1-5)
60	101404070	Naveen Prashar	9.02	4
61	101404072	Nigam Wadha	9.33	4
62	101404073	Nikhil Danodia	9.02	4
63	101404074	Nishita Kumari	9.24	4
64	101404075	Nitin Gupta	12.32	5
65	101404076	Nitish Arora	10.33	4
66	101404077	Nitish Bhardwaj	9.02	4
67	101404078	Omandeep Kaur	8.54	3
68	101404079	Pankaj Garg	12.32	5
69	101404080	Paramjot Singh	9.33	4
70	101404081	Adhiraj Singh	12.98	5
71	101404083	Prabhdeep K	10	4
72	101404084	Prachur	11.10	4
73	101404087	Prashant Khare	11.10	4
74	101404089	Pulkit Bansal	10	4
75	101404090	Pushpinder Singh	10.33	4
76	101404091	Rachit	10	4
77	101404092	Rahul Gautam	9.46	4
78	101404093	Rahul Goyal	10	4
79	101404094	Rajshree Vaidya	9.24	4
80	101404096	Rishabh Gupta	11.10	4
81	101404099	Sagar Bansal	10.67	4
82	101404100	Sahajdeep K	10	4
83	101404102	Sahil Singla	10.33	4
84	101404103	Samarth Gupta	9.02	4
85	101404104	Sambhav Jain	9.33	4
86	101404105	Samrat Kumar Gupta	9.24	4
87	101404106	Simardeep	10	4
88	101404107	Sanket Gupta	11.22	4
89	101404108	Saurabh Kumar	11.10	4
90	101404109	Shailesh	9.67	4
91	101404110	Shaivya	9.67	4
92	101404111	Sher Mohmad	9.67	4
93	101404112	Shivam Dochania	9.46	4
94	101404113	Sivam Gera	9.67	4
95	101404114	Shivam kedia	10	4
96	101404115	S.Bhardwaj	10	4
97	101404116	S.Chaturvedi	10	4
98	101404117	Shubham Garg	10	4
99	101404118	Shubham Kumar	11.22	4
100	101404119	Shubham Verma	11.22	4
101	101404120	S. Singla	10	4
102	101404122	Simran	10	4
103	101404123	Sukhman	10	4
104	101404124	Swapnil Singla	9.33	4
105	101404125	Tanish Gupta	9.33	4
106	101404126	Taranjot Singh	11.22	4
107	101404127	Abhishek	9.33	4
108	101404128	Tarun Gupta	10	4
109	101404129	Tarun Naagar	11.47	4
110	101404130	Tushar Goel	12.32	5
111	101404132	Utkarsh Atri	7.80	3
112	101404133	Vandana Gora	11.66	4
113	101404135	Vasu Mittal	9.76	4
114	101404136	Yashika	8.54	3
115	101404137	Yatin Gudwani	9.52	4

S. No.	Roll Number	Name	Marks (15)	Score (1-5)
116	101404138	Yogesh Garg	10.66	4
117	101454001	Y. Agarwal	10.33	4
118	101454002	Yash Motwani	9.68	4
119	101454003	H. Soni	10.33	4
120	101454004	Simardeep	10.33	4
121	101454005	Tejas Kapila	10.33	4
122	101454006	Nitesh	10.33	4
123	101454007	Tarun Goyal	9.33	4
124	101454008	Tarunpuri	10.33	4
125	101454009	Lariza Bansal	9.33	4
126	101454010	Tanish Goyal	9.33	4
127	101454011	Aditi	9.33	4
128	101584001	Amanjeet Singh	11.44	4
129	101584002	Chetan Garg	9.24	4
130	101584003	Devender Kumar	10.33	4
131	101584007	Karamjeet Singh	12.32	5
132	101584008	Lakshay Garg	11.71	4
133	101584009	Prince Kalia	12.76	5
134	101584010	Rohit Gupta	9.9	4
135	101584011	Satvir	10	4
136	101584012	Sharandeep Singh	8.58	3
137	101584013	Shashi Sharma	12.76	5
138	101584014	Sunny Preet	10	4
139	101584015	Rajat Chandra	8.36	3
140	101584016	Gursimran Singh	8.14	3

The overall performance of the students in the above criteria is then summarized as given below in Table PO-04(B).2.

**Table PO-04(B).2: Average score of student performance in the course UEE691 for criteria PO-04(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE691	11.42	77.86	10.72	0	0	<b>4.00</b>

### **UEE791: Project Semester**

The performance of course *UEE791: Project Semester* is used to measure the attainment of outcome ‘PO-04(A)’ through the ability of students to redesign products, processes or systems in order to improve productivity, quality, safety and other desired needs. The evaluation of the above is obtained from the marks of Midway Report assessment (5 marks) taught in Jan-Jun 2017.

The performance of the students in the above question is summarized in Table PO-04(B).3 using rubrics defined in Table PO-04.1.

**Table PO-04(B).3: Students’ performance in question targeting ‘PO-04(B)’; Course UEE791**

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	2	3
2	101304002	Abhey Arora	2	3
3	101304003	Abhishek Taksali	3	4
4	101304004	Adhikaansh Tayal	3	4
5	101304005	Aditi Narang	4	5

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
6	101304006	Aditya	3	4
7	101304007	Akshat	3	4
8	101304008	Akshay Kapoor	4	5
9	101304009	Akshay Kumar	2	3
10	101304011	Akshay Sharma	0	1
11	101304012	Amandeep Kaur	3	4
12	101304013	Amandeep Singh	3	4
13	101304014	Amaninder Singh Randhawa	3	4
14	101304015	Angad Kapoor	3	4
15	101304016	Ankita Garg	4	5
16	101304018	Anmol Jawa	4	5
17	101304019	Anmolpreet Singh	3.5	4
18	101304020	Anyuti Tiwari	5	5
19	101304021	Arpit Sharma	3	4
20	101304023	Arshbir Kaur	0	1
21	101304024	Arshdeep Singh Bagga	4	5
22	101304025	Ashish	2	3
23	101304026	Ashish Rajpal	4	5
24	101304028	Berry Lubana	3	4
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	3	4
28	101304032	Dipin Garg	3	4
29	101304033	Dishant Vanvari	0	1
30	101304034	Divyesh Pratap Singh	3	4
31	101304035	Elham Anwar	0	1
32	101304036	Gurseerat Singh Meen	3	4
33	101304037	Gursewak Singh	2	3
34	101304040	Hariansh Sehgal	2	3
35	101304041	Hartejdeep Singh	3	4
36	101304042	Himanshu Goyal	3	4
37	101304044	Jasjit Singh	4	5
38	101304045	Jassimran Singh Julka	3	4
39	101304046	Jessica Dhaliwal	0	1
40	101304047	Kanwarpal Singh	2	3
41	101304048	Karan Kumar	4	5
42	101304049	Karanjot	4	5
43	101304050	Kashish Aggarwal	3	4
44	101304051	Kritika Singla	0	1
45	101304052	Love Gaba	3	4
46	101304054	Manik Mittal	3	4
47	101304055	Maninderjit Singh	2	3
48	101304056	Mayank Singla	3	4
49	101304057	Mridul Bhutani	4	5
50	101304058	Naman Garg	2	3
51	101304059	Navdeep Singh	3.5	4
52	101304060	Navdeep Singh	3	4
53	101304061	Nazuk Aggarwal	4	5
54	101304062	Nishant Garg	2	3
55	101304063	Nishtha Raheja	0	1
56	101304064	Paras Bawa	3	4
57	101304065	Parth Ahuja	3	4
58	101304066	Parushi	3	4
59	101304067	Pency Goyal	3	4
60	101304068	Piyush Jindal	3	4
61	101304069	Piyush Tripathi	3	4
62	101304070	Prachi Garg	3	4

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
63	101304071	Prashant Kataria	0	1
64	101304072	Preeti Garg	3	4
65	101304073	Priyank Arora	3	4
66	101304074	Priyanka	4	5
67	101304075	Priyanka Singh	0	1
68	101304076	Priyansh Mahajan	4	5
69	101304077	Rahul Meena	3	4
70	101304079	Rajat Sharma	2	3
71	101304080	Ratul Goyal	4	5
72	101304081	Ravinder Singh	2	3
73	101304082	Rishabh Juneja	0	1
74	101304083	Robin Manktala	4	5
75	101304084	Rohan Ghai	0	1
76	101304085	Rohan Singla	4	5
77	101304086	Rohan Wadhawan	0	1
78	101304087	Rohit Goyal	2	3
79	101304088	Rubina Bamba	4.5	5
80	101304089	Sagar Pulani	4	5
81	101304090	Sahil Kataria	2	3
82	101304091	Sakshi	3	4
83	101304092	Sandal Singh Sidhu	4	5
84	101304093	Sandeep Kaur	3	4
85	101304094	Satripleen Kaur	4	5
86	101304095	Saurabh Mohan	2	3
87	101304097	Shailly Gupta	3	4
88	101304098	Shaina	2	3
89	101304099	Shivika Gupta	4	5
90	101304100	Shresth Rai	3	4
91	101304101	Shubham Goyal	3	4
92	101304102	Shubham Gupta	3	4
93	101304103	Shubham Sharma	3.5	4
94	101304104	Shubham Sharma	4	5
95	101304105	Shubham Soin	3	4
96	101304106	Siddharth Goyal	4	5
97	101304107	Sidharth Garg	4	5
98	101304108	Simran Kaur	0	1
99	101304109	Simranjit Singh	0	1
100	101304111	Sumit Dhingra	4	5
101	101304112	Sumit Kaushik	3.5	4
102	101304113	Tushar Dheer	4	5
103	101304114	Tushar Sharma	3	4
104	101304116	Utsav Chhabra	3	4
105	101304117	Vaibhav Gupta	0	1
106	101304118	Vaishali	3	4
107	101304119	Varun Bansal	5	5
108	101304120	Veni Jindal	4	5
109	101304121	Vishal Arora	3	4
110	101304122	Yugesh Goyal	4	5
111	101484001	Amandeep Singh	0	1
112	101484002	Amrinder Singh	0	1
113	101484004	Azad Singh	2	3
114	101484005	Chandan Garg	2	3
115	101484007	Deepak Singla	4	5
116	101484008	Diljeet Singh	2	3
117	101484009	Jyoti Kaushal	3	4
118	101484011	Pawan Kumar	3	4
119	101484012	Rajat Singla	2	3

S. No.	Roll No.	Name of Students	Marks (5)	Score (1-5)
120	101484013	Satveer Kaur	3	4
121	101484014	Saurabh Kumar Wadhawan	4	5
122	101484015	Shweta Sharma	3	4
123	101484016	Sukhjeet Singh	2	3

The performance of students through the course UEE791 for criteria PO-04(B) is in Table PO-04(B).4:

**Table PO-04(B).4: Average score of student performance in the course UEE791 for criteria PO-04(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	27.64	41.46	17.07	0.00	13.82	<b>3.69</b>

### **UEE793 : Capstone Project**

The performance of course UEE793: Capstone Project is used to measure the attainment of outcome ‘PO-04(B)’ through the students’ performance in Need Analysis (5 marks) taught in July-Dec 2016.

The performance of the students in the above question is summarized in Table PO-04(B).5 using rubrics defined in Table PO-04.

**Table PO-04(B).5: Students’ performance in question targeting ‘PO-04(B)’; Course UEE793**

S. No.	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	3.5	4
2	101304002	Abhey Arora	3	4
3	101304003	Abhishek Taksali	3.5	4
4	101304004	Adhikaansh Tayal	3	4
5	101304005	Aditi Narang	3	4
6	101304006	Aditya	4	5
7	101304007	Akshat	3	4
8	101304008	Akshay Kapoor	3.5	4
9	101304009	Akshay Kumar	2.5	3
10	101304010	Akshay Kumar Chaudhary	4	5
11	101304011	Akshay Sharma	3	4
12	101304012	Amandeep Kaur	2.5	3
13	101304013	Amandeep Singh	4	5
14	101304014	Amaninder Singh Randhawa	3	4
15	101304015	Angad Kapoor	3	4
16	101304016	Ankita Garg	3	4
17	101304018	Anmol Jawa	3	4
18	101304019	Anmolpreet Singh	4	5
19	101304020	Anyuti Tiwary	2.5	3
20	101304021	Arpit Sharma	3.5	4
21	101304022	Arsh Kundal	3	4
22	101304023	Arshbir Kaur	3.5	4
23	101304024	Arshdeep Singh	2.5	3
24	101304025	Ashish	2.5	3
25	101304026	Ashish Rajpal	4	5
26	101304028	Berry	3.5	4
27	101304029	Bhanu	5	5
28	101304030	Bhanu	4	5

S. No.	Roll No.	Name of Student	Marks (5)	Score (1-5)
29	101304031	Chirag Gaba	2.5	3
30	101304032	Dipin	3	4
31	101304033	Dishant	4	5
32	101304034	Divyesh Pratap	4.5	5
33	101304035	Elham	2.5	3
34	101304036	Gurseerat	4	5
35	101304037	Gursewak Singh	2.5	3
36	101304040	Harvensh	4	5
37	101304041	Hartejdeep Singh	2	3
38	101304042	Himanshu Goyal	3.5	4
39	101304044	Jasjit Singh	2.5	3
40	101304045	Jassimran Singh	4	5
41	101304046	Jessica	4	5
42	101304047	Kanwarpal Singh	3	4
43	101304048	Karan Kumar	2.5	3
44	101304049	Karamjot Singh	3	4
45	101304050	Kashish Agarwal	3.5	4
46	101304051	Kritika	4	5
47	101304052	Love gaba	2.5	3
48	101304054	Manik Mittal	3.5	4
49	101304055	Maninderjit Singh	2.5	3
50	101304056	Mayank Singla	2.5	3
51	101304057	Mridul	3	4
52	101304058	Naman Garg	4	5
53	101304059	Navdeep Singh	3	4
54	101304060	Navdeep Singh	3	4
55	101304061	Nazuk Agarwal	4	5
56	101304062	Nishant Garg	4	5
57	101304063	Nishtha Raheja	4	5
58	101304064	Paras Bawa	3.5	4
59	101304065	Parth Ahuja	2.5	3
60	101304066	Parushi	3	4
61	101304067	Pency Goyal	4	5
62	101304068	Piyush Jindal	3.5	4
63	101304069	Piyush Tripathi	3.5	4
64	101304070	Prachi Garg	3	4
65	101304071	Prashant Kataria	3	4
66	101304072	Preeti Garg	3	4
67	101304073	Priyank Arora	3	4
68	101304074	Priyanka	4	5
69	101304075	Priyanka Singh	3.5	4
70	101304076	Priyansh Mahajan	3	4
71	101304077	Rahul Meena	2	3
72	101304078	Rajan	2.5	3
73	101304079	Rajat Sharma	3	4
74	101304080	Ratul Goyal	3.5	4
75	101304081	Ravinder Singh	3.5	4
76	101304082	Rishabh Juneja	2.5	3
77	101304083	Robin Manktala	3.5	4
78	101304084	Rohan Ghai	4.5	5
79	101304085	Rohan Singla	4.5	5
80	101304086	Rohan Wadhawan	3	4
81	101304087	Rohit Goyal	3.5	4
82	101304088	Rubina Bamba	3	4
83	101304089	Sagar Pulani	4.5	5
84	101304090	Sahil Kataria	3.5	4
85	101304091	Sakshi	4	5

S. No.	Roll No.	Name of Student	Marks (5)	Score (1-5)
86	101304092	Sandal Singh Sidhu	3	4
87	101304093	Sandeep Kaur	3	4
88	101304094	SatRipleen Kaur	4.5	5
89	101304095	Saurabh Mohan	3	4
90	101304096	Shagundeepraj Singh	3	4
91	101304097	Shailly Gupta	3.5	4
92	101304098	Shaina	4.5	5
93	101304099	Shivika Gupta	3	4
94	101304100	Shresth Rai	4	5
95	101304101	Shubham Goyal	3.5	4
96	101304102	Shubham Gupta	3	4
97	101304103	Shubham Sharma	4.5	5
98	101304104	Shubham Sharma	4.5	5
99	101304105	Shubham Soin	3.5	4
100	101304106	Siddharth Goyal	3	4
101	101304107	Sidharth Garg	4	5
102	101304108	Simran Kaur	3.5	4
103	101304109	Simranjit Singh	3.5	4
104	101304111	Sumit Dhingra	4.5	5
105	101304112	Sumit Kaushik	3.5	4
106	101304113	Tushar Dheer	3	4
107	101304114	Tushar Sharma	3.5	4
108	101304116	Utsav Chhabra	3	4
109	101304117	Vaibhav Gupta	3	4
110	101304118	Vaishali	3	4
111	101304119	Varun Bansal	3	4
112	101304120	Veni Jindal	3.5	4
113	101304121	Vishal Arora	3	4
114	101304122	Yugesh Goyal	3.5	4
115	101484001	Amandeep Singh	3	4
116	101484002	Amrinder Singh	4	5
117	101484003	Ashmeen Singh	3	4
118	101484004	Azad Singh	3	4
119	101484005	Chardan Garg	3	4
120	101484007	Deepak	3.5	4
121	101484008	Diljeet Singh	3.5	4
122	101484009	Jyoti Kaushal	3	4
123	101484011	Pawan Kumar	3	4
124	101484012	Rajat Singla	3	4
125	101484013	Satveer Kaur	3.5	4
126	101484014	Saurabh Kumar Wadhawan	2.5	3
127	101484015	Shweta Sharma	3.5	4
128	101484016	Sukhjeet Singh	3	4

The performance of students through the course UEE793 for criteria PO-04(B) is summarized in Table PO-04(B).6

**Table PO-04(B).6: Average score of student performance in the course UEE793 for criteria PO-04(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE793	25	60.16	14.84	0	0	4.10

The above data from Table PO-04(B).2, PO-04(B).4 and PO-04(B).6 is used to evaluate weighted average of direct measure through Course Portfolio for criteria PO-04(B), and is summarised in Table PO-04(B).7.

**Table PO-04(B).7: Weighted Average Student class performance (Course Portfolio) for criteria PO-04(B)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE691</b>	11.42	77.86	10.72	0	0	<b>4.00</b>
<b>UEE791</b>	27.64	41.46	17.07	0.00	13.82	<b>3.69</b>
<b>UEE793</b>	25	60.16	14.84	0.00	0.00	<b>4.10</b>
<b>Student Class Performance Score</b>	21.35	59.83	14.21	0.00	4.61	<b>3.93</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-04(B)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-04(B).8 and PO-04(B).9.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-04(B)’.

UEE691	Carry out design calculations and implementations in the area of project
UEE791	Carry out design calculations and implementations in the area of project.
UEE793	To perform simulations and incorporate appropriate adaptations using iterative synthesis

**Table PO-04(B).8: Weighted average score of performance criterion ‘PO-04(B)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE691	67.50	14.56	7.57	1.68	8.68	<b>3.54</b>
UEE791	29.27	35.77	29.24	2.44	3.25	<b>3.85</b>
UEE793	32.03	32.81	28.12	2.34	3.12	<b>4.00</b>
<b>Course Survey Score</b>	<b>42.93</b>	<b>27.71</b>	<b>21.64</b>	<b>2.15</b>	<b>5.02</b>	<b>3.80</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (other surveys) are used to assess the attainment of program outcome ‘PO-04’ through indirect measurement using following question in the respective surveys.

Graduating Student Survey	an ability to function on multidisciplinary teams.
Alumni Survey	
Employer Survey	Do our students have an ability to function on multidisciplinary teams?

**c) Overall weighted average score of performance criterion ‘PO-04(B)’**

The overall weighted average score of performance criterion ‘PO-04(B)’ is summarised in Table PO-04(B).9 from the data given in Table PO-04(B).7, PO-04(B).8 and PO-04(A).7.

**Table PO-04(B).9: Overall weighted average score of performance criterion ‘PO-04(B)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student Class Performance</b>	21.35	59.83	14.21	0.00	4.61	3.93	5
<b>Course Surveys</b>	42.93	27.71	21.64	2.15	5.02	3.80	4
<b>Other Surveys</b>	44.91	39.47	13.20	1.61	0.81	4.26	3
<b>Overall Score</b>	<b>34.43</b>	<b>44.03</b>	<b>16.43</b>	<b>1.12</b>	<b>3.80</b>	<b>3.97</b>	

## Overall assessment of program outcome PO-04 using scores of PO-04(A) and PO-04(B)

In the previous sections, each of the individual performance criteria PO-04(A) and PO-04(B) have been assessed. The performance for attainment of outcome PO-04 has been completed using the attainment values for PO-04(A) and PO-04(B) and is provided below in Table PO-04.2 and Fig PO-04.2:

Table PO-04.2 summarizes the scores of each of the two performance criteria and these scores have been used to assess an overall score for outcome PO-04.

**Table PO-04.2: Overall score for outcome PO-04 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-04(A)	52.63	31.26	14.26	0.95	1.32	4.32	5
PO-04(B)	34.43	44.03	16.43	1.12	3.80	3.97	5
<b>Overall Score</b>	<b>43.53</b>	<b>37.65</b>	<b>15.35</b>	<b>1.04</b>	<b>2.56</b>	<b>4.15</b>	

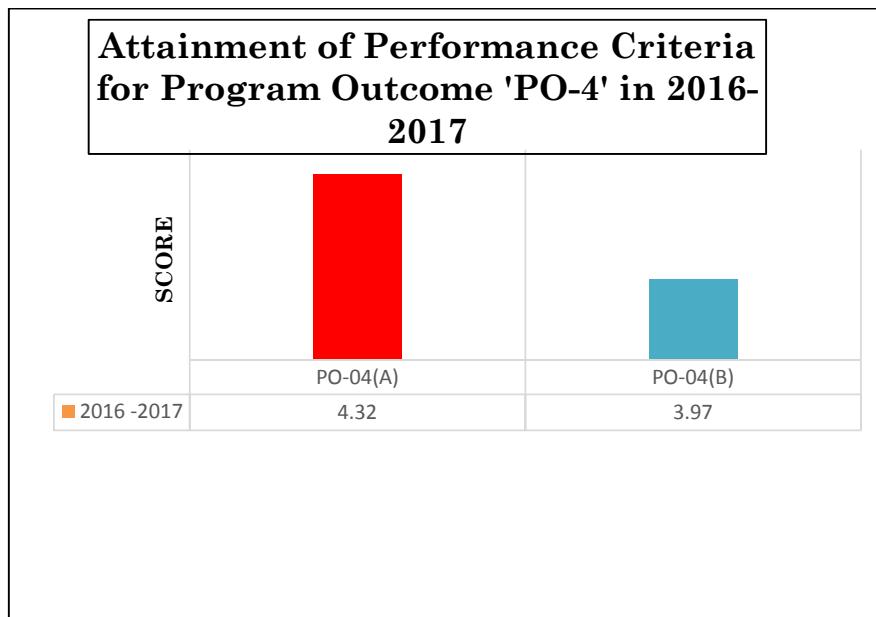


Fig PO-04.2: Performance criteria-wise assessment score of outcome 'PO-04' in the year 2016-17

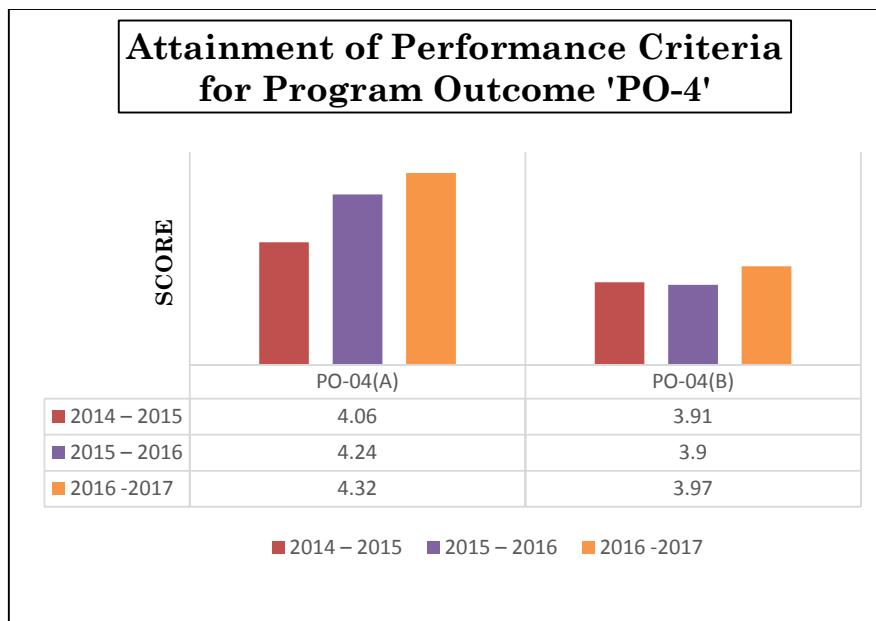
**Track record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessment score distribution and overall weighted score for outcome ‘PO-04’ for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section. The Table PO-04.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-04’.

**Table PO-04.3: Performance criteria-wise assessment score distribution for each outcome ‘PO-04’.**

Program outcome and performance criteria	Academic year			Weight	
	2014 – 2015	2015 – 2016	2016 -2017		
<b>PO-04</b>	<b>PO-04(A)</b>	4.06	4.24	4.32	5
	<b>PO-04(B)</b>	3.91	3.90	3.97	5
<b>Overall weighted score of outcome PO-04</b>		<b>3.99</b>	<b>4.07</b>	<b>4.15</b>	

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-04’ over a period of last three years.



**Figure PO-04.3: Performance criteria-wise assessment score distribution of outcome ‘PO-04’.**

## **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

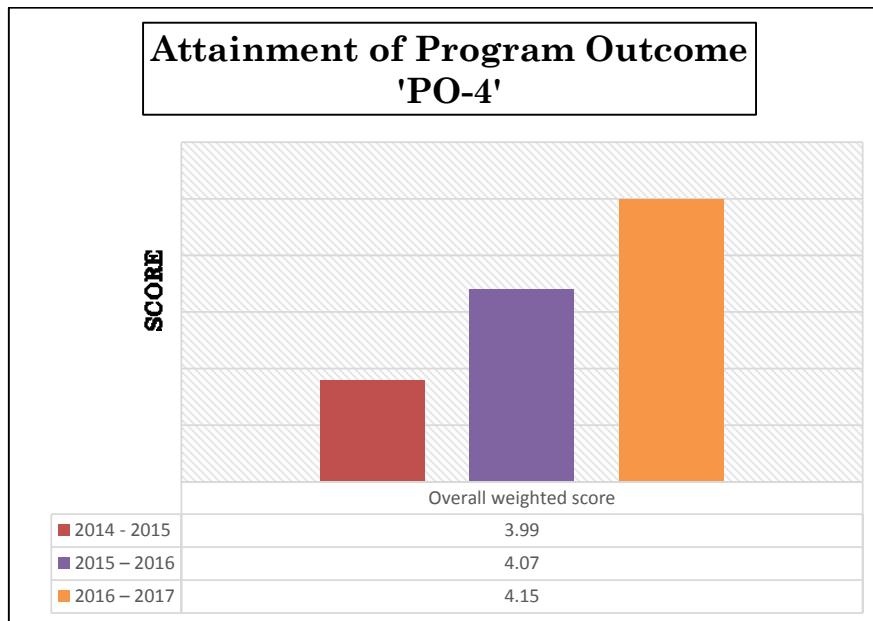
- i. **Excellent**: Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- ii. **Very Good**: Overall weighted score for the outcome is between 4 and 4.5 on a scale of 1 to 5.
- iii. **Good**: Overall weighted score for the outcome is between 3.5 and 4 on a scale of 1 to 5.
- iv. **Satisfactory**: Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.
- v. **Unsatisfactory**: Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

The Table PO-04.4 presents the overall weighted score of outcome ‘PO-04’ over the last three academic years.

**Table PO-04.4: Overall weighted score of the outcome ‘PO-04’ over a period of last three academic years.**

<b>Academic year</b>	<b>Overall weighted score</b>	<b>Level of attainment</b>
2014 - 2015	3.99	Good
2015 – 2016	4.07	Very Good
2016 – 2017	4.15	Very Good

Figure PO-04.4 shows the overall weighted score of outcome ‘PO-04’ over a period of last three academic years.



**Figure PO-04.4:** Overall weighted score of outcome ‘PO-04’ over a period of last three academic years.

# **Assessment of Attainment of Program Outcome**

## **PO-05**

*An ability to identify, formulates, and solve engineering problems*

**(2016-17)**

*for the*

*Bachelor of Engineering*

*in*

***Electrical Engineering***



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

**Electrical & Instrumentation Engineering Department  
Thapar Institute of Engineering & Technology,  
Patiala (Punjab) –INDIA**

## **Attainment of Program outcome ‘PO-05’**

The attainment of program outcome **PO-05**: *An ability to identify, formulate, and solve engineering problems* has been measured using a standard procedure explained for the BE Electrical Engineering program. The program outcome ‘PO-05’ has been classified into following performance criteria:

PO-05(A): *Classify information to identify engineering problems*

PO-05(B): *Develop appropriate models to formulate solutions*

PO-05(C): *Use analytical, computational and/or experimental methods to obtain solutions*

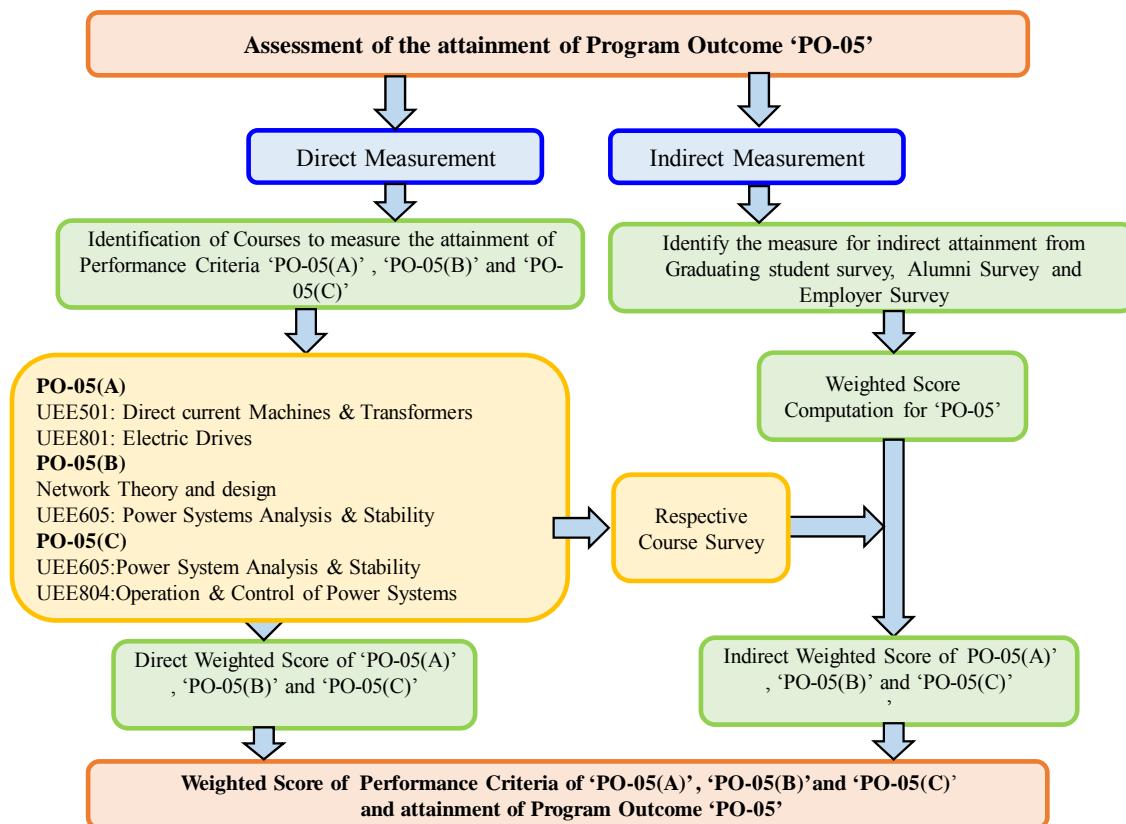
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-05’. The courses used for the assessment during last three academic years are marked bold:

- **UEE301: Direct Current Machines and Transformers**
- UEE401: Alternating Current Machines
- **UEE405: Network Theory & Design**
- UEE501: Generalized Theory of Electrical Machines
- UEI503: Digital Signal Processing and Applications
- UEE523: High Voltage Transmission Systems
- UEE524: Power Quality Monitoring and Conditioning
- UEE603: Switchgear and Protection
- UEE802: Intelligent Algorithms in Power Systems
- UEI841: Advanced Control Systems
- UEE502: High Voltage Engineering
- UMA062: Graph Theory
- **UEE804: Operation and Control of Power Systems**
- **UEE605: Power System Analysis & Stability**
- **UEE801: Electric Drives**

Outcome PO-05 has been assessed through three performance criteria PO-05(A), PO-05(B) and PO-05(C). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-05(A)’, ‘PO-05(B)’ and ‘PO-05(C)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-05(A)	UEE301: Direct Current Machines and Transformers	UEE801: Electric drives
PO-05(B)	UEE405: Network Theory & Design	UEE605: Power Systems Analysis & Stability
PO-05(C)	UEE605: Power Systems Analysis & Stability	UEE804: Operation and Control of Power Systems

The step by step methodology used to measure the attainment of program outcome ‘PO-05’ is shown in Fig. PO-05.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-05’ for all three academic years under consideration.



**Fig. PO-05.1: Process for measurement of attainment of outcome 'PO-05' for the year 2016-17**

The Rubric used to convert marks obtained by students to a scale in the range of 1 to 5 is described in Table PO-05.1.

**Table PO-05.1: Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the subjects mentioned.

#### ***Assessment of Outcome ‘PO-05’ using Performance Criterion ‘PO-05(A)’***

##### **PO-05(A): Classify information to identify engineering problems.**

The performance criteria ‘PO-05(A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

##### **a) Direct Measures:**

###### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE 301: Direct Current Machines and Transformers* and *UEE801: Electric drives* are used to assess performance criteria PO-05(A) as a direct measure. The analysis for each of these courses is provided below:

##### **UEE 301: Direct Current Machines and Transformers**

The performance of course *UEE 301: Direct Current Machines and Transformers* is used to measure the attainment of outcome ‘PO-05(A)’ through the Mid Semester Examination (Question No. 1(b), 1(c), 2 & 5 (a), July-Dec 2016, 9 marks).

##### **Question:**

Q.1	b) The supply frequency is halved at constant voltage. What will be the effect on hysteresis and eddy current losses of a transformer? (c) What type of load should be connected to a transformer for getting zero voltage regulation? Justify your answer.	(2)
Q.2	Describe with help of neat circuit diagram, the Sumpner’s test for separation of losses in transformers. Also, write the limitation of this test.	(2)
Q.5(a)	A 250kVA, single-phase transformer is in circuit continuously. For 8 hours in a day, the load is 180kW at 0.8 power factor lagging. For 6 hours, the load is 100kW at unity power factor, and for the remaining period of 24 hours, it runs on no-load. Full load copper losses are 3.1kW and the iron losses are 1.6kW. Find all-day efficiency.	(5)

The performance of the students in the above question is summarized in Table PO-05(A).1 using rubrics defined in Table PO-05.1.

**Table PO-05(A).1: Students' performance in question targeting 'PO-05(A)': Course UEE301**

S. No	Roll No.	Name of Student	Marks (9)	Score (1-5)
1	101504002	Aastha Jain	0.5	1
2	101504004	AayushVohra	6.5	4
3	101504005	AayushRaiAnand	4	3
4	101504006	Abhijeet Singh Bhatia	2	2
5	101504007	AbhinandanNarang	5.5	4
6	101504008	AbhishekAgarwal	5	3
7	101504009	Abhishek Pandey	0.5	1
8	101504010	Abhishek Prasad	3.5	2
9	101504011	Adarsh Agarwal	0	1
10	101504012	Aditi Mishra	3.5	2
11	101504013	Akshita Kamthan	0	1
12	101504014	Amandeep Singh Dhillon	3	2
13	101504015	Amarjot Singh	5	3
14	101504017	Amrit Kaler	4.5	3
15	101504018	Anahita	8	5
16	101504019	Ankit Gupta	4	3
17	101504020	Ankit Mahajan	5	3
18	101504021	Anmol Saluja	6	4
19	101504022	Anurag Dewangan	6	4
21	101504024	Ashish Nagpal	3.5	2
22	101504025	Ashish Kumar Yadav	5	3
23	101504026	Ashwini Anand Pateriya	2.5	2
24	101504027	Avantika Dhiman	1	1
25	101504028	Avinash Chaturvedi	3	2
26	101504029	Badshah Singh	5.5	4
27	101504030	Baninder Singh Phull	5	3
28	101504031	Bhanu Pratap	6	4
29	101504032	Bhavay Gudwani	6	4
30	101504034	Bikram Pathania	2	2
31	101504035	Charika Mehta	3	2
32	101504036	Daman Aggarwal	5	3
33	101504037	Deen Dayal	6	4
34	101504038	Deepak Goyal	5.5	4
35	101504039	Divanshu Garg	0.5	1
36	101504040	Divyam Soni	4.5	3
37	101504041	Fiza Singh Multani	3	2

S. No	Roll No.	Name of Student	Marks (9)	Score (1-5)
38	101504043	Gurjot Singh Kocher	5	3
39	101504044	Gurleen Kang	5.5	4
40	101504045	Gurleen Kaur	5	3
41	101504047	Gursimratpal Singh Sidhu	6.5	4
42	101504049	Harnishan Singh Kang	1	1
43	101504050	Harshit Lohaan	2.5	2
44	101504052	Harshjot Singh Pahuja	9	5
45	101504053	Hashmeet Singh Ganda	0	1
46	101504054	Himanshu Gupta	1	1
47	101504055	Himanshu Sahwal	3	2
48	101504057	Jaideep Grover	0.5	1
49	101504059	Jasjit Singh	7	5
50	101504060	Jaskirat Kaur Gill	3.5	2
51	101504061	Jatinder Pal Singh	6.5	4
52	101504063	Kuljeet Singh	3.5	2
54	101504065	Lakhan Sharma	8	5
55	101504132	Abhishek Singhal	1.5	1
56	101554001	Aditya	1	1
57	101554002	Aditya Kumar	3	2
58	101554004	Apoorv Gupta	1.5	1
59	101554005	Archit Rawat	6	4
60	101554007	Deepika Gandhi	3.5	2
61	101554010	Gurmehar Singh	1	1
62	101554011	Gursiddak Singh	5	3
63	101554012	Harmanjit Singh	3	2
64	101554013	Harshit Sethi	7	5
65	101554018	Madhurbain Singh	0	1
66	101554021	Piyush Kumar Gupta	6	4
67	101554023	Prakhar Srivastava	2	2
68	101554034	Savi	7	5
69	101554036	Simran Saluja	7	5
70	101684001	Abhishek Kumar	2	2
71	101684002	Ajay Kumar	2.5	2
72	101684003	Deepak Bansal	5	3
73	101684004	Jashandeep Singh Ghumaan	5.5	4
74	101684005	Karanveer Singh	2	2
75	101684006	Khuhaiash Pandey	4	3
76	101684019	Hitesh Gulati	5	3
77	101684020	Kanishk Agarwal	8	5
78	101684021	Raunaq Singh Ghatora	0.5	1

<b>S. No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (9)</b>	<b>Score (1-5)</b>
79	401504001	Abhishek Garg	4.5	3
80	401504002	Divya Kumar Gupta	0.5	1
81	401684001	Abhinav Aggarwal	2	2
82	101254015	Kuldeep Singh Deora	5	3
83	101504046	Gurnoor Kaur	1	1
84	101504067	Malay Chand	1	1
85	101504070	Mehul Natu	1.5	1
86	101504071	Mohit Goyal	4	3
87	101504074	Neha Singla	4.5	3
88	101504075	Nihal Singh	4	3
89	101504076	Nikhil Sharma	3.5	2
90	101504078	Nitin Gupta	5	3
91	101504081	Osho	4.5	3
92	101504082	Pankaj Goyal	4	3
93	101504083	Parmeet Singh Sangha	2	2
94	101504084	Parth Gupta	1.5	1
95	101504085	Pinak Bhardwaj	2.5	2
96	101504086	Prabhav Pande	4.5	3
97	101504087	Pragati Sharma	4.5	3
98	101504088	Pranav Joshi	5	3
99	101504091	Pranav Singh	4	3
100	101504094	Prateek Gupta	3	2
101	101504096	Praveen Kumar Yadav	3.5	2
102	101504098	Ramandeep Singh	3.5	2
103	101504099	Ramandeep Singh	1.5	1
104	101504100	Ramneet Kaur	1.5	1
105	101504101	Ravneet Sharma	1	1
106	101504103	Rohan Malhotra	4	3
107	101504104	Rohit Arora	1	1
108	101504105	Rushil Krishna	3.5	2
109	101504108	Sahil Virk	6.5	4
110	101504109	Sainesh Karam chandani	2	2
111	101504114	Satyam Kumar	5	3
112	101504116	Shaurya Gaba	6	4
113	101504117	Sheikh MohdNajam UISehar	3.5	2
114	101504119	Shubham Gupta	4.5	3
115	101504120	Stuti Sidhu	4	3
116	101504121	Suhas Mahajan	1	1
117	101504122	Swanav Swaroop	5	3
118	101504124	Utkarsh Verma	5	3

S. No	Roll No.	Name of Student	Marks (9)	Score (1-5)
119	101504125	Vaibhav Chawla	2	2
120	101504126	Vaibhav Singh	2	2
121	101504127	Vikram Kumawat	5	3
122	101504131	Vishu Jain	6	4
123	101504133	Riya Gupta	2.5	2
124	101554006	Bhisham Mittal	3	2
125	101554008	Evan Garg	5	3
126	101554009	Gayatri Bansal	4	3
127	101554014	Himanshu Mittal	4.5	3
128	101554015	Ipsita Sahoo	6.5	4
129	101554016	Ishan Kashyap	5	3
130	101554017	Kratika Agarwal	3.5	2
131	101554019	Mahima Goel	6.5	4
132	101554020	Mannat Batish	3.5	2
133	101554022	Prabhjot Singh Saini	1	1
134	101554024	Rajat Dixit	3.5	2
135	101554026	Ritunjay Gupta	2.5	2
136	101554027	Rohit Mehta	3	2
137	101554028	Romil Garg	5.5	4
138	101554029	Sahil Sharma	1	1
139	101554030	Sahil Virk	4	3
140	101554032	Sanchit Sharma	4	3
141	101554033	Saransh Sehgal	1	1
142	101554035	Shishant Airon	5.5	4
143	101684007	Khushdeep Singh	4.5	3
144	101684008	Mandeep Sharma	2.5	2
145	101684010	Nikhil Dhiman	3.5	2
146	101684011	Nittin Garg	5	3
147	101684012	Paras Arora	4	3
148	101684013	Pratik Bal	1.5	1
149	101684014	Simranjeet Singh	3.5	2
150	101684015	Sahib Singh	5.5	4
151	101684017	Ketan Singla	5.5	4
152	101684018	Vaneet Kumar	4	3
153	401504007	Simarpreet Singh	3.5	2
154	401554001	Kunal Gupta	1	1

The performance of students through the course UEE301 for criteria PO-05(A) is summarized in Table PO-05(A).2

**Table PO-05(A).2: Average score of student performance in the course UEE301 for criteria ‘PO-05(A)’**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEE301	5.26	15.79	29.61	28.95	20.39	2.57

### UEE801: Electric Drives

The performance of course *UEE801: Electric Drives* is used to measure the attainment of outcome ‘PO-05(A)’ through the Mid Semester Examination (Question No. 4 (a) & (b), July-Dec 2016, 8 marks).

#### Question:

Q.4 (a)	An electric motor drives four loads; two of them have rotational motion while the two have translational motion whose particulars are given in Table below. The moment of inertia of the motor is $1.2 \text{ kg-m}^2$ and the motor runs at a speed of 1000 rpm. Calculate the equivalent moment of inertia of the entire drive system referred to the motor shaft and the power rating of the motor.						(4)
	Loads	Type of Motion	Speed	Inertia/Mass	Torque/Force	Gear/Transmission Efficiency	
	I	Rotational	200 rpm	$7 \text{ kg-m}^2$	10 N-m	90%	
	II	Rotational	200 rpm	$5 \text{ kg-m}^2$	6 N-m	85%	
	III	Translational	10 m/s	10 kg	20 N	87%	
4(b)	IV	Translational	10 m/s	20 kg	30 N	88%	
	A dc motor has a heating time constant of 80 minutes and a cooling time constant of 110 minutes. Its continuous full load rating is 50 kW and maximum temperature rise or continuous full load operation is 50°C. Find (i) Short time rating of motor if it is run for 15 min followed by a long duration of shutdown. Intermittent periodic duty rating of 15 min operation followed by 20 min of shutdown.						(4)

The performance of the students in the above question is summarized in Table PO-05(A).3 using rubrics defined in Table PO-05.1.

**Table PO-05(A).3: Students’ performance in question targeting ‘PO-05(A)’: Course UEE801**

S. No	Roll No.	Name of Student	Marks (8)	Score (1-5)
1	101304001	Aarushi Bajaj	5	4
2	101304002	Abhey Arora	2	2

S. No	Roll No.	Name of Student	Marks (8)	Score (1-5)
3	101304003	Abhishek Taksali	5	4
4	101304004	Adhikaansh Tayal	2	2
5	101304005	Aditi Narang	8	5
6	101304006	Aditya	8	5
7	101304007	Akshat	5	4
8	101304008	Akshay Kapoor	6	5
9	101304009	Akshay Kumar	8	5
10	101304010	Akshay Kumar Chaudhary	1	1
11	101304011	Akshay Sharma	5	4
12	101304012	Amandeep Kaur	6	5
13	101304013	Amandeep Singh	8	5
14	101304014	Amaninder Singh	3	2
15	101304015	Angad Kapoor	5	4
16	101304016	Ankita Garg	8	5
17	101304018	Anmol Jawa	4	3
18	101304019	Anmolpreet Singh	4	3
19	101304020	Anyuti Tiwary	8	5
20	101304021	Arpit Sharma	3	2
21	101304022	Arsh Kundal	4	3
22	101304023	Arshbir Kaur	7	5
23	101304024	Arshdeep Singh Bagga	3	2
24	101304025	Ashish	4	3
25	101304026	Ashish Rajpal	4	3
26	101304028	Berry Lubana	5	4
27	101304029	Bhanu Duggal	7	5
28	101304030	Bhanu Marwaha	0	1
29	101304031	Chirag Gaba	4	3
30	101304032	Dipin Garg	3	2
31	101304033	Dishant Vanvari	4	3
32	101304034	Divyesh Pratap Singh	5	4
33	101304035	Elham Anwar	4	3
34	101304036	Gurseerat Singh Meen	1	1
35	101304037	Gursewak Singh	8	5
36	101304040	Hariansh Sehgal	4	3
37	101304041	Hartejdeep Singh	2	2
38	101304042	Himanshu Goyal	5	4
39	101304044	Jasjit Singh	6	5

S. No	Roll No.	Name of Student	Marks (8)	Score (1-5)
40	101304045	Jassimran Singh Julka	5	4
41	101304046	Jessica Dhaliwal	6	5
42	101304047	Kanwarpal Singh	3	2
43	101304048	Karan Kumar	4	3
44	101304049	Karanjot Singh Kochar	5	4
45	101304050	Kashish Aggarwal	7	5
46	101304051	Kritika Singla	8	5
47	101304052	Love Gaba	3	2
48	101304054	Manik Mittal	3	2
49	101304055	Maninderjit Singh	3	2
50	101304056	Mayank Singla	4	3
51	101304057	Mridul Bhutani	3	2
52	101304058	Naman Garg	8	5
53	101304059	Navdeep Singh	7	5
54	101304060	Navdeep Singh	5	4
55	101304061	Nazuk Aggarwal	5	4
56	101304062	Nishant Garg	8	5
57	101304063	Nishtha Raheja	1	1
58	101304064	Paras Bawa	5	4
59	101304065	Parth Ahuja	8	5
60	101304066	Parushi	8	5
61	101304067	Pency Goyal	7	5
62	101304068	Piyush Jindal	7	5
63	101304069	Piyush Tripathi	8	5
64	101304070	Prachi Garg	7	5
65	101304071	Prashant Kataria	4	3
66	101304072	Preeti Garg	6	5
67	101304073	Priyank Arora	4	3
68	101304074	Priyanka	2	2
69	101304075	Priyanka Singh	8	5
70	101304076	Priyansh Mahajan	5	4
71	101304077	Rahul Meena	3	2
72	101304078	Rajan	8	5
73	101304079	Rajat Sharma	8	5
74	101304080	Ratul Goyal	8	5
75	101304081	Ravinder Singh	7	5
76	101304082	Rishabh Juneja	7	5

S. No	Roll No.	Name of Student	Marks (8)	Score (1-5)
77	101304083	Robin Manktala	4	3
78	101304084	Rohan Ghai	3	2
79	101304085	Rohan Singla	5	4
80	101304086	Rohan Wadhawan	6	5
81	101304087	Rohit Goyal	2	2
82	101304088	Rubina Bamba	4	3
83	101304089	Sagar Pulani	8	5
84	101304090	Sahil Kataria	8	5
85	101304091	Sakshi	6	5
86	101304092	Sandal Singh Sidhu	2	2
87	101304093	Sandeep Kaur	4	3
88	101304094	Satripleen Kaur	8	5
89	101304095	Saurabh Mohan	5	4
90	101304096	Shagundeepr Singh	1	1
91	101304097	Shailey Gupta	4	3
92	101304098	Shaina	5	4
93	101304099	Shivika Gupta	2	2
94	101304100	Shresth Rai	4	3
95	101304101	Shubham Goyal	3	2
96	101304102	Shubham Gupta	6	5
97	101304103	Shubham Sharma	5	4
98	101304104	Shubham Sharma	4	3
99	101304105	Shubham Soin	5	4
100	101304106	Siddharth Goyal	4	3
101	101304107	Sidharth Garg	8	5
102	101304108	Simran Kaur	5	4
103	101304109	Simranjit Singh	0	1
104	101304111	Sumit Dhingra	1	1
105	101304112	Sumit Kaushik	6	5
106	101304113	Tushar Dheer	8	5
107	101304114	Tushar Sharma	6	5
108	101304116	Utsav Chhabra	3	2
109	101304117	Vaibhav Gupta	7	5
110	101304118	Vaishali	1	1
111	101304119	Varun Bansal	4	3
112	101304120	Veni Jindal	8	5
113	101304121	Vishal Arora	5	4

S. No	Roll No.	Name of Student	Marks (8)	Score (1-5)
114	101304122	Yugesh Goyal	6	5
115	101484001	Amandeep Singh	8	5
116	101484002	Amrinder Singh	8	5
117	101484003	Ashmeen Singh	6	5
118	101484004	Azad Singh	8	5
119	101484005	Chandan Garg	8.0	5
120	101484007	Deepak Singla	2.0	2
121	101484008	Diljeet Singh	7.0	5
122	101484009	Jyoti Kaushal	4	3
123	101484011	Pawan Kumar	8	5
124	101484012	Rajat Singla	6	5
125	101484013	Satveer Kaur	7	5
126	101484014	Saurabh Kumar Wadhawan	8	5
127	101484015	Shweta Sharma	5	4
128	101484016	Sukhjeet Singh	2	2

The performance of students through the course UEE801 for criteria PO-05(A) is summarized in Table PO-05(A).4.

**Table PO-05(A).4: Average score of student performance in the course UEE801 for criteria PO-05(A)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE801	42.19	17.19	17.19	17.19	6.25	3.72

The data from Table PO-05(A).2 and Table PO-05(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-05(A)’, and is summarised in Table PO-05(A).5.

**Table PO-05(A).5: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-05(A)’**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE301	5.26	15.79	29.61	28.95	20.39	2.57
UEE801	42.19	17.19	17.19	17.19	6.25	3.72
Student class performance score	23.73	16.49	23.40	23.07	13.32	3.14

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-05(A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-05(A).6 and Table PO-05(A).7.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-05(A)’.

<b>UEE301</b>	Test the transformer and calculate its efficiency and performance in distribution system.
<b>UEE801</b>	Conceptualize the basic drive system and analyse it for different types of loads

**Table PO-05(A).6: Weighted average score of performance criterion ‘PO-05(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE301</b>	36.84	33.08	19.55	4.51	6.01	3.90
<b>UEE801</b>	38.32	26.16	18.69	6.54	10.28	3.75
<b>Course surveys score</b>	<b>37.58</b>	<b>29.62</b>	<b>19.12</b>	<b>5.525</b>	<b>8.145</b>	<b>3.825</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey  
(Other surveys) are used to assess the attainment of program outcome ‘PO-05’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An ability to identify, formulate and solve engineering problems.
Alumni Survey	
Employer Survey	Do our students have an ability to identify, formulate, and solve engineering problems?

**Table PO-05(A).7: Weighted average score of performance criterion ‘PO-05(A)’ based on Other Surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	19.77	44.07	30.51	5.08	0.56	<b>3.77</b>
<b>Employer survey</b>	60	40	0	0	0	<b>4.60</b>
<b>Alumni survey</b>	30.43	36.23	24.64	5.80	2.90	<b>3.85</b>
<b>Other Surveys score</b>	<b>36.73</b>	<b>40.1</b>	<b>18.38</b>	<b>3.62</b>	<b>1.15</b>	<b>4.07</b>

**c) Overall weighted average score of performance criterion ‘PO-05(A)’**

The overall weighted average score of performance criterion ‘PO-05(A)’ is summarised in Table PO-05(A).8 from the data given in Tables PO-05(A).5, PO-05(A).6 and PO-05(A).7.

**Table PO-05(A).8: Overall weighted average score of performance criterion ‘PO-05(A)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
student class performance score	23.73	16.49	23.40	23.07	13.32	<b>3.14</b>	<b>5</b>
Course surveys score	37.58	29.62	19.12	5.525	8.145	<b>3.825</b>	<b>4</b>
Other surveys score	36.73	40.1	18.38	3.62	1.15	<b>4.07</b>	<b>3</b>
<b>Overall weighted score</b>	<b>31.59</b>	<b>26.76</b>	<b>20.71</b>	<b>12.35</b>	<b>8.55</b>	<b>3.60</b>	

**Assessment of Outcome ‘PO-05’ using Performance Criterion ‘PO-05(B)’**

**PO-05(B): Develop appropriate models to formulate solutions**

**a.) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE405: Network Theory & Design* and *UEE605: Power System Analysis & Stability* are used to assess performance criteria PO-05(B) as a direct measure. The analysis for each of these courses is provided below:

**(i) UEE405: Network Theory & Design**

The performance of course *UEE405: Network Theory & Design* is used to measure the attainment of outcome ‘PO-05(B)’ through End Semester Examination (Question No. 7&8, July-Dec 2016, 20 marks)).

**Question:**

Q.7	Derive the expressions for the resistors $R_1$ , $R_2$ and $R_3$ for an asymmetrical T-type attenuator. Design a symmetrical bridged-T attenuator with an attenuation of 20 dB and terminated into a load of $500 \Omega$ .	(10)
Q.8	Design a constant-K band pass filter (T-section) with cut off frequencies of 3 KHz and 7.5 KHz and nominal characteristic impedance of $900 \Omega$ . Draw the complete circuit diagram with elements. Obtain the expression of ‘m’ for a high pass m-derived filter with $\pi$ -network.	(10)

The performance of the students in the above question is then summarized as given below in Table PO-05(B).3 using rubrics defined in Table PO-05.1.

**Table PO-05(B).3: Students’ performance in question targeting ‘PO-05(B)’; Course UEE405**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101504046	Gurnoor Kaur	11	3
2	101504054	Himanshu Gupta	8	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
3	101504067	Malay Chand	11	3
4	101504069	Mayank Kumar	14	4
5	101504070	Mehul Natu	3	1
6	101504071	Mohit Goyal	7	2
7	101504073	Neha Bhargava	7	2
8	101504074	Neha Singla	13	4
9	101504075	Nihal Singh	17	5
10	101504076	Nikhil Sharma	14	4
11	101504078	Nitin Gupta	15	5
12	101504079	Nitish Kumar Soni	16	5
13	101504081	Osho	10	3
14	101504082	Pankaj Goyal	0	1
15	101504083	Parmeet Singh Sangha	6	2
16	101504084	Parth Gupta	12	4
17	101504085	Pinak Bhardwaj	5	2
18	101504086	Prabhav Pande	12	4
19	101504087	Pragati Sharma	10	3
20	101504088	Pranav Joshi	13	4
21	101504089	Pranav Mathur	4	2
22	101504094	Prateek Gupta	11	3
23	101504096	Praveen Kumar Yadav	5	2
24	101504098	Ramandeep Singh	17	5
25	101504099	Ramandeep Singh	12	4
26	101504100	Ramneet Kaur	9	3
27	101504101	Ravneet Sharma	13	4
28	101504103	Rohan Malhotra	10	3
29	101504104	Rohit Arora	9	3
30	101504105	Rushil Krishna	12	4
31	101504107	Sahil Bansal	8	3
32	101504108	Sahil Virk	13	4
33	101504109	Sainesh Karam Chandani	4	2
34	101504114	Satyam Kumar	16	5
35	101504116	Shaurya Gaba	2	1
36	101504117	Sheikh MohdNajamUlSehar	4	2
37	101504118	Shrey Arora	6	2
38	101504119	Shubham Gupta	4	2
39	101504120	Stuti Sidhu	8	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
40	101504121	Suhas Mahajan	9	3
41	101504122	Swanav Swaroop	2	1
42	101504124	Utkarsh Verma	3	1
43	101504125	Vaibhav Chawla	10	3
44	101504126	Vaibhav Singh	10	3
45	101504127	Vikram Kumawat	16	5
46	101504128	Viraj Baswana	4	2
47	101504130	Vishal Bansal	11	3
48	101504133	Riya Gupta	6	2
49	101554006	Bhisham Mittal	15	5
50	101554008	Evan Garg	10	3
51	101554009	Gayatri Bansal	12	4
52	101554014	Himanshu Mittal	16	5
53	101554015	Ipsita Sahoo	3	1
54	101554017	Kratika Agarwal	9	3
55	101554019	Mahima Goel	14	4
56	101554020	Mannat Batish	2	1
57	101554022	Prabhjot Singh Saini	3	1
58	101554024	Rajat Dixit	7	2
59	101554026	Ritunjay Gupta	15	5
60	101554027	Rohit Mehta	9	3
61	101554028	Romil Garg	14	4
62	101554029	Sahil Sharma	15	5
63	101554030	Sahil Virk	15	5
64	101554031	Sajan Goyal	14	4
65	101554032	Sanchit Sharma	0	1
66	101554033	Saransh Sehgal	0	1
67	101554035	Shishant Airon	19	5
68	101684007	Khushdeep Singh	20	5
69	101684008	Mandeep Sharma	11	3
70	101684010	Nikhil Dhiman	4	2
71	101684011	Nittin Garg	8	3
72	101684012	Paras Arora	10	3
73	101684014	Simranjeet Singh	8	3
74	101684015	Sahib Singh	13	4
75	101684016	Sukhwinder Singh	4	2
76	101684017	Ketan Singla	16	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
77	101684018	Vaneet Kumar	9	3
78	401504007	Simarpreet Singh	15	5
79	401504008	Uday Bhandari	11	3
80	401554001	Kunal Gupta	13	4

The overall performance of students for the above criterion is summarized in Table PO-05(B).4.

**Table PO-05(B).4: Average score of student performance in the course UEE405 for criteria PO-05(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	18.75	20.00	30.00	18.75	12.5	3.14

### **UEE605: Power System Analysis & Stability**

The performance of course *UEE605: Power System Analysis & Stability* is used to measure the attainment of outcome ‘PO-05(B)’ through the Mid Semester Test (Question No. 1, 2 & 5, July-Dec 2016, 30 marks).

#### **Question:**

Q.1	Show that the diagonal elements and off diagonal elements in the bus admittance matrix YBUS for n-bus network can be computed from the formula and, where all the terms used have their usual meanings. Clearly mention the assumption/s taken. Modify the formulation when mutual coupling is considered.	(10)
Q.2	Derive the power flow equations as applicable to power system for load flows solution.	(10)
Q.5	For 4-bus network for line impedance data in per unit based on 100MVA, bus impedance matrix as given is assembled using building algorithm.	(10)

The performance of the students in the above question is then summarized as given below in Table PO-05(B).1 using rubrics defined in Table PO-05.

**Table PO-05(B).1: Students’ performance in question targeting ‘PO-05(B)’; Course UEE605**

Sr.No.	Roll No.	Name of Student	Marks(30)	Score(1-5)
1	101404001	Abhay Mahipal	30	5
2	101404002	Abhijeet Singh Sankhla	5	1
3	101404004	Abhinav Arora	16	3
4	101404006	Abhishek Sharma	23	5
5	101404007	Ajay Singh	13	3
6	101404009	Alka Thakur	21	4
7	101404012	Ankush Goyal	16	3
8	101404013	Anmol Arjun Bharaj	12	3

Sr.No.	Roll No.	Name of Student	Marks(30)	Score(1-5)
9	101404014	Anmol Goyat	19	4
10	101404015	Anmol Rattan Kaur	7	2
11	101404017	Anubhav Kumar	0	1
12	101404018	Apeksha Goel	13	3
13	101404019	Arnish Jain	24	5
14	101404020	Arshiya	28	5
15	101404021	Arshjot Kaur	24	5
16	101404023	Ayush Jain	24	5
17	101404024	Bhawani Singh	6	2
18	101404025	Chirag Jain	27	5
19	101404026	Davileen Garg	26	5
20	101404027	Dilpreet Kaur	20	4
21	101404028	Divesh Kamdar	24	5
22	101404029	Divyam Aggarwal	22.5	5
23	101404031	Divyanshu Siddharth	10.5	2
24	101404032	Garima	3	1
25	101404033	Garv Chahar	6	2
26	101404035	Gaurav Rathore	5	1
27	101404036	Gurpreet Singh	17	3
28	101404037	Gursagar Singh	28.5	5
29	101404038	Gurupinder Pal Singh	18	4
30	101404039	Harmanpreet Singh	7	2
31	101404041	Harshit Kaushik	19	4
32	101404042	Harshvir Singh	26	5
33	101404043	Harsimarjot Kaur	10	2
34	101404044	Harsimran Singh	24	5
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	15	3
37	101404047	Hitesh Kumar	10	2
38	101404048	Ishita Mahindru	16	3
39	101404049	Jagmeet Singh	0	1
40	101404050	Jagnoor Kaur	5	1
41	101404051	Jashanpreet Singh	27.5	5
42	101404052	Jatin Bansal	20	4
43	101404053	Jatin Raheja	28	5
44	101404054	Kanishak Sharma	30	5
45	101404055	Karan Sanjeev Bajaj	21	4

Sr.No.	Roll No.	Name of Student	Marks(30)	Score(1-5)
46	101404056	Kirtish Madaan	15	3
47	101404057	Mahitosh Sharma	17	3
48	101404058	Manan Mittal	21	4
49	101404059	Mandeep Singh Panesar	21	4
50	101404060	Manisha Gupta	21	4
51	101404061	Manit Gupta	4	1
52	101404062	Manjosh Singh Dhillon	16	3
53	101404063	Manpreet Singh Brar	14	3
54	101404064	Manvir Kaur	22.5	5
55	101404065	Mehak Bhatia	22	4
56	101404066	Mithilesh Kumar	16	3
57	101404067	Mohit Goyal	8	2
58	101404068	Mridul Marwaha	29	5
59	101404069	Mudit Arora	16	3
60	101404070	Naveen Parashar	25.5	5
61	101404072	Nigam Wadhwa	10	2
62	101404073	Nikhil Danodia	21	4
63	101404074	Nishita Kumari	0	1
64	101404075	Nitin Gupta	30	5
65	101404076	Nitish Arora	26	5
66	101404077	Nitish Bhardwaj	26	5
67	101404078	Omandeep Kaur	1	1
68	101404079	Pankaj Garg	29.5	5
69	101404080	Paramjot Singh	29	5
70	101404081	Parmar Adhiraj Singh	20	4
71	101404083	Prabhdeep Kaur	20	4
72	101404084	Prachur Maharwal	20	4
73	101404087	Prashant Khare	12	3
74	101404089	Pulkit Bansal	15	3
75	101404090	Pushpinder Singh	26	5
76	101404091	Rachit Verma	23	5
77	101404092	Rahul Gautam	23	5
78	101404093	Rahul Goyal	20	4
79	101404094	Rajshree Vaidya	27	5
80	101404096	Rishabh Gupta	22.5	5
81	101404099	Sagar Bansal	22	4
82	101404100	Sahajdeep Kaur	29.5	5

Sr.No.	Roll No.	Name of Student	Marks(30)	Score(1-5)
83	101404102	Sahil Singla	21	4
84	101404103	Samarth Gupta	28	5
85	101404104	Sambhav Jain	12	3
86	101404105	Samrat Kumar Gupta	22	4
87	101404106	Sanamdeep Singh	20	4
88	101404107	Sanket Gupta	27	5
89	101404108	Saurabh Kumar	12	3
90	101404109	Shailesh Verma	4	1
91	101404110	Shaivya Thapliyal	14	3
92	101404111	Sher Mohammed	27	5
93	101404112	Shivam Dochania	20	4
94	101404113	Shivam Gera	4	1
95	101404114	Shivam Kumar Kedia	1.5	1
96	101404115	Shubham Bhardwaj	22.5	5
97	101404116	Shubham Chaturvedi	15	3
98	101404117	Shubham Garg	24	5
99	101404118	Shubham Kumar	17	3
100	101404119	Shubham Verma	9	2
101	101404120	Shubhdeep Singh	21.5	4
102	101404121	Siddharth Singh	13	3
103	101404122	Simran Mehra	10	2
104	101404123	Sukhman	17	3
105	101404124	Swapnil Singla	18	4
106	101404125	Tanish Gupta	5	1
107	101404126	Taranjot Singh	21	4
108	101404127	Tarun Garg	9	2
109	101404128	Tarun Gupta	24	5
110	101404129	Tarun Kumar	14.5	3
111	101404130	Tushar Goel	12	3
112	101404132	Utkarsh Atri	14	3
113	101404133	Vandana Gora	25	5
114	101404135	Vasu Mittal	15	3
115	101404136	Yashika Chopra	25	5
116	101404137	Yatin Gudwani	21	4
117	101404138	Yogesh Garg	9	2
118	101454001	Yatendra Agrawal	19	4
119	101454002	Yash Motwani	22.5	5

Sr.No.	Roll No.	Name of Student	Marks(30)	Score(1-5)
120	101454003	Harshwardhan Soni	19	4
121	101454004	Simardeep Kaur	18	4
122	101454005	Tejas Kapila	26	5
123	101454006	Nitish Dewan	22	4
124	101454007	Abhishek Nigam	19	4
125	101454008	Tarun Puri	7	2
126	101454009	Lariza Bansal	1	1
127	101454010	Tanish Goyal	29.5	5
128	101454011	Aditi	22	4
129	101584001	Amanjit Singh	29	5
130	101584002	Chetan Garg	12	3
131	101584003	Devinder Kumar	24.5	5
132	101584007	Karamjeet Singh	0	1
133	101584008	Lakshay Garg	7	2
134	101584009	Prince Kalia	10	2
135	101584010	Rohit	0	1
136	101584012	Sharandeep Singh	7	2
137	101584013	Shashi Sharma	0	1
138	101584014	Sunnypreet Singh	4	1
139	101584015	Rajat Chandra	15	3
140	101584016	Gursimran Singh	3	1

The overall performance of students for the above criterion is summarized in Table PO-05(B).2

**Table PO-05(B).2: Average score of student performance in the course UEE505 for criteria PO-05(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE605	30.71	22.14	20.71	12.14	14.29	3.43

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-05(B) is given in Table PO-05(B).5.

**Table PO-05(B).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-05(B)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	18.75	20.00	30.00	18.75	12.5	3.14
UEE605	30.71	22.14	20.71	12.14	14.29	3.43
Student class performance score	24.73	21.07	25.35	15.455	13.395	3.285

**b) Indirect measures for Performance criteria PO-05(B) (Surveys)**

- (i) **Assessment Tool:** Student Course Surveys are used to assess the attainment of program outcome ‘PO-05(B)’ through indirect measurement using following course learning objectives in the respective courses.

UEE405	Design different type of circuits such as rectifiers, clippers, clampers, filters etc.
UEE605	Develop an appropriate mathematical model of power system

**(ii) Assessment Tools: Student Course Surveys**

**Table PO-05(B).6: Weighted average score of performance criterion ‘PO-05(B)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	45.24	22.41	13.57	2.85	6.84	4.06
UEE605	47.72	15.67	8.86	5.00	22.72	3.46
Course surveys score	<b>46.48</b>	<b>19.04</b>	<b>11.215</b>	<b>3.925</b>	<b>14.78</b>	<b>3.76</b>

- (i) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-05’ through indirect measurement is summarized in Table PO-05(A).7

**c) Overall weighted average score of performance criterion ‘PO-05(B)’**

Finally overall weighted average score of performance criterion ‘PO-05(B)’ is evaluated as given below in Table PO-05(B).7.

**Table PO-05(B).7: Overall weighted average score of performance criterion ‘PO-05(B)’**

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance score	24.73	21.07	25.35	15.455	13.395	<b>3.285</b>	5
Course surveys score	<b>46.48</b>	<b>19.04</b>	<b>11.215</b>	<b>3.925</b>	<b>14.78</b>	<b>3.76</b>	4
Other surveys score	36.73	40.1	18.38	3.62	1.15	<b>4.07</b>	3
Overall weighted score	<b>34.98</b>	<b>25.15</b>	<b>18.89</b>	<b>8.65</b>	<b>10.79</b>	<b>3.63</b>	

**Assessment of Outcome ‘PO-05’ using performance criterion PO-05(C)**

**PO-05(C): Use analytical, computational and/or experimental methods to obtain solutions**

**a.) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE605: Power System Analysis & Stability* and *UEE804: Operation and Control of Power Systems* are used to assess performance criteria PO-05(C) as a direct measure. The analysis for each of these courses is provided below:

## UEE605: Power System Analysis & Stability

The performance of course *UEE605: Power System Analysis & Stability* is used to measure the attainment of outcome ‘PO-05(C)’ through the End Semester Examination (Question No. 3, Jan-May 2017, 10 marks).

### Question:

Q3.	For a three bus system, the line data and bus data is given in table 1. All Line data are based on 100MVA and 11kV. Assemble Bus admittance matrix. Obtain load flow solution at the end of first iteration using Gauss Seidal iterative method. Assume the limits on variables reactive power and voltage magnitude in per unit are as: $0 \leq Q \leq 0.5$ and $0.95 \leq  V  \leq 1.05$ . Take acceleration factor $\alpha=1.5$ .									(10)
	Line Data			Bus No.	Generated		Load		Bus Voltage	
	From bus	To Bus	Line admittance (per unit)		P <sub>Gi</sub> (MW)	Q <sub>Gi</sub> (M VAr)	P <sub>Di</sub> (MW)	Q <sub>Di</sub> (MVA r)	V <sub>i</sub> (pu)	
	1	2	2.0-j5 0		---	--	--	--	1.05∠0°	
	1	3	1.0-j4.0	2	25	15	50	2	1.02	
	2		3.0-j9.0	3	0	0	60	30	-	

The performance of the students in the above question is then summarized as given below in Table PO-05(C).1 using rubrics defined in Table PO-05.1.

**Table PO-05(C).1:Student’s performance in question targeting ‘PO-05(C)’; Course UEE605**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	0	1
2	101404002	Abhijeet Singh Sankhla	2	2
3	101404004	Abhinav Arora	6	4
4	101404006	Abhishek Sharma	4	3
5	101404007	Ajay Singh	0	1
6	101404009	Alka Thakur	5	3
7	101404012	Ankush Goyal	6	4
8	101404014	Anmol Goyat	4	3
9	101404015	Anmol Rattan Kaur	4	3
10	101404017	Anubhav Kumar	5.5	3

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
11	101404018	Apeksha Goel	3	2
12	101404019	Arnish Jain	7.5	5
13	101404020	Arshiyा	4	3
14	101404021	Arshjot Kaur	7	4
15	101404023	Ayush Jain	5	3
16	101404024	Bhawani Singh	3	2
17	101404025	Chirag Jain	5.5	3
18	101404026	Davileen Garg	3	2
19	101404027	Dilpreet Kaur	1	1
20	101404028	Divesh Kamdar	5	3
21	101404029	Divyam Aggarwal	7	4
22	101404031	Divyanshu Siddharth	3	2
23	101404032	Garima	1.5	1
24	101404033	Garv Chahar	4	3
25	101404035	Gaurav Rathore	0	1
26	101404036	Gurpreet Singh	3	2
27	101404037	Gursagar Singh	8	5
28	101404038	Gurupinder Pal Singh	3	2
29	101404039	Harmanpreet Singh	4	3
30	101404041	Harshit Kaushik	4	3
31	101404042	Harshvir Singh	9	5
32	101404043	Harsimarjot Kaur	9	5
33	101404044	Harsimran Singh	4	3
34	101404046	Heema Gupta	7	4
35	101404047	Hitesh Kumar	6	4
36	101404048	Ishita Mahindru	5.5	3
37	101404049	Jagmeet Singh Bawa	3	2
38	101404050	Jagnoor Kaur	4	3
39	101404051	Jashanpreet Singh	5.5	3
40	101404052	Jatin Bansal	5.5	3
41	101404053	Jatin Raheja	4	3
42	101404054	Kanishak Sharma	7	4
43	101404055	Karan Sanjeev Bajaj	6	4
44	101404056	Kirtish Madaan	4	3
45	101404057	Mahitosh Sharma	10	5
46	101404058	Manan Mittal	6	4
47	101404059	Mandeep Singh Panesar	10	5

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
48	101404060	Manisha Gupta	5	3
49	101404061	Manit Gupta	3.5	2
50	101404062	Manjosh Singh Dhillon	5	3
51	101404063	Manpreet Singh Brar	4	3
52	101404064	Manvir Kaur	3.5	2
53	101404065	Mehak Bhatia	5	3
54	101404066	Mithilesh Kumar	3	2
55	101404067	Mohit Goyal	10	5
56	101404068	Mridul Marwaha	10	5
57	101404069	Mudit Arora	10	5
58	101404070	Naveen Parashar	3	2
59	101404072	Nigam Wadhwa	6	4
60	101404073	Nikhil Danodia	3	2
61	101404074	Nishita Kumari	5.5	3
62	101404075	Nitin Gupta	6	4
63	101404076	Nitish Arora	6	4
64	101404077	Nitish Bhardwaj	3	2
65	101404078	Omandeep Kaur	3	2
66	101404079	Pankaj Garg	4	3
67	101404080	Paramjot Singh	4.5	3

The overall performance of students for the above criterion is summarized in Table PO-05(C).2.

**Table PO-05(C).2: Average score of student performance in the course UEE605 for criteria PO-05(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE605	13.43	17.91	38.81	22.39	7.46	3.08

#### **UEE804: Operation and Control of PowerSystems**

The performance of course *UEE804: Operation and Control of Power Systems* is used to measure the attainment of outcome ‘PO-05(C)’ through Mid Semester Test (Question3 July-Dec 2016, 15 Marks)

##### **Question:**

Q.3	<p>(i) Obtain the economic schedule for the two units, the production costs of which are given as follows, to supply a load of 3MW, in steps of 1MW</p> $C_1 = 0.8P_1^2 + 25P_1$ $C_2 = 1.2P_2^2 + 22P_2$ <p>(ii) If only a load of 2MW is to be supplied, how are the units to be committed in Use dynamic programming method.</p>	15
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The performance of the students in the above question is then summarized as given below in Table PO-05(C).2 using rubrics defined in Table PO-05.1.

**Table PO-05(C).2: Student's performance in question targeting 'PO-05(C)'; Course UEE804**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101304001	Aarushi Bajaj	15	5
2	101304002	Abhey Arora	4	2
3	101304005	Aditi Narang	15	5
4	101304006	Aditya	8	3
5	101304007	Akshat	15	5
6	101304008	Akshay Kapoor	15	5
7	101304009	Akshay Kumar	15	5
8	101304010	Akshay Kumar Chaudhary	15	5
9	101304011	Akshay Sharma	15	5
10	101304012	Amandeep Kaur	15	5
11	101304013	Amandeep Singh	11	4
12	101304015	Angad Kapoor	0	1
13	101304016	Ankita Garg	15	5
14	101304018	Anmol Jawa	15	5
15	101304019	Anmolpreet Singh	15	5
16	101304020	Anyuti Tiwary	14	5
17	101304021	Arpit Sharma	15	5
18	101304022	Arsh Kundal	15	5
19	101304023	Arshbir Kaur	2	1
20	101304024	Arshdeep Singh Bagga	5	2
21	101304025	Ashish	15	5
22	101304026	Ashish Rajpal	15	5
23	101304028	Berry Lubana	4	2
24	101304029	Bhanu Duggal	15	5
25	101304030	Bhanu Marwaha	7	3
26	101304031	Chirag Gaba	14	5
27	101304032	Dipin Garg	15	5
28	101304033	Dishant Vanvari		

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
29	101304034	Divyesh Pratap Singh	15	5
30	101304035	Elham Anwar	15	5
31	101304036	Gurseerat Singh Meen	0	1
32	101304037	Gursewak Singh	15	5
33	101304040	Hariansh Sehgal	15	5
34	101304042	Himanshu Goyal	6	3
35	101304044	Jasjit Singh	0	1
36	101304045	Jassimran Singh Julka	6	3
37	101304046	Jessica Dhaliwal	15	5
38	101304047	Kanwarpal Singh	0	1
39	101304048	Karan Kumar	12	5
40	101304049	Karanjot Singh Kochhar	15	5
41	101304050	Kashish Aggarwal	14	5
42	101304052	Love Gaba	15	5
43	101304054	Manik Mittal	7	3
44	101304055	Maninderjit Singh	15	5
45	101304056	Mayank Singla	15	5
46	101304057	Mridul Bhutani	15	5
47	101304059	Navdeep Singh	15	5
48	101304062	Nishant Garg	7	3
49	101304094	Satripleen Kaur	15	5
50	101484001	Amandeep Singh	8	3
51	101484002	Amrinder Singh	15	5
52	101484003	Ashmeen Singh	15	5
53	101484004	Azad Singh	6	3
54	101484007	Deepak Singla	15	5
55	101484008	Diljeet Singh	4	2

The overall performance of students for the above criterion is summarized in Table .PO-05(C).4.

**Table PO-05(C).4: Average score of student performance in the course UEE804 for criteria PO-05(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE804</b>	66.67	1.85	14.81	7.41	9.26	<b>4.04</b>

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-05(C) as given in Table PO-05(C).5.

**Table PO-05(C).5: Weighted Average Student class performance (course portfolio) for criteria PO-05(C)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE605	13.43	17.91	38.81	22.39	7.46	3.08
UEE804	66.67	1.85	14.81	7.41	9.26	4.04
Student class performance score	<b>40.05</b>	<b>9.88</b>	<b>26.81</b>	<b>14.9</b>	<b>8.36</b>	<b>3.56</b>

**b) Indirect measures for Performance criteria PO-05(C) (Surveys)**

- (i) **Assessment Tool:** Student Course Surveys are used to assess the attainment of program outcome 'PO-05(B)' through indirect measurement using following course learning objectives in the respective courses.

UEE605	Carry out power flow analysis of practical power system for balanced system
UEE804	Decide the scheduling of thermal units and hydro-thermal units for overall economy

**Table PO-05(C).6: Weighted average score of performance criterion 'PO-05(C)' based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE605	13.43	17.91	38.81	22.39	7.46	3.07
UEE804	44.26	19.67	18.03	8.1	9.8	<b>3.80</b>
Course surveys score	<b>45.34</b>	<b>20.54</b>	<b>13.60</b>	<b>6.6</b>	<b>13.82</b>	<b>3.76</b>

- (ii) **Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome 'PO-05' through indirect measurement is summarized in Table PO-05(A).7

**c) Overall weighted average score of performance criterion 'PO-05(C)'**

Finally overall weighted average score of performance criterion 'PO-05(C)' is evaluated as given below in Table PO-05(C).7.

**Table PO-05(C).7: Overall weighted average score of performance criterion 'PO-05(C)'**

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance score	40.05	9.88	26.81	14.9	8.36	<b>3.56</b>	5
Course surveys score	45.34	20.54	13.60	6.6	13.82	<b>3.77</b>	4
Other surveys score	36.73	40.1	18.38	3.62	1.15	<b>4.07</b>	3
Overall weighted score	<b>40.98</b>	<b>20.98</b>	<b>20.29</b>	<b>9.31</b>	<b>8.37</b>	<b>3.75</b>	

## Overall assessment of program outcome PO-05 using scores of PO-05(A), PO-05(B) and PO-05(C)

In the previous sections, each of the individual performance criteria PO-05(A), PO-05(B) and PO-05(C) have been assessed. The performance for attainment of outcome PO-05 has been completed using the attainment values for PO-05(A), PO-05(B) and PO-05(C) are given in Table PO-05.2 and Fig. PO-05.2:

Table PO-05.2 summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome PO-05.

**Table PO-05.2: Overall score for outcome PO-05 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
<b>PO-05(A)</b>	31.59	26.76	20.71	12.35	8.55	<b>3.60</b>	5
<b>PO-05(B)</b>	34.98	25.15	18.89	8.65	10.79	<b>3.63</b>	5
<b>PO-05(C)</b>	40.98	20.98	20.29	9.31	8.37	<b>3.75</b>	5
<b>Overall score</b>	<b>35.85</b>	<b>24.29</b>	<b>19.96</b>	<b>10.10</b>	<b>9.23</b>	<b>3.66</b>	



**Figure PO-05.2: Performance criteria-wise assessment score distribution of outcome ‘PO-05’**

The data presented above pertains to the courses offered during the academic year 2016-17. Similar data is available for the previous two academic years (2014-15 and 2015-16). The final results of all the outcomes are summarized and presented below in the section ‘Track Records’.

## **Track Record and assessment of attainment of program outcomes over the last three academic years**

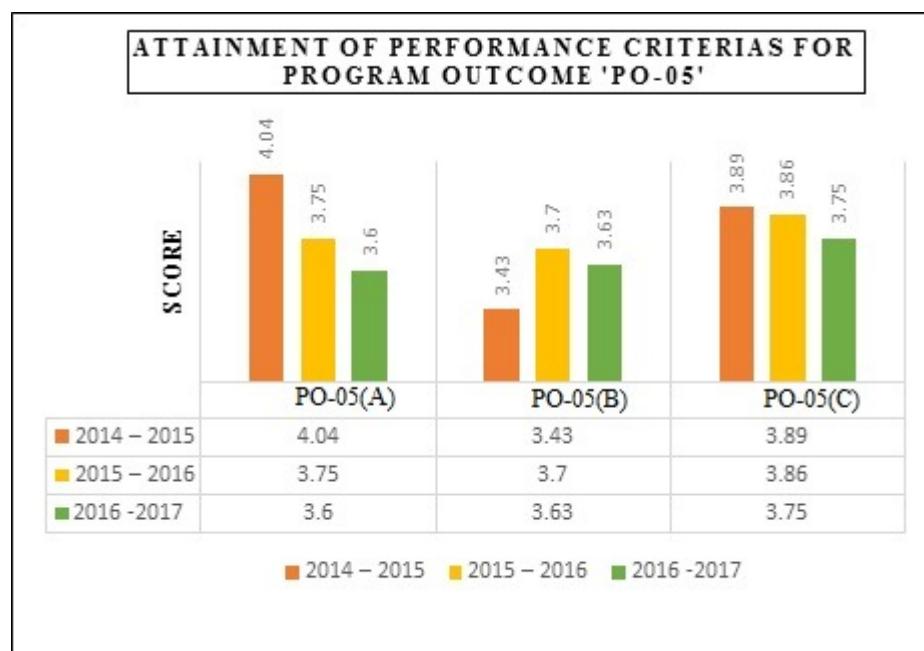
The performance criteria-wise assessment scores distribution and overall weighted score for outcome ‘PO-05’ for last three years, i.e. 2014-2015, 2015-2016, and 2016-2017 are presented in this section.

### ***Attainment of Outcomes***

The Table PO-05.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-05’.

**Table PO-05.3: Performance criteria-wise assessment scores distribution for each outcome ‘PO-05’.**

Program outcome and performance criteria	Academic year			Weight
	2014 – 2015	2015 – 2016	2016 -2017	
<b>PO-05</b>	<b>PO-05(A)</b>	4.04	3.75	3.60
	<b>PO-05(B)</b>	3.43	3.7	3.63
	<b>PO-05(C)</b>	3.89	3.86	3.75
<b>Overall weighted score of outcome PO-05</b>		<b>3.78</b>	<b>3.77</b>	<b>3.66</b>



**Figure PO-05.3: Performance criteria-wise assessment score distribution of outcome ‘PO-05’**

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-05’ over a period of last three years.

### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

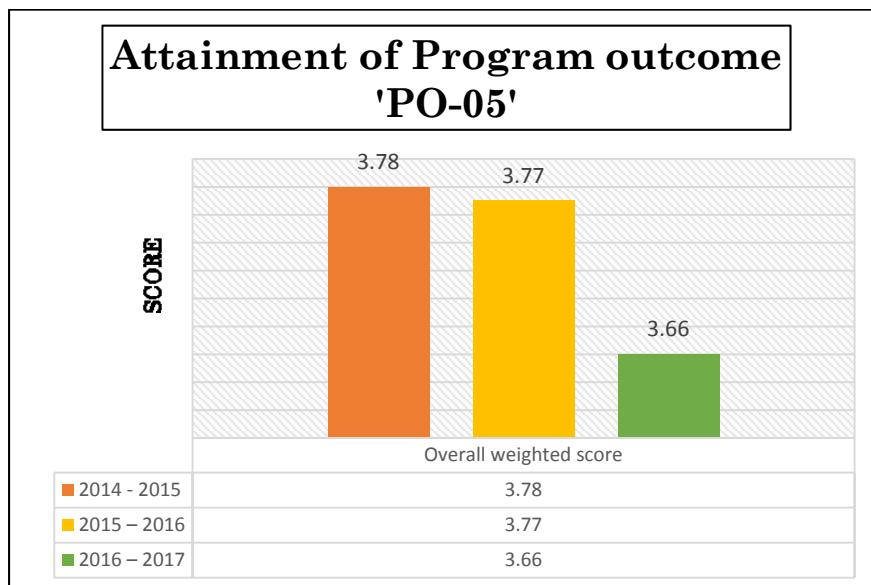
- i. **Excellent**: Overall weighted score for the outcome is  $\geq 4.5$ .
- ii. **Very Good**: Overall weighted score for the outcome is between 4 and 4.5.
- iii. **Good**: Overall weighted score for the outcome is between 3.5 and 4.0.
- iv. **Satisfactory**: Overall weighted score for the outcome is between 3.0 and 3.5.
- v. **Unsatisfactory**: Overall weighted score for the outcome is  $\leq 3.0$ .

The Table PO-05.4 presents the overall weighted score of outcome ‘PO-05’ over the last three academic years.

**Table PO-05.4: Overall weighted score of the outcome ‘PO-05’ over a period of last three academic years.**

Academic year	Overall Weighted Score	Level of Attainment
2014 - 2015	3.78	Good
2015 – 2016	3.77	Good
2016 – 2017	3.66	Good

Figure PO-05.4 shows the overall weighted score of outcome ‘PO-05’ over a period of last three academic years.



**Figure PO-05.4: Overall weighted score of outcome ‘PO-05’ over a period of last three academic years.**

# **Assessment of Attainment of Program outcome**

## **PO-06**

*An understanding of professional and ethical responsibility*  
**(2016-17)**

*for the*  
**Bachelor of Engineering**  
*in*  
**Electrical Engineering**



**Electrical & Instrumentation Engineering Department  
Thapar Institute of Engineering and Technology, Patiala  
(Punjab) -INDIA**

## **Attainment of Program outcome ‘PO-06’**

The attainment of program outcome PO-06: *An understanding of professional and ethical responsibility* has been measured for the BE Electrical Engineering program. The program outcome ‘PO-06’ has been classified into the following performance criteria:

**PO-06(A):** *Able to interact with the people in organizations, industries and/or professional societies in a professional manner to achieve their goals*

**PO-06(B):** *Able to evaluate ethical issues that may occur in professional practice using professional codes of ethics ensuring protection of organization, human safety and well-being of society*

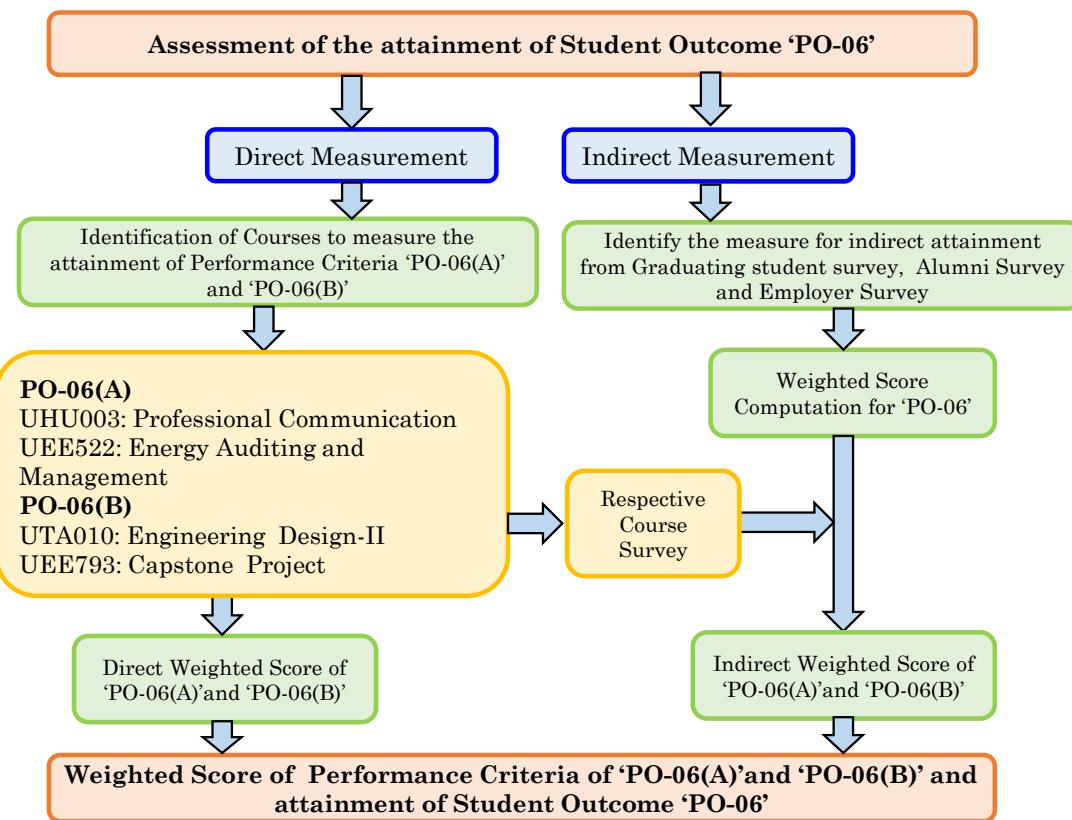
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-06’. The courses selected for assessment in the last three academic years have been marked in bold.

- UEN002: Energy and Environment
- **UHU003: Professional Communication**
- UHU005: Humanities for Engineers
- UTA002: Manufacturing Processes
- **UTA008: Engineering Design-I**
- **UTA010: Engineering Design-II**
- UTA011: Engineering Design-III
- **UEE522: Energy Auditing and Management**
- UEE691: Engineering Design Project
- **UEE591: Summer Training**
- **UEE791: Project Semester**
- **UEE793: Capstone Project**
- **UEE801: Electric Drives**

Program outcome PO-06 has been assessed through two performance criteria PO-06(A) and PO-06(B). The following courses have been considered by the program assessment committee for the assessment of performance criteria PO-06(A) and PO-06(B) for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-06(A)	UHU003: Professional Communication	UEE522: Energy Auditing and Management
PO-06(B)	UTA010: Engineering Design II	UEE793: Capstone Project

The step by step methodology used to measure the attainment of program outcome PO-06 is shown in Fig. PO-06.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome PO-06 for all three academic years under consideration.



**Fig. PO-06.1: Process for measurement of attainment of outcome 'PO-06' for the year 2016-17**

The following Rubric has been used to convert marks obtained by students to a Likert scale in the range of 1 to 5 are described in Table PO-06.1(a) and Table PO-06.1(b) for assessment of theoretical and sessional components respectively in most cases unless specifically mentioned.

**Table PO-06.1(a): Rubric for Outcome Measurement in Theoretical Courses**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

**Table PO-06.1(b): Rubric for Outcome Measurement in Sessional Components**

S. No.	Range of Marks (%)	Score (1-5)
1	$80 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the subjects mentioned.

## **Assessment of Outcome ‘PO-06’ using Performance Criterion ‘PO-06(A)’**

### **PO-06(A): Able to interact with the people in organizations, industries and/or professional societies in a professional manner to achieve their goals.**

The performance criteria PO-06(A) has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating Student Survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UHU003: Professional Communication* and *UEE522: Energy Auditing and Management* are used to assess performance criteria PO-06(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UHU003: Professional Communication**

The performance of course *UHU003: Professional Communication* is used to measure the attainment of outcome PO-06(A) through the **component of panel discussion** in sessional evaluation of July-Dec 2016, (10 Marks).

The performance of the students in the above measure is summarized in Table PO-06(A).1 using rubrics defined in Table PO-06.1(b).

**Table PO-06(A).1: Students’ performance in question targeting PO-06(A): Course UHU003**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101554001	Aditya	6	4
2	101604024	Anjan Abhishek Singh	6.5	4
3	101604025	Ankita Anand	6.7	4
4	101604026	Ankur Garg	6.5	4
5	101604027	Ankur Jangra	6.9	4
6	101604028	Anmol Tiwari	7.25	4
7	101604029	Annwesh Das	7.65	4
8	101604030	Ansh Gupta	0	1
9	101604031	Anurakt Rai	7.25	4
10	101604032	Apoorv Sharma	7.3	4
11	101604033	Apoorv Sharma	7.45	4
12	101604034	Apoorva Garg	6.9	4
13	101604035	Apoorvee Sharma	6.65	4

<b>S. No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (10)</b>	<b>Score (1-5)</b>
14	101604036	Arjun Singh Pathania	0	1
15	101604037	Arnav Mukherjee	7.1	4
16	101604038	Arpit Ahuja	7	4
17	101604039	Ashish Jain	6.8	4
18	101604040	Ashutosh Pareek	0	1
19	101604041	Avijot Kaur	7	4
20	101604042	Avnish Gupta	6.9	4
21	101604043	Ayush Dhanda	6.6	4
22	101604044	Ayush Gupta	0	1
23	101604045	Ayush Singh	5.95	3
24	101604046	Baljeet Singh	6.6	4
25	101604047	Bharat Bansal	5.7	3
26	101604048	Chandra Bhushan Singh	5.6	3
27	101604049	Chetan Bir Singh	5.95	3
28	101604050	Chetan Modi	5.75	3
29	101604051	Chiranjeev Singh	6.6	4
30	101604052	Dabeet Singh	5.9	3
31	101604053	Deepanshu Sambhariya	6.7	4
32	101604055	Dhruv Sharma	7.5	4
33	101604056	Diksha	7.05	4
34	101604057	Divya Goyal	6.7	4
35	101604058	Divya Jallendhra	6.85	4
36	101604059	Gagan Sharma	6.8	4
37	101604060	Gagandeep Jindal	6.5	4
38	101604061	Gurjot Singh Tiwana	7.15	4
39	101604062	Gurkiran Kaur	6.55	4
40	101604063	Gurupdesh Singh	6.85	4
41	101604094	Navdeep Kaur	6.95	4
42	101604095	Naveen Mehta	7	4
43	101604096	Navjot Kaur	6.75	4
44	101604097	Navudit S Madaan	6.6	4
45	101604098	Nikhil Anand	7	4
46	101604099	Nimesh Agarwal	7.2	4
47	101604100	Nishtha Arora	7	4
48	101604101	Paarth Arora	7.2	4
49	101604102	Palam Singla	6.55	4
50	101604103	Parakh Sharma	7.25	4
51	101604104	Piyush Kumar	7.1	4
52	101604105	Piyusha	5.75	3
53	101604106	Prabhat Singh	6.25	4
54	101604107	Pradeep Murarka	0	1
55	101604108	Praggya Chakravorty	6.3	4

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
56	101604109	Prakhar Pandey	6.55	4
57	101604110	Pranshu Kumar Sharma	6.3	4
58	101604111	Pranvi	7	4
59	101604112	Pratham Arora	6.55	4
60	101604113	Pratik Sidhu	6.5	4
61	101604156	Suraj Singh	6.25	4
62	101604157	Surbhi Manral	6.6	4
63	101604158	Sushant Goyal	6.65	4
64	101604159	Sushant Joshi	6.6	4
65	101604160	Takshak Kohli	6.3	4
66	101604161	Tarun Goyal	6.3	4
67	101604162	Tushar Jain	6.25	4
68	101604163	Utkarsh Srivastava	6.4	4
69	101604164	Vanshika Aggarwal	6.75	4
70	101604165	Vidhi Mehta	6.75	4
71	101604166	Vikramjit Singh	6.9	4
72	101604167	Vikramjit Singh	7.2	4
73	101604168	Vishal Choudhary	6.15	4
74	101604169	Yash Kumar	6	4
75	101604170	Yati Arora	6.4	4
76	101604171	Yukta Sharma	6.15	4

The performance of students through the course UHU003 for criteria PO-06(A) is summarized in Table PO-06(A).2.

**Table PO-06(A).2: Average score of student performance in the course UHU003 for criteria PO-06(A)**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UHU003	0.00	84.21	9.21	0.00	6.58	3.71

## UEE522: Energy Auditing and Management

The performance of course UEE522: Energy Auditing and Management is used to measure the attainment of outcome PO-06(A) through the End Semester Examination (Question No. 9, July-Dec 2016, 20 marks).

### Question:

Q.9	<b>Case Study:</b> An energy audit has been carried out in a hostel. The following data has been collected before energy audit.					(20)
	Appliance	Rating (watts)	Quantity	Operating time (hrs x days)	Price (₹)	
	Fluorescent Lamb	40	422	8x365	60 ₹	
	Night lamp (CFL)	14	240	6x365	200₹	
	Fan (Ceiling)	60	589	18x245	1400₹	
		Existing TR	EER	Operating hours (hrs x days)	Price (₹)	
	AC.No.1	1.5	2.05	12x120	25000	
	AC.No.2	1.5	2.05	12x120	25000	
	AC.No.3	1.5	2.19	12x120	25000	
	AC.No.4	1.5	2.30	12x120	25000	
	AC.No.5	1.5	2.40	12x120	25000	
	AC.No.6	2	2.80	24x120	30000	
	AC.No.7	2	2.90	24x120	30000	
by the energy auditors, it has been recommending for the energy saving:						
(i) If the Fluorescent lamps in hostel are replaced with a good quality CFL bulbs with a rating of 29 W for the same luminance with a price of 100₹ each. (ii) All Night lamp will be replaced by LED lamp with a rating of 5 W price of each 80₹. (iii) All fans are replaced by a good quality energy efficient fan from Crompton Greaves company with a rating of 50 W with a price of 1600₹ (each). (iv) All ACs are replaced with three star labeled new ACs having Energy Efficiency Ratio (EER) of 2.50 kW/kW for 1.5 Tons and 3.25 for 2 Tons with a price of 30,000₹ and 35,000₹ respectively. (v) Rate of energy is 5.00 ₹/kWh and a 50% of depreciation factor is considered for old products.						
Calculate the money saving by replacing old system with new one. Also comment on saving recommendations. What is simple payback period (if any).						

The performance of the students in the above question is summarized in Table PO-06(A).3 using rubrics defined in Table PO-06.1(a).

**Table PO-06(A).3: Students' performance in question targeting PO-06(A): Course UEE522**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101404007	Ajay Singh	0	1
2	101404009	Alka Thakur	3	1
3	101404012	Ankush Goyal	15	5
4	101404014	Anmol Goyat	2	1
5	101404015	Anmol Rattan Kaur	5	2
6	101404017	Anubhav Kumar	0	1
7	101404018	Apeksha Goel	0	1
8	101404020	Arshiya	0	1
9	101404021	Arshjot Kaur	0	1
10	101404024	Bhawani Singh	0	1
11	101404026	Davileen Garg	8	3
12	101404029	Divyam Aggarwal	10	3
13	101404032	Garima	18	5
14	101404033	Garv Chahar	8	3
15	101404035	Gaurav Rathore	0	1
16	101404036	Gurpreet Singh	0	1
17	101404037	Gursagar Singh	4	2
18	101404038	Gurupinder Pal Singh	0	1
19	101404039	Harmanpreet Singh	0	1
20	101404041	Harshit Kaushik	6	2
21	101404042	Harshvir Singh	6	2
22	101404043	Harsimarjot Kaur	0	1
23	101404044	Harsimran Singh	2	1
24	101404046	Heema Gupta	6	2
25	101404047	Hitesh Kumar	0	1
26	101404048	Ishita Mahindru	0	1
27	101404049	Jagmeet Singh Bawa	10	3
28	101404051	Jashanpreet Singh	10	3
29	101404052	Jatin Bansal	18	5
30	101404053	Jatin Raheja	6	2
31	101404056	Kirtish Madaan	0	1
32	101404057	Mahitosh Sharma	16	5
33	101404058	Manan Mittal	8	3
34	101404059	Mandeep Singh Panesar	14	4
35	101404060	Manisha Gupta	0	1
36	101404061	Manit Gupta	17	5
37	101404062	Manjosh Singh Dhillon	8	3
38	101404063	Manpreet Singh Brar	8	3
39	101404064	Manvir Kaur	6	2
40	101404066	Mithilesh Kumar	15	5
41	101404067	Mohit Goyal	18	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
42	101404068	Mridul Marwaha	8	3
43	101404070	Naveen Parashar	0	1
44	101404072	Nigam Wadhwa	10	3
45	101404073	Nikhil Danodia	10	3
46	101404075	Nitin Gupta	10	3
47	101404076	Nitish Arora	15	5
48	101404077	Nitish Bhardwaj	8	3
49	101404078	Omandeep Kaur	8	3
50	101404079	Pankaj Garg	14	4
51	101404081	Parmar Adhiraj Singh	10	3
52	101404083	Prabhdeep Kaur	0	1
53	101404089	Pulkit Bansal	16	5
54	101404090	Pushpinder Singh	10	3
55	101404091	Rachit Verma	2	1
56	101404092	Rahul Gautam	0	1
57	101404093	Rahul Goyal	18	5
58	101404094	Rajshree Vaidya	5	2
59	101404099	Sagar Bansal	12	4
60	101404100	Sahajdeep Kaur	6	2
61	101404102	Sahil Singla	15	5
62	101404103	Samarth Gupta	0	1
63	101404105	Samrat Kumar Gupta	0	1
64	101404106	Sanamdeep Singh	2	1
65	101404108	Saurabh Kumar	0	1
66	101404109	Shailesh Verma	0	1
67	101404111	Sher Mohammed	0	1
68	101404112	Shivam Dochania	5	2
69	101404113	Shivam Gera	5	2
70	101404115	Shubham Bhardwaj	0	1
71	101404118	Shubham Kumar	6	2
72	101404120	Shubhdeep Singh	8	3
73	101404121	Siddharth Singh	0	1
74	101404122	Simran Mehra	6	2
75	101404123	Sukhman	10	3
76	101404124	Swapnil Singla	8	3
77	101404126	Taranjot Singh	6	2
78	101404128	Tarun Gupta	12	4
79	101404129	Tarun Kumar	2	1
80	101404132	Utkarsh Atri	10	3
81	101404133	Vandana Gora	2	1
82	101454002	Yash Motwani	4	2
83	101454003	Harshwardhan Soni	0	1

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
84	101454004	Simardeep Kaur	10	3
85	101454005	Tejas Kapila	15	5
86	101454009	Lariza Bansal	2	1
87	101584001	Amanjit Singh	16	5
88	101584002	Chetan Garg	18	5
89	101584003	Devinder Kumar	6	2
90	101584004	Gurpreet Singh	0	1
91	101584005	Gurpreet Singh	4	2
92	101584006	Harman Preet Singh	8	3
93	101584007	Karamjeet Singh	0	1
94	101584008	Lakshay Garg	10	3
95	101584009	Prince Kalia	8	3
96	101584010	Rohit	4	2
97	101584011	Satvir Singh	6	2
98	101584012	Sharandeep Singh	15	5
99	101584013	Shashi Sharma	15	5
100	101584014	Sunyppreet Singh	8	3
101	101584015	Rajat Chandra	0	1
102	101584016	Gursimran Singh	8	3

The performance of students through the course UEE522 for criteria PO-06(A) is summarized in Table PO-06(A).4.

**Table PO-06(A).4: Average score of student performance in the course UEE522 for criteria PO-06(A)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE522	15.69	3.92	25.49	18.63	36.27	2.44

The data from Table PO-06(A).2 and Table PO-06(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria PO-06(A), and is summarised in Table PO-06(A).5.

**Table PO-06(A).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-06(A)**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UHU003	0.00	84.21	9.21	0.00	6.58	3.71
UEE522	15.69	3.92	25.49	18.63	36.27	2.44
Weighted Average Score	7.85	44.07	17.35	9.32	21.43	3.08

**b) Indirect Measures:**

The indirect measurement of performance criteria PO-06(A) has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-06(A).6 and Table PO-06(A).7.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of PO-06(A).

UHU003	Speak assertively and effectively
UEE522	Decide about energy management in more effective way

**Table PO-06(A).6: Weighted average score of performance criterion PO-06(A) based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UHU003	31.88	28.12	28.75	3.12	8.12	<b>3.73</b>
UEE522	44.87	33.33	10.25	6.41	5.13	<b>4.06</b>
<b>Weighted average score</b>	<b>38.38</b>	<b>30.73</b>	<b>19.50</b>	<b>4.77</b>	<b>6.63</b>	<b>3.90</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey

(Other surveys) are used to assess the attainment of program outcome ‘PO-06’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An understanding of professional and ethical responsibility
Alumni Survey	
Employer Survey	Do our students have an understanding of professional and ethical responsibility?

**Table PO-06(A).7: Weighted average score of performance criterion PO-06(A) based on Other Surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	<b>54.93</b>	<b>42.25</b>	<b>2.82</b>	<b>0.00</b>	<b>0.00</b>	<b>4.52</b>
<b>Employer survey</b>	<b>31.88</b>	<b>35.27</b>	<b>26.57</b>	<b>4.83</b>	<b>1.45</b>	<b>3.91</b>
<b>Alumni survey</b>	<b>60.00</b>	<b>33.33</b>	<b>6.67</b>	<b>0.00</b>	<b>0.00</b>	<b>4.53</b>
<b>Weighted average score</b>	<b>48.94</b>	<b>36.95</b>	<b>12.02</b>	<b>1.61</b>	<b>0.48</b>	<b>4.32</b>

**c) Overall weighted average score of performance criterion PO-06(A)**

The overall weighted average score of performance criterion (A) is summarised in Table PO-06(A).8 from the data given in Tables PO-06(A).5, PO-06(A).6 and PO-06(A).7.

**Table PO-06(A).8: Overall weighted average score of performance criterion PO-06(A)**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	7.85	44.07	17.35	9.32	21.43	3.08	5
Course surveys	38.38	30.73	19.50	4.77	6.63	3.90	4
Other surveys	48.94	36.95	12.02	1.61	0.48	4.32	3
Overall weighted score	28.30	37.84	16.73	5.88	11.26	3.66	-

## **Assessment of Outcome ‘PO-06’ using Performance Criterion PO-06(B)**

**PO-06(B): Able to evaluate ethical issues that may occur in professional practice using professional codes of ethics ensuring protection of organization, human safety and well-being of society**

The performance criteria PO-06(B) has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating Student Survey, Alumni survey and Employer survey).

### **a) Direct Measures:**

#### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UTA010: Engineering Design-II* and *UEE793: Capstone Project* are used to assess performance criteria PO-06(B) as a direct measure. The analysis for each of these courses is provided below:

#### **UTA010: Engineering Design-II**

The performance of course *UTA010: Engineering Design-II* is used to measure the attainment of outcome PO-06(B) considering the **ethical issues that may occur in professional practice using professional codes of ethics ensuring protection of organization, human safety and well-being of society** assessed through End semester Examination during Jan-June 2017, (30 Marks).

The performance of the students in the above measure is summarized in Table PO-06(B).1 using rubrics defined in Table PO-06.1(b).

**Table PO-06(B).1: Students’ performance in question targeting PO-06(B): Course UTA010**

S. No	Roll No.	Name of Student	Marks (30)	Score (1-5)
1	101604001	Aakanksha Garg	25	5
2	101604002	Aastha Aggarwal	24	5
3	101604003	Aayush Gaharwar	24.5	5
4	101604004	Abhigyan Prakash	23.5	4
5	101604005	Abhinandan Vijan	24	5
6	101604008	Abhranil Mandal	24.25	5
7	101604009	Aditi Singh	24.25	5
8	101604010	Aditya Kapur	25.25	5
9	101604011	Aditya Rathore	23	4
10	101604012	Aishwarya	27	5
11	101604013	Ajaypal Singh	24	5

S. No	Roll No.	Name of Student	Marks (30)	Score (1-5)
12	101604014	Akash Negi	23.5	4
13	101604016	Akshat Choudhary	25.5	5
14	101604019	Akshit Kapahi	25.5	5
15	101604020	Akshit Kumar	22	4
16	101604021	Aman	24	5
17	101604022	Aman Goyal	23.5	4
18	101604023	Amrinder Singh	23.5	4
19	101604024	Anjan Abhishek Singh	21	4
20	101604025	Ankita Anand	23.5	4
21	101604026	Ankur Garg	20	4
22	101604027	Ankur Jangra	20	4
23	101604028	Anmol Tiwari	27.5	5
24	101604029	Annwesh Das	23.75	4
25	101604032	Apoorv Sharma	27	5
26	101604034	Apoorva Garg	27.75	5
27	101604036	Arjun Singh Pathania	24	5
28	101604037	Arnav Mukherjee	29	5
29	101604039	Ashish Jain	28.5	5
30	101604041	Avijot Kaur	26.5	5
31	101604043	Ayush Dhanda	27	5
32	101604045	Ayush Singh	21.5	4
33	101604046	Baljeet Singh	21.5	4
34	101604047	Bharat Bansal	26.5	5
35	101604048	Chandra Bhushan Singh	25.5	5
36	101604049	Chetanbir Singh	19.5	4
37	101604050	Chetan Modi	20	4
38	101604051	Chiranjeev Singh	25.25	5
39	101604052	Dabeet Singh	23	4
40	101604053	Deepanshu Sambhariya	25.75	5
41	101604055	Dhruv Sharma	26	5
42	101604056	Diksha	26	5
43	101604059	Gagan Sharma	22.5	4
44	101604060	Gagandeep Jindal	23.5	4
45	101604061	Gurjot Singh Tiwana	23.5	4
46	101604062	Gurkiran Kaur	24.5	5
47	101604063	Gurupadesh Singh	23.5	4
48	101604066	Harsimar Arora Singh	23.5	4
49	101604067	Himanshu Garg	23	4
50	101604068	Hitesh Kumar	22.5	4
51	101604070	Japjot Singh	22.5	4
52	101604071	Kalpit Sharma	23.75	4
53	101604073	Kartik Gupta	27	5

S. No	Roll No.	Name of Student	Marks (30)	Score (1-5)
54	101604074	Kawal Jeet Singh	26	5
55	101604075	Kiran Thakur	26	5
56	101604077	Lakshay Mehta	26	5
57	101604079	Lovin Kr Singh	26	5
58	101604080	Madhu Sudan Singh	23.25	4
59	101604081	Madhur Bain Singh	26.5	5
60	101604083	Mannat	25.5	5
61	101604084	Mansi Gupta	26	5
62	101604087	Meghna Goyal	24	5
63	101604088	Minnervir Kaur Dhanoa	26	5
64	101604089	Misha Aggarwal	26.5	5
65	101604090	Mithil Bishnoi	23.75	4
66	101604091	Mukul Goswami	24	5
67	101604092	Naman Dhingra	23	4
68	101604093	Narain Kumar Bedi	23.25	4
69	101604094	Navdeep Kaur	24.25	5
70	101604095	Naveen Mehta	24	5
71	101604096	Navjot Kaur	24.25	5
72	101604097	Navudit S Madaan	25	5
73	101604098	Nikhil Anand	24	5
74	101604100	Nishtha Arora	27	5
75	101604101	Paarth Arora	27	5
76	101604102	Palam Singla	26	5
77	101604103	Parakh Sharma	27	5
78	101604104	Piyush	27	5
79	101604105	Piyusha	28.5	5
80	101604106	Prabhat Singh	28.5	5
81	101604107	Pradeep Murarka	26	5
82	101604108	Praggya Chakravorty	28.5	5
83	101604109	Prakhar Pandey	26	5
84	101604110	Pranshu Kumar Sharma	19.5	4
85	101604111	Pranvi	19.5	4
86	101604112	Pratham Arora	23.5	4
87	101604113	Pratik Sidhu	21.5	4
88	101604114	Raghav Garg	22	4
89	101604115	Raghav Goyal	27	5
90	101604117	Ranjana	22.5	4
91	101604118	Rashampreet Singh	24.5	5
92	101604119	Rishav Jindal	24	5
93	101604121	Rohan Kansal	25.5	5
94	101604123	Rukman Kaur Brar	24.5	5
95	101604125	Sahil	24	5

S. No	Roll No.	Name of Student	Marks (30)	Score (1-5)
96	101604127	Sahil Chigal	23.5	4
97	101604128	Sahil Goel	24.5	5
98	101604129	Sahil Goyal	24	5
99	101604130	Sahil Vasisht	24.5	5
100	101604131	Sajan Rana	24	5
101	101604133	Sakshi Kaushal	25.5	5
102	101604134	Sakshi Sharma	26	5
103	101604136	Saransh Sagar	24	5
104	101604137	Seeratdeep Kaur	27	5
105	101604138	Sehajdeep Singh	27	5
106	101604140	Shaunak Chattopadhyay	26	5
107	101604142	Shaurya Sharma	22	4
108	101604143	Shekhar Pal	24.5	5
109	101604144	Shivam Monga	22	4
110	101604145	Shivanshu Sharma	22.25	4
111	101604146	Shivi Deveshwar	22.5	4
112	101604147	Shreyansh Sharma	24	5
113	101604148	Shubham Agrawal	26.5	5
114	101604149	Shubham Singla	26.5	5
115	101604150	Sidharth	27	5
116	101604151	Simranjeet Singh	23.5	4
117	101604152	Simranpreet Singh	23.5	4
118	101604153	Soham Banerjee	24.5	5
119	101604154	Sukhpal Singh Mann	24.5	5
120	101604155	Sultan Singh	24	5
121	101604157	Surbhi Manral	25	5
122	101604158	Sushant Goyal	21.5	4
123	101604159	Sushant Joshi	22.5	4
124	101604160	Takshak Kohli	21.5	4
125	101604162	Tushar Jain	26	5
126	101604163	Utkarsh Srivastava	26.5	5
127	101604164	Vanshika Aggarwal	19.5	4
128	101604165	Vidhi Mehta	25	5
129	101604166	Vikramjit Singh	22	4
130	101604167	Vikramjit Singh	26	5
131	101604168	Vishal Choudhary	23.75	4
132	101604169	Yash Kumar	24	5
133	101604170	Yati Arora	25	5
134	101604171	Yukta Sharma	25	5
135	101654001	Abhinav Singh	24	5
136	101654002	Abhishek Juneja	24.5	5
137	101654003	Abhishek Khadwal	24.5	5

S. No	Roll No.	Name of Student	Marks (30)	Score (1-5)
138	101654004	Achint Kaur Batra	26	5
139	101654005	Barjinder Singh	26	5
140	101654006	Charu Guggadh	20	4
141	101654008	Gurveen Bajwa	23.75	4
142	101654009	Jasmine Kaur	23.25	5
143	101654010	Joshika Rani	24	4
144	101654011	Jyotsna Rajan	23.5	4
145	101654012	Kartik Jain	23	4
146	101654013	Kinshuk Saldi	23	4
147	101654014	Manish Kumar Singh	23	4
148	101654015	Mohd Anas	18.5	4
149	101654016	Navreesh Kaur	23	4
150	101654017	Oankar Singh Dev	21	4
151	101654019	Praveen Verma	22	5
152	101654020	Saurabh Gupta	24.5	5
153	101654021	Sehaj Arora	27	4
154	101654022	Shubham Gandhi	23.5	5
155	101654023	Shubhanjali Singh	25	5
156	101654026	Vibhuti	25	5
157	101654027	Yuvraj Singh Chauhan	24.5	5
158	101784018	Kartik Goyal	24	4
159	101784019	Mohit Singla	23.25	5
160	101784020	Aashima Bansal	25	5

The performance of students through the course UTA010 for criteria PO-06(B) is summarized in Table PO-06(B).2.

**Table PO-06(B).2: Average score of student performance in the course UTA010 for criteria PO-06(B)**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UTA010	61.88	38.12	0.00	0.00	0.00	4.62

### **UEE793: Capstone Project**

The performance of course *UEE793: Capstone Project* is used to measure the attainment of outcome PO-06(B) considering the following expected outcomes assessed in Capstone Project during July-Dec 2016 session.

- a) Final design of process/ equipment/ systems optimized through engineering, social, environmental, ethical, economic, financial, institutional and commercial considerations.**
- b) Application of engineering principles and software/ mathematical tools using engineering knowledge and concepts/ codes/ standards.**

The evaluation of the above mentioned factors (a) and (b) is obtained by the assessment of Final design of process/equipment/system marks (10 marks).

The performance of the students in the above measure is summarized in Table PO-06(B).3 using rubrics defined in Table PO-06.1(b).

**Table PO-06(B).3: Students' performance in question targeting PO-06(B): Course UEE793**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101304001	Aarushi Bajaj	7	4
2	101304002	Abhey Arora	5	3
3	101304003	Abhishek Taksali	5	3
4	101304004	Adhikaansh Tayal	7	4
5	101304005	Aditi Narang	7	4
6	101304006	Aditya	7.5	4
7	101304007	Akshat	5	3
8	101304008	Akshay Kapoor	7.5	4
9	101304009	Akshay Kumar	7	4
10	101304010	Akshay Kumar Chaudhary	5.5	3
11	101304011	Akshay Sharma	7	4
12	101304012	Amandeep Kaur	6.5	4
13	101304013	Amandeep Singh	7	4
14	101304014	Amaninder Singh Randhawa	5	3
15	101304015	Angad Kapoor	7	4
16	101304016	Ankita Garg	6	4
17	101304018	Anmol Jawa	6	4
18	101304019	Anmolpreet Singh	5.5	3
19	101304020	Anyuti Tiwary	6.5	4
20	101304021	Arpit Sharma	7	4
21	101304022	Arsh Kundal	5.5	3
22	101304023	Arshbir Kaur	6.25	4
23	101304024	Arshdeep Singh	5.5	3

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
24	101304025	Ashish	6	4
25	101304026	Ashish Rajpal	5.5	3
26	101304028	Berry	4.5	3
27	101304029	Bhanu	7.5	4
28	101304030	Bhanu	6	4
29	101304031	Chirag Gaba	5.5	3
30	101304032	Dipin	4.5	3
31	101304033	Dishant	5	3
32	101304034	Divyesh Pratap	6.5	4
33	101304035	Elham	5.5	3
34	101304036	Gurseerat	5	3
35	101304037	Gursewak Singh	5.5	3
36	101304040	Harvensh	5.5	3
37	101304041	Hartejdeep Singh	4.5	3
38	101304042	Himanshu Goyal	7	4
39	101304044	Jasjit Singh	7	4
40	101304045	Jassimran Singh	6.5	4
41	101304046	Jessica	7	4
42	101304047	Kanwarpal Singh	6.25	4
43	101304048	Karan Kumar	6.25	4
44	101304049	Karamjot Singh	7	4
45	101304050	Kashish Agarwal	6	4
46	101304051	Kritika	6	4
47	101304052	Love Gaba	7	4
48	101304054	Manik Mittal	6.5	4
49	101304055	Maninderjit Singh	6	4
50	101304056	Mayank Singla	7.5	4
51	101304057	Mridul	5	3
52	101304058	Naman Garg	7	4
53	101304059	Navdeep Singh	6	4
54	101304060	Navdeep Singh	5.5	3
55	101304061	Nazuk Agarwal	7	4
56	101304062	Nishant Garg	5.5	3
57	101304063	Nishtha Raheja	7	4
58	101304064	Paras Bawa	6.5	4
59	101304065	Parth Ahuja	7	4
60	101304066	Parushi	6.5	4
61	101304067	Pency Goyal	6	4
62	101304068	Piyush Jindal	5.75	3
63	101304069	Piyush Tripathi	7	4
64	101304070	Prachi Garg	6.25	4
65	101304071	Prashant Kataria	6	4

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
66	101304072	Preeti Garg	7	4
67	101304073	Priyank Arora	7	4
68	101304074	Priyanka	7	4
69	101304075	Priyanka Singh	6.5	4
70	101304076	Priyansh Mahajan	5.5	3
71	101304077	Rahul Meena	6	4
72	101304078	Rajan	6.5	4
73	101304079	Rajat Sharma	7	4
74	101304080	Ratul Goyal	6.5	4
75	101304081	Ravinder Singh	6.75	4
76	101304082	Rishabh Juneja	6.5	4
77	101304083	Robin Manktala	7	4
78	101304084	Rohan Ghai	7	4
79	101304085	Rohan Singla	5.5	3
80	101304086	Rohan Wadhawan	6	4
81	101304087	Rohit Goyal	5.5	3
82	101304088	Rubina Bamba	6	4
83	101304089	Sagar Pulani	6	4
84	101304090	Sahil Kataria	7	4
85	101304091	Sakshi	7	4
86	101304092	Sandal Singh Sidhu	6	4
87	101304093	Sandeep Kaur	6.75	4
88	101304094	Satripleen Kaur	7.33	4
89	101304095	Saurabh Mohan	8	5
90	101304096	Shagundeepr Singh	7	4
91	101304097	Shailly Gupta	6.5	4
92	101304098	Shaina	6.5	4
93	101304099	Shivika Gupta	5.5	3
94	101304100	Shresth Rai	6	4
95	101304101	Shubham Goyal	7	4
96	101304102	Shubham Gupta	7	4
97	101304103	Shubham Sharma	5.5	3
98	101304104	Shubham Sharma	7	4
99	101304105	Shubham Soin	6	4
100	101304106	Siddharth Goyal	6	4
101	101304107	Sidharth Garg	6	4
102	101304108	Simran Kaur	7	4
103	101304109	Simranjit Singh	6	4
104	101304111	Sumit Dhingra	5.5	3
105	101304112	Sumit Kaushik	6	4
106	101304113	Tushar Dheer	6	4
107	101304114	Tushar Sharma	6	4

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
108	101304116	Utsav Chhabra	6	4
109	101304117	Vaibhav Gupta	7	4
110	101304118	Vaishali	5.5	3
111	101304119	Varun Bansal	6	4
112	101304120	Veni Jindal	7	4
113	101304121	Vishal Arora	6.5	4
114	101304122	Yugesh Goyal	5.75	3
115	101484001	Amandeep Singh	6.75	4
116	101484002	Amrinder Singh	6.75	4
117	101484003	Ashmeen Singh	6.25	4
118	101484004	Azad Singh	5.5	3
119	101484005	Chardan Garg	6	4
120	101484007	Deepak	7	4
121	101484008	Diljeet Singh	7	4
122	101484009	Jyoti Kaushal	7.5	4
123	101484011	Pawan Kumar	8	5
124	101484012	Rajat Singla	7	4
125	101484013	Satveer Kaur	7.5	4
126	101484014	Saurabh Kumar Wadhawan	7.5	4
127	101484015	Shweta Sharma	6	4
128	101484016	Sukhjeet Singh	7	4

The performance of students through the course UEE793 for criteria PO-06(B) is summarized in Table PO-06(B).4.

**Table PO-06(B).4: Average score of student performance in the course UEE793 for criteria PO-06(B)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE793	1.56	74.22	24.22	0.00	0.00	3.77

The data from Table PO-06(B).2 and Table PO-06(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria PO-06(B), and is summarised in Table PO-06(B).5.

**Table PO-06(B).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-06(B)**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UTA010	61.88	38.12	0.00	0.00	0.00	4.62
UEE793	1.56	74.22	24.22	0.00	0.00	3.77
Weighted Average Score	31.72	56.17	12.11	0.00	0.00	4.20

**b) Indirect Measures:**

The indirect measurement of performance criteria PO-06(B) has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-06(B).6 and Table PO-06(A).7.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-06(B)’.

UTA010	Design and construct and test an electronic hardware solution to process sensor data
UEE793	To design an electrical engineering project implementing an integrated design approach applying knowledge accrued in various professional courses

**Table PO-06(B).6: Weighted average score of performance criterion PO-06(B) based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UTA010	27.74	35.48	30.32	3.23	3.23	<b>3.81</b>
UEE793	35.16	32.03	28.12	3.12	1.56	<b>3.96</b>
<b>Weighted average score</b>	<b>31.45</b>	<b>33.76</b>	<b>29.22</b>	<b>3.18</b>	<b>2.40</b>	<b>3.89</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey

(Other surveys) are used to assess the attainment of program outcome ‘PO-06’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An understanding of professional and ethical responsibility
Alumni Survey	
Employer Survey	Do our students have an understanding of professional and ethical responsibility?

**c) Overall weighted average score of performance criterion PO-06(B)**

The overall weighted average score of performance criterion ‘PO-06(B)’ is summarised in Table PO-06(B).7 from the data given in Tables PO-06(B).5, PO-06(B).6 and PO-06(A).7.

**Table PO-06(B).7: Overall weighted average score of performance criterion PO-06(B)**

<b>Assessment Tool</b>	<b>% of students in each score</b>					<b>Average Score</b>	<b>Assessment Tool Weight</b>
	5	4	3	2	1		
<b>Student class performance</b>	<b>31.72</b>	<b>56.17</b>	<b>12.11</b>	<b>0.00</b>	<b>0.00</b>	<b>4.20</b>	5
<b>Course surveys</b>	<b>31.45</b>	<b>33.76</b>	<b>29.22</b>	<b>3.18</b>	<b>2.40</b>	<b>3.89</b>	4
<b>Other surveys</b>	<b>48.94</b>	<b>36.95</b>	<b>12.02</b>	<b>1.61</b>	<b>0.48</b>	<b>4.32</b>	3
<b>Overall weighted score</b>	<b>35.94</b>	<b>43.90</b>	<b>17.79</b>	<b>1.46</b>	<b>0.92</b>	<b>4.13</b>	-

## Overall assessment of program outcome PO-06 using scores of PO-06(A) and PO-06(B)

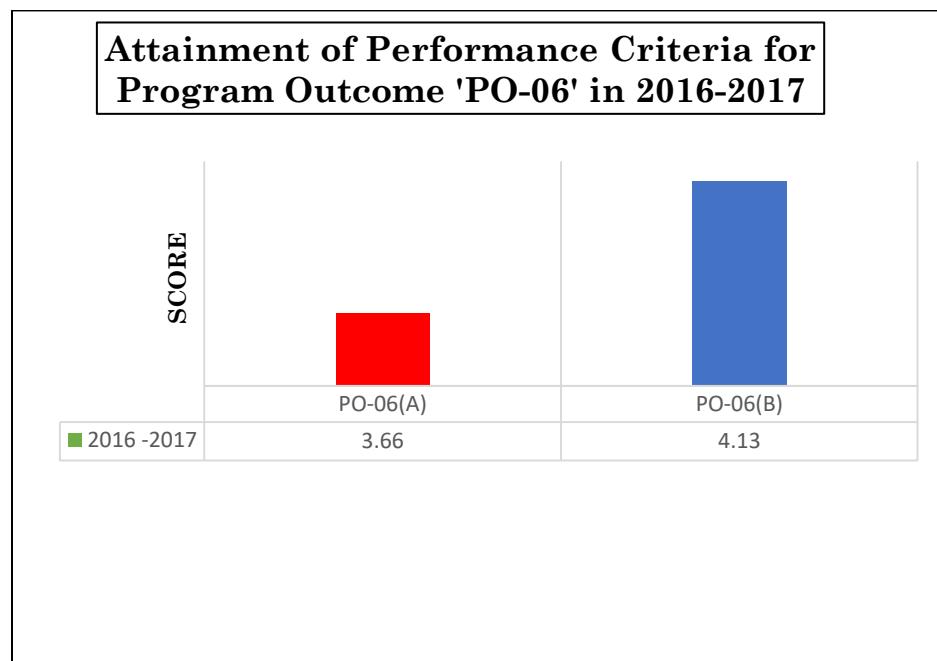
In the previous sections, each of the individual performance criteria PO-06(A) and PO-06(B) has been assessed. The performance for attainment of outcome PO-06 has been completed using the attainment values for PO-06(A) and PO-06(B) are given below:

Table PO-06.2 summarizes the scores of each of the two performance criteria and these scores have been used to assess an overall score for outcome PO-06.

**Table PO-06.2: Overall score for outcome ‘PO-06’ at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-06(A)	28.30	37.84	16.73	5.88	11.26	3.66	5
PO-06(B)	35.94	43.90	17.79	1.46	0.92	4.13	5
<b>Overall score</b>	<b>32.12</b>	<b>40.87</b>	<b>17.26</b>	<b>3.67</b>	<b>6.09</b>	<b>3.90</b>	-

The performance criteria wise assessment score distribution of outcome ‘PO-06’ is shown in Fig. PO-06.1.



**Fig. PO-06.2: Performance criteria-wise assessment score distribution of outcome ‘PO-06’**

The data presented above pertains to the courses offered during the academic year 2016-17. Similar data is available for the previous two academic years (2014-15 and 2015-16). The final results of all the outcomes are summarized and presented below in the section ‘Track Records’.

## **Track Record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessment scores distribution and overall weighted score for outcome ‘PO-06’ for last three years, i.e. 2014-2015, 2015-2016, and 2016-2017 are presented in this section.

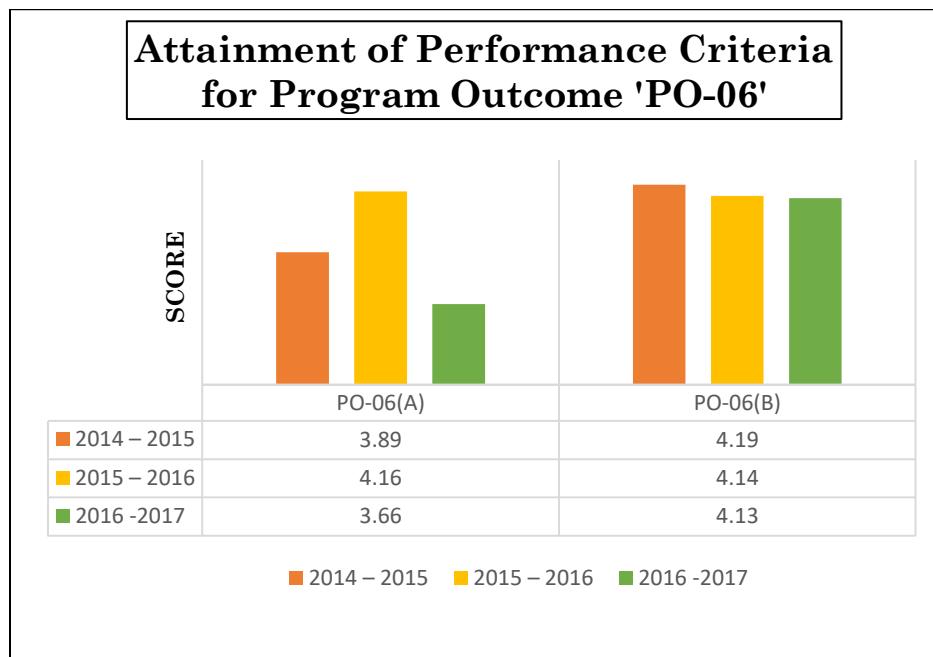
### ***Attainment of Outcomes***

Table PO-06.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-06’ for all the academic years under consideration.

**Table PO-06.3: Performance criteria-wise assessment score distribution for each outcome ‘PO-06’.**

Program outcome and performance criteria	Academic year			Weight
	2014 – 2015	2015 – 2016	2016 -2017	
‘PO-06’	PO-06(A)	3.89	4.16	3.66
	PO-06(B)	4.19	4.14	4.13
Overall weighted score of outcome ‘PO-06’	4.04	4.15	3.90	-

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-06’ over a period of last three years.



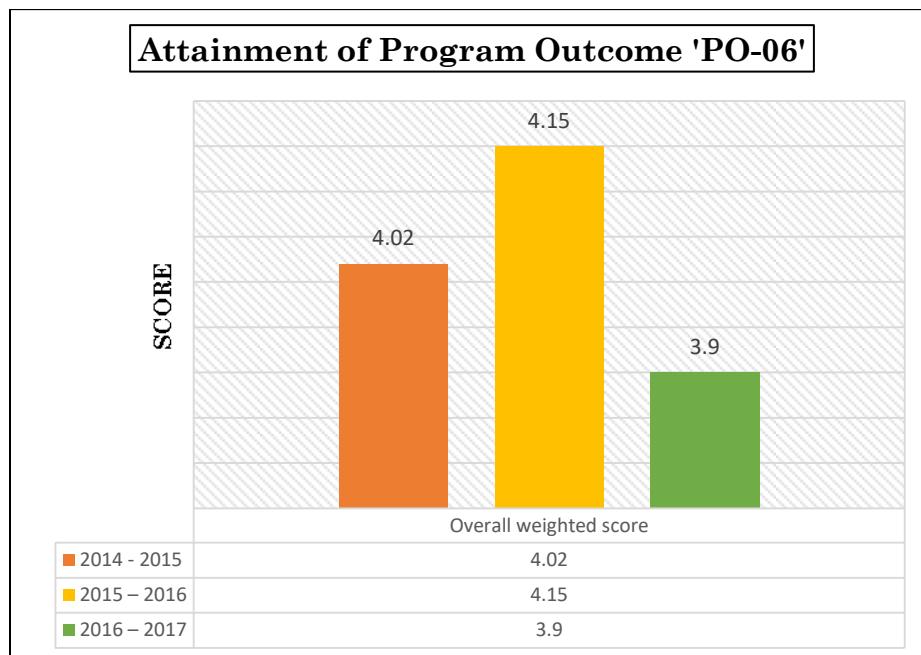
**Fig. PO-06.3: Performance criteria-wise assessment score distribution of outcome ‘PO-06’**

Table PO-06.4 presents the overall weighted score of outcome ‘PO-06’ over the last three academic years along with their level of attainment.

**Table PO-06.4: Overall weighted score of the outcome ‘PO-06’ over a period of last three academic years.**

Academic year	Overall Weighted Score	Level of Attainment
2014 - 2015	<b>4.04</b>	Very Good
2015 – 2016	<b>4.15</b>	Very Good
2016 – 2017	<b>3.90</b>	Good

Fig. PO-06.4 shows the overall weighted score of outcome ‘PO-06’ over a period of last three academic years.



**Fig. PO-06.4: Overall weighted score of outcome ‘PO-06’ over a period of last three academic years.**

The following actions have been taken based on the analysis of outcome ‘PO-06’.

<b>Weighted score of outcome ‘PO-06’</b>	<b>Recommendations</b>	<b>Reason</b>	<b>Implemented from</b>
4.03	To provide assignments/case studies to the students in small groups on UEE522: Energy Auditing and Management	This will help the students to have a better outlook to tackle real world problems with greater efficiency.	June, 2017
	To generate more awareness of IEEE and IEC Standards among the students	This will help the students to improve proficiency in preparing reports following international standards.	
	To encourage the undergraduate students to read latest research articles from journals of repute	This will facilitate the students to enrich the literature section and finally give their projects a better shape	

# **Assessment of Attainment of Program Outcome**

## **PO-07**

*An ability to communicate effectively*

**(2016-17)**

*for the  
Bachelor of Engineering  
in  
Electrical Engineering*



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

**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering and Technology, Patiala**  
**(Punjab) -INDIA**

## **Attainment of Program Outcome ‘PO-07’**

The attainment of program outcome **PO-07:** *An ability to communicate effectively* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-07’ has been classified into following performance criteria;

**PO-07 (A):** *Prepare and present variety of documents such as project or laboratory reports and inspection reports with discipline specific standards*

**PO-07 (B):** *Able to communicate effectively with peers in well-organised and logical manner using adequate technical knowledge to solve engineering problems*

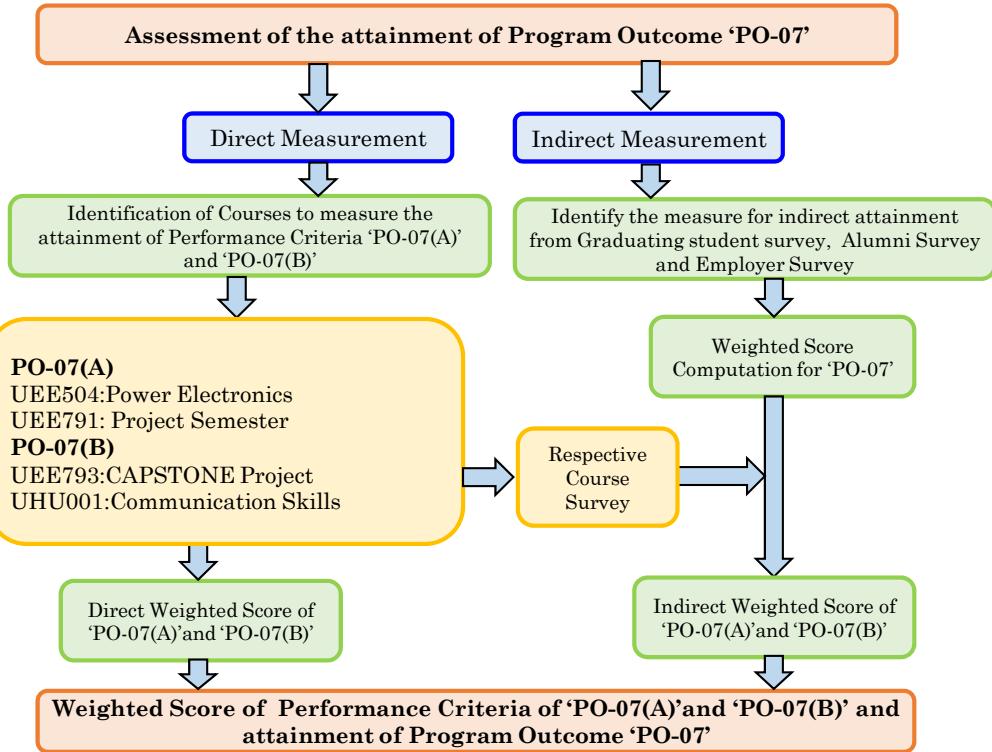
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-07’:

- UTA010: Engineering Design II
- **UEE504: Power Electronics**
- **UEE591: Summer Training**
- UEE601: FACTS
- UEE691: Design Project
- UEE791: Project Semester
- **UEE793: Capstone Project**
- UEE801: Electric Drives
- UEE802: Intelligent Algorithms in Power Systems
- UEE804: Operation and Control of Power Systems
- UHU031: Organizational Behavior
- UHU032: Human Values, Ethics and IPR
- **UHU001: Communication Skills**

Outcome PO-07 has been assessed by two performance criteria *PO-07(A)* and *PO-07(B)*. The following courses have been considered by the program assessment committee for the assessment of performance criteria *PO-07(A)* and *PO-07(B)* for the academic year 2016-17.

Performance Criteria	Course-1	Course-2
PO-07 (A)	UEE504: Power Electronics	UEE791: Project Semester
PO-07 (B)	UEE793: CAPSTONE Project	UHU001: Communication Skills

The step by step methodology used to measure the attainment of program outcome ‘PO-07’ through performance criteria ‘*PO-07(A)*’ and ‘*PO-07(B)*’ is shown in Fig. PO-07.1.



**Fig. PO-07.1:** Process for measurement of attainment of outcome 'PO-07' for the year 2016-17

The Rubric used to convert marks obtained by students to a Likert scale in the range of 1 to 5 is described in Table PO-07.1.

**Table PO-07.1: Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$80 \leq \text{Marks} \leq 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the subjects mentioned.

## **Assessment of Outcome PO-07 using performance criterion PO-07 (A)**

### ***PO-07 (A): Prepare and present variety of documents such as project or laboratory reports and inspection reports with discipline specific standards***

The performance criteria ‘PO-07 (A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE 504: Power Electronics* and *UEE791: Project Semester* are used to assess performance criteria PO-07(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE504: Power Electronics**

The performance criteria is used to measure the attainment of outcome ‘PO-07 (A)’ by considering evaluation of aforementioned subject in Jan-June 2017. The internal marks from the faculty mentor, lab report marks and viva voce marks are the major components in the evaluation process. Lab reports marks are considered here for evaluation of performance criteria ‘PO-07 (A)’ where performances with respect to Quality of the report writing: layout, structure, written and graphical material, referencing and Work content: quality work, student effort are considered.

The performance of the students in the above question is then summarized as given below in Table PO-07 (A).1 using rubrics defined in the Table PO-07.1.

**Table PO-07 (A).1: Students’ performance in Lab Reports targeting ‘PO-07’; Course UEE504**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101404001	Abhay Mahipal	4.5	5
2	101404002	Abhijeet Singh Sankhla	4	5
3	101404004	Abhinav Arora	4	5
4	101404006	Abhishek Sharma	4	5
5	101404007	Ajay Singh	3	4
6	101404009	Alka Thakur	4	5
7	101404012	Ankush Goyal	5	5
8	101404013	Anmol Arjun Bharaj	3	4
9	101404014	Anmol Goyat	3	4
10	101404015	Anmol Rattan Kaur	5	5
11	101404017	Anubhav Kumar	3	4
12	101404018	Apeksha Goel	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
13	101404019	Arnish Jain	3.5	4
14	101404020	Arshiya	4	5
15	101404021	Arshjot Kaur	4.5	5
16	101404023	Ayush Jain	2.5	3
17	101404024	Bhawani Singh	2.5	3
18	101404025	Chirag Jain	2	3
19	101404026	Davileen Garg	5	5
20	101404027	Dilpreet Kaur	4.5	5
21	101404028	Divesh Kamdar	4	5
22	101404029	Divyam Aggarwal	3.5	4
23	101404031	Divyanshu Sidhartha	3	4
24	101404032	Garima	2.5	3
25	101404033	Garv Chahar	2	3
26	101404035	Gaurav Rathore	1	2
27	101404036	Gurpreet Singh	2.5	3
28	101404037	Gursagar Singh	5	5
29	101404038	Gurupinder Pal Singh	3.5	4
30	101404039	Harmanpreet Singh	3	4
31	101404041	Harshit Kaushik	3.5	4
32	101404042	Harshvir Singh	4.5	5
33	101404043	Harsimarjot Kaur	4	5
34	101404044	Harsimran Singh	5	5
35	101404045	Hartej Singh Bains	0	1
36	101404046	Heema Gupta	3	4
37	101404047	Hitesh Kumar	2	3
38	101404048	Ishita Mahindru	2.5	3
39	101404049	Jagmeet Singh Bawa	2	3
40	101404050	Jagnoor Kaur	4	5
41	101404051	Jashanpreet Singh	3.5	4
42	101404052	Jatin Bansal	2.5	3
43	101404053	Jatin Raheja	3	4
44	101404054	Kanishak Sharma	3	4
45	101404055	Karan Sanjeev Bajaj	4	5
46	101404056	Kirtish Madaan	4	5
47	101404057	Mahitosh Sharma	5	5
48	101404058	Manan Mittal	3.5	4
49	101404059	Mandeep Singh Panesar	4.5	5
50	101404060	Manisha Gupta	2.5	3
51	101404061	Manit Gupta	2	3
52	101404121	Siddharth Singh	2	3
53	101404129	Tarun Kumar	4	5
54	101404130	Tushar Goel	5	5
55	101404132	Utkarsh atri	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
56	101404133	Vandana Gora	5	5
57	101404135	Vasu Mittal	5	5
58	101404136	Yashika Chopra	5	5
59	101404137	Yatin Gudwani	4	5
60	101404138	Yogesh Garg	5	5
61	101454001	Yatendra Agrawal	5	5
62	101454002	Yash Motwani	2	3
63	101584001	Amanjit Singh	5	5
64	101584002	Chetan Garg	5	5
65	101584004	Gurpreet Singh	5	5
66	101584005	Gurpreet Singh	5	5
67	101584006	Harman Preet Singh	4	5
68	101584008	Lakshay Garg	5	5
69	101584010	Rohit Gupta	5	5
70	101584012	Sharandeep Singh	3	4
71	101205060	Robin rana	3.5	4
72	101204013	Anshul	4	5
73	101404067	Mohit Goel	4.5	5
74	101404068	Mridul Marwaha	4.5	5
75	101404076	Nitin Arora	4.5	5
76	101404089	Pulkit Bansal	4.5	5
77	101404093	Rahul Goel	3.5	4
78	101404094	Rajshree Vaidya	4	5
79	101404099	Sagar Bansal	4.5	5
80	101404100	Sahaj Deep Paor	4.5	5
81	101404102	Sahil Singla	4.5	5
82	101404112	Shivam Dochania	3	4
83	101404128	Tarun Gupta	4	5
84	101454005	Tejas Kapla	4	5

The overall performance of students for the above criterion is summarized in Table PO-07 (A).2:

**Table PO-07 (A).2: Average score of student performance in the course UEE504 for criteria PO-07 (A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE504	58.33	22.62	16.67	1.19	1.19	4.36

### **UEE791: Project Semester**

The performance criteria is used to measure the attainment of outcome ‘PO-07(A)’ through the evaluation of the project report. This criteria is given weightage of 20 marks and is awarded by mentor to the students towards report.

The performance of the students in the above question is then summarized as given below in Table PO-07 (A).3 using rubrics defined in Table PO-07.1.

**Table PO-07 (A).3: Students' performance in question targeting ‘PO-07 (A)’; Course UEE791**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101304001	Aarushi Bajaj	13	4
2	101304002	Abhey Arora	10	3
3	101304003	Abhishek Taksali	13	4
4	101304004	Adhikaansh Tayal	10	3
5	101304005	Aditi Narang	17	5
6	101304006	Aditya	12	4
7	101304007	Akshat	12	4
8	101304008	Akshay Kapoor	15	4
9	101304009	Akshay Kumar	10	3
10	101304011	Akshay Sharma	14	4
11	101304012	Amandeep Kaur	13	4
12	101304013	Amandeep Singh	12	4
13	101304014	Amaninder Singh Randhawa	10	3
14	101304015	Angad Kapoor	11	3
15	101304016	Ankita Garg	16	5
16	101304018	Anmol Jawa	11	3
17	101304019	Anmolpreet Singh	15	4
18	101304020	Anyuti Tiwary	15	4
19	101304021	Arpit Sharma	14	4
20	101304023	Arshbir Kaur	13	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
21	101304024	Arshdeep Singh Bagga	10	3
22	101304025	Ashish	10	3
23	101304026	Ashish Rajpal	12	4
24	101304028	Berry Lubana	11	3
25	101304029	Bhanu Duggal	14	4
26	101304030	Bhanu Marwaha	15	4
27	101304031	Chirag Gaba	11	3
28	101304032	Dipin Garg	14	4
29	101304033	Dishant Vanvari	13	4
30	101304034	Divyesh Pratap Singh	15	4
31	101304035	Elham Anwar	13	4
32	101304036	Gurseerat Singh Meen	13	4
33	101304037	Gursewak Singh	11	3
34	101304040	Hariansh Sehgal	9	3
35	101304041	Hartejdeep Singh	10	3
36	101304042	Himanshu Goyal	11	3
37	101304044	Jasjit Singh	12	4
38	101304045	Jassimran Singh Julka	14	4
39	101304046	Jessica Dhaliwal	12	4
40	101304047	Kanwarpal Singh	10	3
41	101304048	Karan Kumar	14	4
42	101304049	Karanjot Singh Kochar	14	4
43	101304050	Kashish Aggarwal	17	5
44	101304051	Kritika Singla	14	4
45	101304052	Love Gaba	12	4
46	101304054	Manik Mittal	11	3
47	101304055	Maninderjit Singh	10	3
48	101304056	Mayank Singla	10	3
49	101304057	Mridul Bhutani	13	4
50	101304058	Naman Garg	15	4
51	101304059	Navdeep Singh	12	4
52	101304060	Navdeep Singh	12	4
53	101304061	Nazuk Aggarwal	13	4
54	101304062	Nishant Garg	12	4
55	101304063	Nishtha Raheja	14	4
56	101304064	Paras Bawa	15	4
57	101304065	Parth Ahuja	13	4
58	101304066	Parushi	10	3
59	101304067	Pency Goyal	11	3
60	101304068	Piyush Jindal	12	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
61	101304069	Piyush Tripathi	11	3
62	101304070	Prachi Garg	12	4
63	101304071	Prashant Kataria	8	3
64	101304072	Preeti Garg	15	4
65	101304073	Priyank Arora	14	4
66	101304074	Priyanka	12	4
67	101304075	Priyanka Singh	15	4
68	101304076	Priyansh Mahajan	12	4
69	101304077	Rahul Meena	10	3
70	101304079	Rajat Sharma	14	4
71	101304080	Ratul Goyal	12	4
72	101304081	Ravinder Singh	10	3
73	101304082	Rishabh Juneja	11	3
74	101304083	Robin Manktala	16	5
75	101304084	Rohan Ghai	13	4
76	101304085	Rohan Singla	8	3
77	101304086	Rohan Wadhawan	14	4
78	101304087	Rohit Goyal	11	3
79	101304088	Rubina Bamba	15	4
80	101304089	Sagar Pulani	13	4
81	101304090	Sahil Kataria	14	4
82	101304091	Sakshi	15	4
83	101304092	Sandal Singh Sidhu	13	4
84	101304093	Sandeep Kaur	8	3
85	101304094	Satripleen Kaur	13	4
86	101304095	Saurabh Mohan	12	4
87	101304097	Shailly Gupta	14	4
88	101304098	Shaina	11	3
89	101304099	Shivika Gupta	10	3
90	101304100	Shresth Rai	12	4
91	101304101	Shubham Goyal	17	5
92	101304102	Shubham Gupta	14	4
93	101304103	Shubham Sharma	13	4
94	101304104	Shubham Sharma	15	4
95	101304105	Shubham Soin	11	3
96	101304106	Siddharth Goyal	10	3
97	101304107	Sidharth Garg	15	4
98	101304108	Simran Kaur	14	4
99	101304109	Simranjit Singh	11	3
100	101304111	Sumit Dhingra	12	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
101	101304112	Sumit Kaushik	13	4
102	101304113	Tushar Dheer	10	3
103	101304114	Tushar Sharma	8	3
104	101304116	Utsav Chhabra	10	3
105	101304117	Vaibhav Gupta	10	3
106	101304118	Vaishali	13	4
107	101304119	Varun Bansal	12	4
108	101304120	Veni Jindal	15	4
109	101304121	Vishal Arora	12	4
110	101304122	Yugesh Goyal	11	3
111	101484001	Amandeep Singh	14	4
112	101484002	Amrinder Singh	14	4
113	101484004	Azad Singh	12	4
114	101484005	Chandan Garg	11	3
115	101484007	Deepak Singla	13	4
116	101484008	Diljeet Singh	12	4
117	101484009	Jyoti Kaushal	12	4
118	101484011	Pawan Kumar	14	4
119	101484012	Rajat Singla	12	4
120	101484013	Satveer Kaur	15	4
121	101484014	Saurabh Kumar Wadhawan	11	3
122	101484015	Shweta Sharma	14	4
123	101484016	Sukhjeet Singh	12	4

The overall performance of students for the above criterion is summarized in Table PO-07 (A).4

**Table PO-07 (A).4: Average score of student performance in the course UEE791 for criteria: ‘PO-07 (A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	4.07	63.41	32.52	0.00	0.00	3.72

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-07 (A) is given in Table PO-07 (A).5.

**Table PO-07 (A).5: Weighted Average Student class performance (course portfolio) for criteria PO-07 (A)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE504</b>	58.33	22.62	16.67	1.19	1.19	4.36
<b>UEE791</b>	4.07	63.41	32.52	0.00	0.00	3.72
<b>Students class performance score</b>	31.20	43.02	24.60	0.60	0.60	4.04

**b) Indirect measures**

The indirect measurement of performance criteria ‘PO-07 (A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-07 (A).6 and Table PO-07 (A).7.

**(i) Assessment Tools:**

Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome „PO-06“ through indirect measurement using following question in the respective surveys.

**Table PO-07 (A).6: Weighted average score of performance criterion ‘PO-07 (A)’ based on student course surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE504</b>	50.94	20.43	13.39	2.95	12.28	<b>3.95</b>
<b>UEE791</b>	34.15	27.64	32.52	1.63	4.07	<b>3.86</b>
<b>Course survey score</b>	42.55	24.04	22.96	2.29	8.18	3.91

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ’PO-07’ through indirect measurement from the respective surveys.

**Table PO-07 (A).6: Weighted average score of performance criterion ‘PO-07 (A)’ based on surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	54.93	39.44	4.23	1.41	0.00	4.48

<b>Employer survey</b>	53.33	46.67	0.00	0.00	0.00	3.95
<b>Alumni survey</b>	39.61	38.16	16.43	4.35	1.45	4.10
<b>Other survey score</b>	49.29	41.42	6.89	1.92	0.48	4.18

**c) Overall weighted average score of performance criterion ‘PO-07 (A)’**

The overall weighted average score of performance criterion ‘PO-07 (A)’ is evaluated as given below in Table PO-07 (A).7:

**Table PO-07 (A).7: Overall weighted average score of performance criterion ‘PO-07 (A)’**

<b>Assessment Tool</b>	<b>% of students in each score</b>					<b>Average Score</b>	<b>Assessment Tool Weight</b>
	5	4	3	2	1		
<b>Average student class performance</b>	31.20	43.02	24.60	0.60	0.60	4.04	5
<b>Average score surveys</b>	42.55	24.04	22.96	2.29	8.18	3.91	4
<b>Average score surveys</b>	49.29	41.42	6.89	1.92	0.48	4.18	3
<b>Overall score</b>	<b>41.01</b>	<b>36.16</b>	<b>18.15</b>	<b>1.60</b>	<b>3.09</b>	<b>4.04</b>	

## **Assessment of Outcome ‘PO-07’ using performance criterion ‘PO-07 (B)’**

**PO-07 (B): Able to communicate effectively with peers in well-organised and logical manner using adequate technical knowledge to solve engineering problems**

### **a.) Assessment Tool: Students’ performance using course portfolio**

Two courses namely *UEE793: CAPSTONE Project* and *UHU001: Communication Skills* are used to assess performance criteria ‘PO-07(B)’ as a direct measure. The analysis for each of these courses is provided below:

#### **(i) UEE793: CAPSTONE Project**

The performance criteria is used to measure the attainment of outcome ‘PO-07(B)’ by considering evaluation of the subject *UEE793: CAPSTONE Project*. The marks considered in this case include the component related to peer communication.

The performance of the students towards the communication between their team members is then summarized as given below in Table PO-07 (B).1.1 using rubrics defined in Table PO-07.1.

**Table PO-07 (B).1: Students’ performance in Project work targeting ‘PO-07 (B)’; Course UEE793**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	1.5	2
2	101304002	Abhey Arora	3.25	4
3	101304003	Abhishek Taksali	2.5	3
4	101304004	Adhikaansh Tayal	2.5	3
5	101304005	Aditi Narang	3.75	4
6	101304006	Aditya	1.5	2
7	101304007	Akshat	2.5	3
8	101304008	Akshay Kapoor	3	4
9	101304009	Akshay Kumar	1.5	2
10	101304010	Akshay Kumar Chaudhary	3	4
11	101304011	Akshay Sharma	3.75	4
12	101304012	Amandeep Kaur	2.5	3
13	101304013	Amandeep Singh	1.5	2
14	101304014	Amaninder Singh Randhawa	3	4
15	101304015	Angad Kapoor	2.5	3
16	101304016	Ankita Garg	3.75	4
17	101304018	Anmol Jawa	4	5
18	101304019	Anmolpreet Singh	2.5	3
19	101304020	Anyuti Tiwary	3.25	4
20	101304021	Arpit Sharma	3	4
21	101304022	Arsh Kundal	3	4
22	101304023	Arshbir Kaur	2.5	3

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
23	101304024	Arshdeep Singh	2.5	3
24	101304025	Ashish	3	4
25	101304026	Ashish Rajpal	2	3
26	101304028	Berry	2.5	3
27	101304029	Bhanu	4.5	5
28	101304030	Bhanu	3.5	4
29	101304031	Chirag Gaba	2.5	3
30	101304032	Dipin	2.5	3
31	101304033	Dishant	2.5	3
32	101304034	Divyesh Pratap	3.5	4
33	101304035	Elham	3	4
34	101304036	Gurseerat	3	4
35	101304037	Gursewak Singh	2.75	3
36	101304040	Harvensh	3	4
37	101304041	Hartejdeep Singh	2.5	3
38	101304042	Himanshu Goyal	4	5
39	101304044	Jasjit Singh	3.5	4
40	101304045	Jassimran Singh	3.5	4
41	101304046	Jessica	3.5	4
42	101304047	Kanwarpal singh	3	4
43	101304048	Karan Kumar	3	4
44	101304049	Karamjot Singh	4	5
45	101304050	Kashish Agarwal	4	5
46	101304051	Kritika	3.5	4
47	101304052	Love gaba	3.25	4
48	101304054	Manik Mittal	3	4
49	101304055	Maninderjit Singh	2.25	3
50	101304056	Mayank Singla	3.5	4
51	101304057	Mridul	3	4
52	101304058	Naman Garg	3.5	4
53	101304059	Navdeep Singh	3	4
54	101304060	Navdeep Singh	2.75	3
55	101304061	Nazuk Agarwal	3.75	4
56	101304062	Nishant Garg	3	4
57	101304063	Nishtha Raheja	3	4
58	101304064	Paras Bawa	3	4
59	101304065	Parth Ahuja	3	4
60	101304066	Parushi	3.5	4
61	101304067	Pency Goyal	2	3
62	101304068	Piyush Jindal	2.5	3

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
63	101304069	Piyush Tripathi	3.5	4
64	101304070	Prachi Garg	3	4
65	101304071	Prashant Kataria	3	4
66	101304072	Preeti Garg	4	5
67	101304073	Priyank Arora	3.25	4
68	101304074	Priyanka	3.5	4
69	101304075	Priyanka Singh	3.5	4
70	101304076	Priyansh Mahajan	3	4
71	101304077	Rahul Meena	3	4
72	101304078	Rajan	3.25	4
73	101304079	Rajat Sharma	3	4
74	101304080	Ratul Goyal	2.5	3
75	101304081	Ravinder Singh	2	3
76	101304082	Rishabh Juneja	2.5	3
77	101304083	Robin Manktala	4	5
78	101304084	Rohan Ghai	4	5
79	101304085	Rohan Singla	3	4
80	101304086	Rohan Wadhawan	3	4
81	101304087	Rohit Goyal	3	4
82	101304088	Rubina Bamba	3	4
83	101304089	Sagar Pulani	3.5	4
84	101304090	Sahil Kataria	3.5	4
85	101304091	Sakshi	2.75	3
86	101304092	Sandal Singh Sidhu	3	4
87	101304093	Sandeep Kaur	3.5	4
88	101304094	SatRipleen kaur	4	5
89	101304095	Saurabh Mohan	4	5
90	101304096	Shagundeepraj Singh	3.5	4
91	101304097	Shailey Gupta	3.5	4
92	101304098	Shaina	3.5	4
93	101304099	Shivika Gupta	3.25	4
94	101304100	Shresth Rai	2.75	3
95	101304101	Shubham Goyal	3	4
96	101304102	Shubham Gupta	3.75	4
97	101304103	Shubham Sharma	3	4
98	101304104	Shubham Sharma	4	5
99	101304105	Shubham Soin	3.25	4
100	101304106	Siddharth Goyal	3.5	4
101	101304107	Sidharth Garg	3.5	4
102	101304108	Simran Kaur	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
103	101304109	Simranjit Singh	2.25	3
104	101304111	Sumit Dhingra	3	4
105	101304112	Sumit Kaushik	3.5	4
106	101304113	Tushar Dheer	3.25	4
107	101304114	Tushar Sharma	3.25	4
108	101304116	Utsav Chhabra	3.25	4
109	101304117	Vaibhav Gupta	3.25	4
110	101304118	Vaishali	3	4
111	101304119	Varun Bansal	3.25	4
112	101304120	Veni Jindal	3.5	4
113	101304121	Vishal Arora	3.5	4
114	101304122	Yugesh Goyal	3	4
115	101484001	Amandeep Singh	2	3
116	101484002	Amrinder Singh	2	3
117	101484003	Ashmeen Singh	3.5	4
118	101484004	Azad Singh	3.5	4
119	101484005	Chardan Garg	3.5	4
120	101484007	Deepak	3	4
121	101484008	Diljeet Singh	3.5	4
122	101484009	Jyoti Kaushal	3.25	4
123	101484011	Pawan Kumar	4.25	5
124	101484012	Rajat Singla	3.5	4
125	101484013	Satveer Kaur	3	4
126	101484014	Saurabh Kumar Wadhawan	3.25	4
127	101484015	Shweta Sharma	3.5	4
128	101484016	Sukhjeet Singh	4	5

The overall performance of students for the above criterion is summarized in Table PO-07 (B).2:

**Table PO-07 (B).2: Average score of student performance in the course UEE793 for criteria PO-07(B)**

Assessment Tool	% of students in each score					Average Score
	5	4	3	2	1	
UEE793	10.94	64.84	21.09	3.13	0.00	3.84

**(ii) UHU001: Communication Skills**

The performance criteria is used to measure the attainment of outcome ‘PO-07 (B)’ by considering evaluation of the subject *UHU001: Communication Skills*. Total marks reflect the communication skills between peers.

The performance of the students in the above question is then summarized as given below in Table PO-07 (B).3.

**Table PO-07 (B).3: Students’ performance in question targeting ‘PO-07 (B)’; Course UHU001**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101604024	Anjan Abhishek Singh	3.25	4
2	101604025	Ankita Anand	3	4
3	101604026	Ankur Garg	4	5
4	101604027	Ankur Jangra	4	5
5	101604028	Anmol Tiwari	4	5
6	101604029	Annwesh Das	3.5	4
7	101604030	Ansh Gupta	2	3
8	101604031	Anurakt Rai	3.5	4
9	101604032	Apoorv Sharma	4.25	5
10	101604033	Apoorv Sharma	4	5
11	101604034	Apoorva Garg	3	4
12	101604035	Apoorvee Sharma	3.5	4
13	101604036	Arjun Singh Pathania	4.25	5
14	101604037	Arnav Mukherjee	4	5
15	101604038	Arpit Ahuja	4	5
16	101604039	Ashish Jain	4.25	5
17	101604040	Ashutosh Pareek	0	1
18	101604041	Avijot Kaur	3.5	4
19	101604042	Avnish Gupta	3.45	4
20	101604043	Ayush Dhanda	3.3	4
21	101604044	Ayush Gupta		1
22	101604045	Ayush Singh	2.5	3
23	101604046	Baljeet Singh	2.5	3
24	101604047	Bharat Bansal	2.5	3
25	101604048	Chandra Bhushan Singh	3	4
26	101604049	Chetan Bir Singh	2.75	3
27	101604050	Chetan Modi	3.75	4
28	101604051	Chiranjeev Singh	3.62	4
29	101604052	Dabeet Singh	3.25	4
30	101604053	Deepanshu Sambhariya	3.62	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
31	101604055	Dhruv Sharma	4.25	5
32	101604056	Diksha	4	5
33	101604057	Divya Goyal	3.75	4
34	101604058	Divya Jallendhra	0	1
35	101604059	Gagan Sharma	3.8	4
36	101604060	Gagandeep Jindal	3.45	4
37	101604061	Gurjot Singh Tiwana	3.75	4
38	101604062	Gurkiran Kaur	3	4
39	101604063	Gurupdesh Singh	3.25	4
40	101604094	Navdeep Kaur	3	4
41	101604095	Naveen Mehta	3.5	4
42	101604096	Navjot Kaur	3	4
43	101604097	Navudit S Madaan	3	4
44	101604098	Nikhil Anand	3	4
45	101604099	Nimesh Agarwal	3.25	4
46	101604100	Nishtha Arora	3	4
47	101604101	Paarth Arora	1.5	2
48	101604102	Palam Singla	3.3	4
49	101604103	Parakh Sharma	3.5	4
50	101604104	Piyush Kumar	3.5	4
51	101604105	Piyusha	3.25	4
52	101604106	Prabhat Singh	3.25	4
53	101604107	Pradeep Murarka	3.5	4
54	101604108	Praggya Chakravorty	4	5
55	101604109	Prakhar Pandey	4	5
56	101604110	Pranshu Kumar Sharma	3.5	4
57	101604111	Pranvi	3	4
58	101604112	Pratham Arora	3	4
59	101604113	Pratik Sidhu	4.25	5
60	101604156	Suraj Singh	3	4
61	101604157	Surbhi Manral	3.75	4
62	101604158	Sushant Goyal	3	4
63	101604159	Sushant Joshi	3.75	4
64	101604160	Takshak Kohli	2.75	3
65	101604161	Tarun Goyal	3.75	4
66	101604162	Tushar Jain	3.5	4
67	101604163	Utkarsh Srivastava	4	5
68	101604164	Vanshika Aggarwal	3.5	4
69	101604165	Vidhi Mehta	3.5	4
70	101604166	Vikramjit Singh	3	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
71	101604167	Vikramjit Singh	2.5	3
72	101604168	Vishal Choudhary	3.25	4
73	101604169	Yash Kumar	3	4
74	101604170	Yati Arora	4	5
75	101604171	Yukta Sharma	4.25	5

The overall performance of students for the above criterion is summarized in Table PO-07 (B).4

**Table PO-07 (B).4: Average score of student performance in the course UHU001 for criteria PO-07 (B).**

Assessment Tool	% of students in each score					Average Score
	5	4	3	2	1	
<b>UHU001</b>	22.67	62.67	9.33	1.33	4.00	3.99

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-07 (B) is given in Table PO-07 (B).5.

**Table PO-07 (B).5:Weighted Average Student class performance (course portfolio) for criteria PO-07 (B)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE793</b>	10.94	64.84	21.09	3.13	0.00	3.84
<b>UHU001</b>	22.67	62.67	9.33	1.33	4.00	3.99
<b>Student class performance score</b>	16.81	63.76	15.21	2.23	2.00	3.92

**b) Indirect measures for Performance criteria PO-07 (B). (Surveys)**

**Assessment Tools: Student course surveys**

**Table PO-07(B).4:Average score of student performance in the course UHU001 for criteria PO-07(B)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
<b>UHU001</b>	7.3	73.0	0.0	19.0	0.7	3.67
<b>UHU793</b>	25.78	34.38	36.72	0.78	2.34	3.80
<b>Course survey score</b>	16.54	53.69	18.36	9.89	1.52	<b>3.74</b>

**c) Overall weighted average score of performance criterion ‘PO-07 (B)’**

Finally overall weighted average score of performance criterion ‘PO-07 (B).’ is evaluated as given below in Table PO-07 (B).6.

**Table PO-07 (B).6: Weighted average score of performance criterion ‘PO-07 (B)’ based on surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	54.93	39.44	4.23	1.41	0.00	4.48
<b>Employer survey</b>	53.33	46.67	0.00	0.00	0.00	3.95
<b>Alumni survey</b>	39.61	38.16	16.43	4.35	1.45	4.10
<b>Other survey score</b>	49.29	41.42	6.89	1.92	0.48	4.18

Finally overall weighted average score of performance criterion ‘PO-07 (B).’ is evaluated as given below in Table PO-07 (B).7:

**Table PO-07 (B).7: Overall weighted average score of performance criterion ‘PO-07 (B)’**

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Average student class performance</b>	16.81	63.76	15.21	2.23	2.00	3.92	5
<b>Average score on course surveys</b>	16.54	53.69	18.36	9.89	1.52	3.74	4
<b>Average score surveys</b>	49.29	41.42	6.89	1.92	0.48	4.18	3
<b>Overall Score</b>	<b>27.55</b>	<b>52.96</b>	<b>13.49</b>	<b>4.68</b>	<b>1.33</b>	<b>3.95</b>	

### **Overall assessment of program outcome PO-07 using scores of PO-07 (A) and PO-07 (B)**

In the previous sections, each of the individual performance criteria PO-07 (A) and PO-07 (B) have been assessed. The performance for attainment of outcome PO-07 has been completed using the attainment values for PO-07 (A) and PO-07 (B) and is provided below:

Table PO-07.2 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome PO-07.

**Table PO-07.2: Overall score for outcome PO-07 (A) at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-07 (A)	41.01	36.16	18.15	1.60	3.09	4.04	5
PO-07 (B)	27.55	52.96	13.49	4.68	1.33	3.95	5
<b>Overall score</b>	<b>34.28</b>	<b>44.56</b>	<b>15.82</b>	<b>3.14</b>	<b>2.21</b>	<b>4.00</b>	

The Performance criteria-wise assessment score distribution of outcome 'PO-07' is shown in figure PO-07.2.

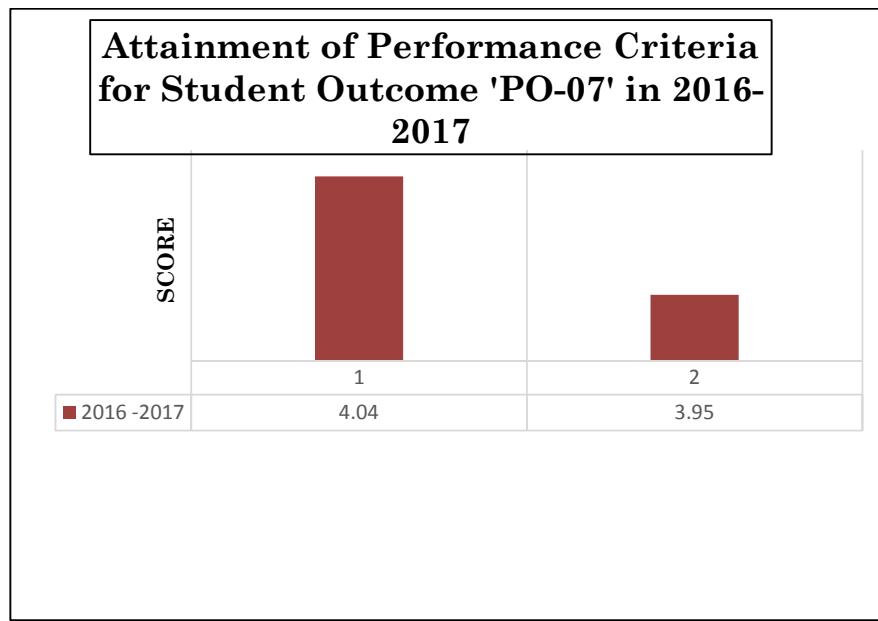


Fig PO-07.2 : Performance criteria-wise assessment score distribution of outcome 'PO-07'

**Track record and assessment of attainment of program outcomes over the last three academic years**

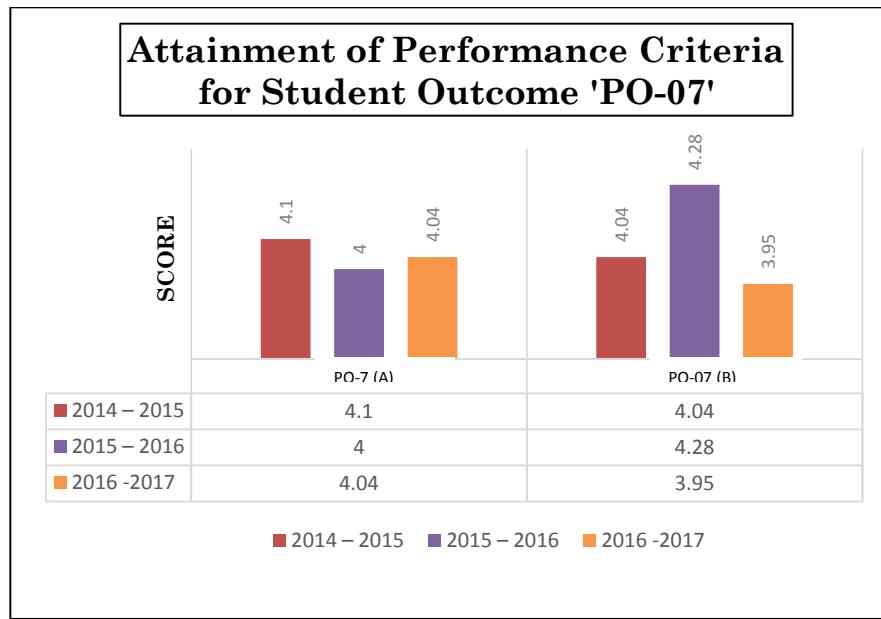
The performance criteria-wise assessments score distribution and overall weighted score for outcome ‘PO-07’ for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section.

The Table PO-07.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-07’.

**Table PO-07.3: Performance criteria-wise assessment score distribution for each outcome ‘PO-07’**

Program outcome and performance criteria	Academic year			Weight
	2014 –2015	2015 – 2016	2016 - 2017	
<b>PO-07</b>	<b>PO-07 (A)</b>	4.10	4.00	4.04
	<b>PO-07 (B)</b>	4.04	4.28	3.95
<b>Overall weighted score of outcome PO-07</b>		4.07	4.14	4.00

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-07’ over a period of last three years and is shown in Figure PO-07.3.



**Figure PO-07.3:** Performance criteria-wise assessment score distribution of outcome ‘PO-07’

### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4.5 on a scale of 1 to 5.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.

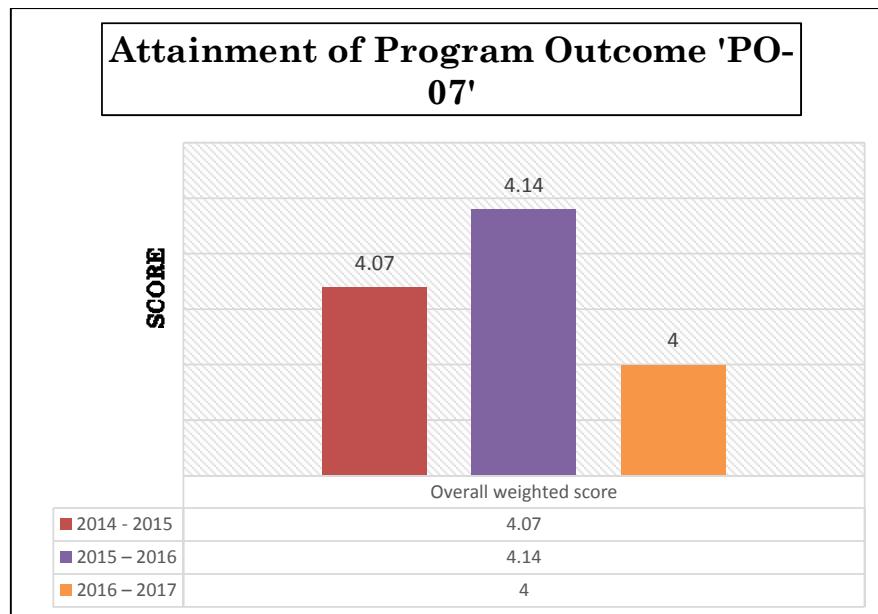
iv. **Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

The Table PO-07.4 presents the overall weighted score of outcome ‘PO-07’ over the last three academic years.

**Table PO-07.4: Overall weighted score of the outcome ‘PO-07’ over a period of last three academic years.**

Academic year	Overall weighted score	Level of attainment
2014 – 2015	4.07	Good
2015 – 2016	4.14	Good
2016 – 2017	4.00	Good

Figure PO-07.4 shows the overall weighted score of outcome ‘PO-07’ over a period of last three academic years.



**Figure PO-07.3: Overall weighted score of outcome ‘PO-07’ over a period of last three academic years.**

# **Assessment of Attainment of Program Outcome**

## **PO-08**

*The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context*  
**(2016-17)**

*for the*  
*Bachelor of Engineering*  
*in*  
***Electrical Engineering***



**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering and Technology, Patiala**  
**(Punjab) -INDIA**



## **Attainment of Program Outcome ‘PO-08’**

The attainment of program outcome **PO-08**: *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-08’ has been classified into following performance criteria:

**PO-08 (A):** *Aware of societal and global changes due to engineering innovations*

**PO-08 (B):** *Analyze economic trade-offs in engineering systems*

**PO-08 (C):** *Evaluates engineering solutions considering environmental constraints*

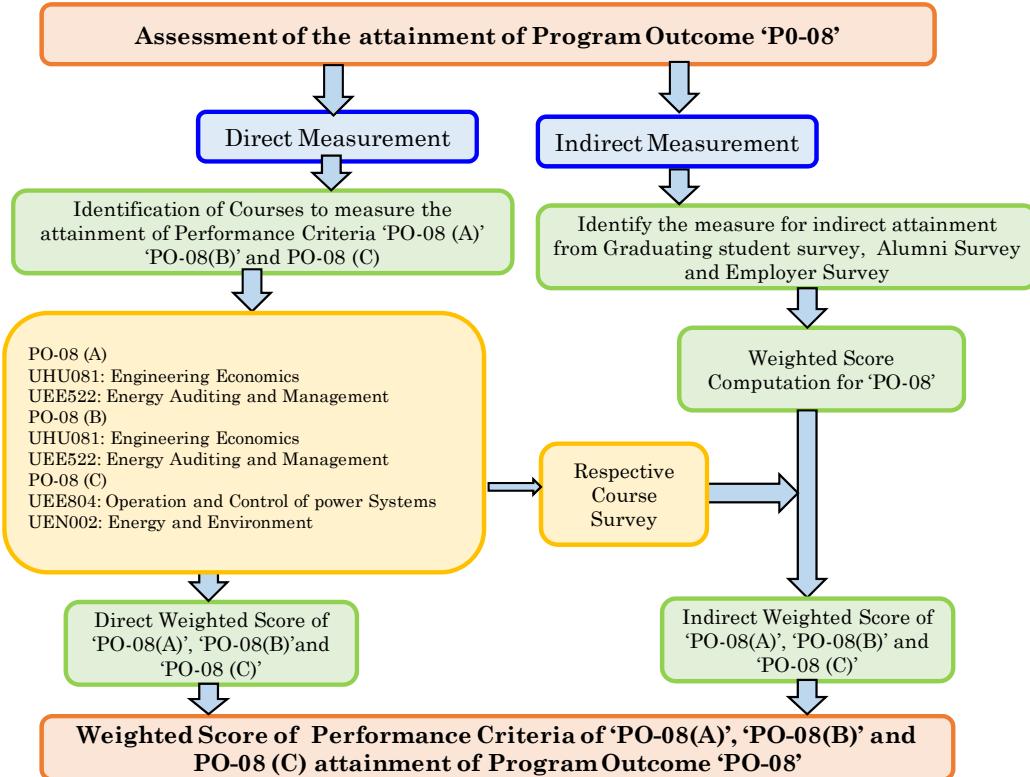
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-08’:

- **UHU081: Engineering Economics**
- **UEN002: Energy and Environment**
- UHU031: Organizational Behavior
- **UEE522: Energy Auditing and Management**
- UEE303: Power Generation and Associated Economics
- **UEE804: Operation and Control of Power Systems**
- UEE601: Flexible AC Transmission Systems
- UEE502: High voltage Engineering
- UEE843: Power System Planning
- UHU005: Humanities for Engineers
- UEE632: Power Generation and Economics

Outcome PO-08 has been assessed through three performance criteria PO-08 (A), PO-08 (B) and PO-08 (C). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-08 (A)’, ‘PO-08 (B)’ and ‘PO-08 (C)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-08 (A)	UHU081:Engineering Economics	UEE522:Energy Auditing and Management
PO-08 (B)	UHU081:Engineering Economics	UEE522:Energy Auditing and Management
PO-08 (C)	UEE804: Operation and Control of Power Systems	UEN002: Energy and Environment

The step by step methodology used to measure the attainment of program outcome ‘PO-08’ is shown in Fig. 4PO-08.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-08’ for all three academic years under consideration.



**Fig. PO-08.1: Process for measurement of attainment of outcome 'PO-08' for the year 2016-17**

The following Rubric has been used to convert marks obtained by students to a Likert scale in the range of 1 to 5 is described in Table PO-08.1 in most cases unless specifically mentioned.

**Table PO-08.1: Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessment for each of the performance criteria using the subjects mentioned.

## **Assessment of Outcome ‘PO-08’ using performance criterion PO-08 (A)**

### ***PO-08 (A): Aware of societal and global changes due to engineering innovations.***

The performance criteria ‘PO-08 (A)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and the other surveys (Graduating student survey, Alumni survey and Employer survey)

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UHU081: Engineering Economics* and *UEE522: Energy Auditing and Management* are used to assess performance criteria PO-08 (A) as a direct measure. The analysis for each of these courses is provided below:

#### **UHU081: Engineering Economics**

The performance of the course *UHU081: Engineering Economics* is used to measure the attainment of outcome ‘PO-08 (A)’ through the End Semester Examination (Question No. 4 (a), July-Dec. 2016, 06 marks).

##### **Question:**

Q.4 (a)	In contrast to perfect and monopolistic competition, oligopolistic market structures are characterized by interdependence in pricing and output decisions. Explain.	(6)
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The performance of the students in the above question is then summarized as given below in Table PO-08 (A).1 using rubrics defined in Table PO-08.1.

**Table PO-08 (A).1: Students’ performance in question targeting ‘PO-08 (A)’; Course UHU081**

S.No.	Roll no.	Name	Marks (6)	Score (1-5)
1	101304001	Aarushi Bajaj	4	4
2	101304002	Abhey Arora	4	4
3	101304003	Abhishek Taksali	4	4
4	101304004	Adhikaansh Tayal	3.5	3
5	101304005	Aditi Narang	3.5	3
6	101304006	Aditya	3.5	3
7	101304007	Akshat	4.5	5
8	101304008	Akshay Kapoor	3	3
9	101304009	Akshay Kumar	4	4
10	101304010	Akshay Kumar Chaudhary	5	5
11	101304011	Akshay Sharma	3.5	3

S.No.	Roll no.	Name	Marks (6)	Score (1-5)
12	101304012	Amandeep Kaur	2.5	3
13	101304013	Amandeep Singh	5	5
14	101304014	Amaninder Singh Randhawa	4	4
15	101304015	Angad Kapoor	4	4
16	101304016	Ankita Garg	3	3
17	101304017	Ankur Malik	4.5	5
18	101304018	Anmol Jawa	5	5
19	101304019	Anmolpreet Singh	4	4
20	101304020	Anyuti Tiwary	2.5	3
21	101304021	Arpit Sharma	3.5	3
22	101304022	Arsh Kundal	2	2
23	101304023	Arshbir Kaur	4	4
24	101304024	Arshdeep Singh Bagga	6	5
25	101304025	Ashish	4	4
26	101304026	Ashish Rajpal	3.5	3
27	101304028	Berry Lubana	3.5	3
28	101304029	Bhanu Duggal	4	4
29	101304030	Bhanu Marwaha	4.5	5
30	101304031	Chirag Gaba	5	5
31	101304032	Dipin Garg	5.5	5
32	101304033	Dishant Vanvari	5.5	5
33	101304034	Divyesh Pratap Singh	4.5	5
34	101304035	Elham Anwar	5	5
35	101304036	Gurseerat Singh Meen	5.5	5
36	101304037	Gursewak Singh	5.5	5
37	101304040	Hariansh Sehgal	5	5
38	101304041	Hartejdeep Singh	5	5
39	101304042	Himanshu Goyal	5	5
40	101304044	Jasjit Singh	4	4
41	101304045	Jassimran Singh Julka	4.5	5
42	101304046	Jessica Dhaliwal	4	4
43	101304047	Kanwarpal Singh	3	3
44	101304048	Karan Kumar	2	2
45	101304049	Karanjot Singh Kochar	3	3
46	101304050	Kashish Aggarwal	3.5	3
47	101304051	Kritika Singla	2.5	3
48	101304052	Love Gaba	3.5	3
49	101304054	Manik Mittal	4	4

S.No.	Roll no.	Name	Marks (6)	Score (1-5)
50	101304055	Maninderjit Singh	2	2
51	101304056	Mayank Singla	1	1
52	101304057	Mridul Bhutani	3	3
53	101304058	Naman Garg	4.5	5
54	101304059	Navdeep Singh	5	5
55	101304060	Navdeep Singh	3	3
56	101304061	Nazuk Aggarwal	4	4
57	101304062	Nishant Garg	2	2
58	101304063	Nishtha Raheja	5	5
59	101304064	Paras Bawa	4	4
60	101304065	Parth Ahuja	3	3
61	101304066	Parushi	4	4
62	101304067	Pency Goyal	5	5
63	101304068	Piyush Jindal	3	3
64	101304069	Piyush Tripathi	4	4
65	101304070	Prachi Garg	3	3
66	101304071	Prashant Kataria	3.5	3
67	101304072	Preeti Garg	4.5	5
68	101304073	Priyank Arora	3.5	3
69	101304074	Priyanka	3	3
70	101304075	Priyanka Singh	2.5	3
71	101304076	Priyansh Mahajan	4	4
72	101304077	Rahul Meena	3	3
73	101304078	Rajan	5.5	5
74	101304079	Rajat Sharma	5	5
75	101304080	Ratul Goyal	4.5	5
76	101304081	Ravinder Singh	4	4
77	101304082	Rishabh Juneja	4	4
78	101304083	Robin Manktala	3	3
79	101304084	Rohan Ghai	4	4
80	101304085	Rohan Singla	2	2
81	101304086	Rohan Wadhawan	5	5
82	101304087	Rohit Goyal	3	3
83	101304088	Rubina Bamba	3	3
84	101304089	Sagar Pulani	4	4
85	101304090	Sahil Kataria	2.5	3
86	101304091	Sakshi	3	3
87	101304092	Sandal Singh Sidhu	3	3

S.No.	Roll no.	Name	Marks (6)	Score (1-5)
88	101304093	Sandeep Kaur	5.0	5
89	101304094	Satripleen Kaur	5.0	5
90	101304095	Saurabh Mohan	4.0	4
91	101304096	Shagundeepraj Singh	4.5	5
92	101304097	Shailly Gupta	3.5	3
93	101304098	Shaina	2.5	3
94	101304099	Shivika Gupta	3.0	3
95	101304100	Shresth Rai	4.0	4
96	101304101	Shubham Goyal	4.0	4
97	101304102	Shubham Gupta	3.0	3
98	101304103	Shubham Sharma	3.5	3
99	101304104	Shubham Sharma	2.0	2
100	101304105	Shubham Soin	1.5	2
101	101304106	Siddharth Goyal	2.5	3
102	101304107	Sidharth Garg	3.0	3
103	101304108	Simran Kaur	4.0	4
104	101304109	Simranjit Singh	4.0	4
105	101304111	Sumit Dhingra	4.0	4
106	101304112	Sumit Kaushik	3.0	3
107	101304113	Tushar Dheer	4.0	4
108	101304114	Tushar Sharma	4.0	4
109	101304116	Utsav Chhabra	3.5	3
110	101304117	Vaibhav Gupta	3.5	3
111	101304118	Vaishali	4.0	4
112	101304119	Varun Bansal	4.0	4
113	101304120	Vemi Jindal	3.5	3
114	101304121	Vishal Arora	3.5	3
115	101304122	Yugesh Goyal	2.5	3
116	101484001	Amandeep Singh	3.0	3
117	101484002	Amrinder Singh	4.0	4
118	101484003	Ashmeen Singh	3.5	3
119	101484004	Azad Singh	3.0	3
120	101484005	Chandan Garg	3.5	3
121	101484007	Deepak Singla	3.0	3
122	101484008	Diljeet Singh	4.0	4
123	101484009	Jyoti Kaushal	4.0	4
124	101484011	Pawan Kumar	5.0	5
125	101484012	Rajat Singla	5.0	5

S.No.	Roll no.	Name	Marks (6)	Score (1-5)
126	101484013	Satveer Kaur	5.5	5
127	101484014	Saurabh Kumar Wadhawan	3.0	3
128	101484015	Shweta Sharma	2.5	3
129	101484016	Sukhjeet Singh	3.0	3

The performance of students through the course UHU081 for criteria PO-08 (A) is summarized in Table PO-08 (A).2:

**Table PO-08 (A).2: Average score of student performance in the course UHU081 for criteria ‘PO-08 (A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UHU081	25.58	27.13	41.09	5.43	0.78	3.71

## **UEE522: Energy Auditing and Management**

The performance of the course UEE522: Energy Auditing and Management is used to measure the attainment of outcome ‘PO-08 (A)’ through the End Semester Examination (Question No. 6, July-December 2016, 10 marks).

### **Question:**

Q.6	(a) List five energy saving measures in lighting system. Define the term Lux, CRI and luminous efficacy.  (b) A 3-phase, 50 Hz, 400 V motor develops 100 H.P. (74.6 kW), the power factor being 0.75 lagging and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance units is built of 4 similar 100 V capacitors. Determine the capacitance of each capacitor.	(10)
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The performance of the students in the above question is then summarized as given below in Table PO-08 (A).3 using rubrics defined in Table PO-08.1.

**Table PO-08 (A).3: Students' performance in question targeting ‘PO-08 (A)’; Course UEE522**

S.No.	Roll No.	Name	Marks (10)	Score (1-5)
1	101404007	Ajay Singh	6	4
2	101404009	Alka Thakur	6	4
3	101404012	Ankush Goyal	7	4
4	101404014	Anmol Goyat	7	4
5	101404015	Anmol Rattan Kaur	7	4
6	101404017	Anubhav Kumar	7	4
7	101404018	Apeksha Goel	8	5
8	101404020	Arshiya	8	5
9	101404021	Arshjot Kaur	7	4
10	101404024	Bhawani Singh	6	4
11	101404026	Davileen Garg	4	3
12	101404029	Divyam Aggarwal	4	3
13	101404032	Garima	7	4
14	101404033	Garv Chahar	5	3
15	101404035	Gaurav Rathore	4	3
16	101404036	Gurpreet Singh	2	2
17	101404037	Gursagar Singh	7	4
18	101404038	Gurupinder Pal Singh	7	4
19	101404039	Harmanpreet Singh	2	2

S.No.	Roll No.	Name	Marks (10)	Score (1-5)
20	101404041	Harshit Kaushik	6	4
21	101404042	Harshvir Singh	7	4
22	101404043	Harsimarjot Kaur	6	4
23	101404044	Harsimran Singh	4	3
24	101404046	Heema Gupta	6	4
25	101404047	Hitesh Kumar	5	3
26	101404048	Ishita Mahindru	7	4
27	101404049	Jagmeet Singh Bawa	0	1
28	101404051	Jashanpreet Singh	5	3
29	101404052	Jatin Bansal	6	4
30	101404053	Jatin Raheja	6	4
31	101404056	Kirtish Madaan	6	4
32	101404057	Mahitosh Sharma	7	4
33	101404058	Manan Mittal	1	1
34	101404059	Mandeep Singh Panesar	4	3
35	101404060	Manisha Gupta	5	3
36	101404061	Manit Gupta	8	5
37	101404062	Manjosh Singh Dhillon	7	4
38	101404063	Manpreet Singh Brar	7	4
39	101404064	Manvir Kaur	7	4
40	101404066	Mithilesh Kumar	6	4
41	101404067	Mohit Goyal	7	4
42	101404068	Mridul Marwaha	6	4
43	101404070	Naveen Parashar	7	4
44	101404072	Nigam Wadhwa	6	4
45	101404073	Nikhil Danodia	4	3
46	101404075	Nitin Gupta	7	4
47	101404076	Nitish Arora	8	5
48	101404077	Nitish Bhardwaj	6	4
49	101404078	Omandeep Kaur	7	4
50	101404079	Pankaj Garg	3	2
51	101404081	Parmar Adhiraj Singh	0	1
52	101404083	Prabhdeep Kaur	7	4
53	101404089	Pulkit Bansal	7	4
54	101404090	Pushpinder Singh	6	4
55	101404091	Rachit Verma	2	2
56	101404092	Rahul Gautam	7	4
57	101404093	Rahul Goyal	8	5

S.No.	Roll No.	Name	Marks (10)	Score (1-5)
58	101404094	Rajshree Vaidya	6	4
59	101404099	Sagar Bansal	7	4
60	101404100	Sahajdeep Kaur	8	5
61	101404102	Sahil Singla	0	1
62	101404103	Samarth Gupta	8	5
63	101404105	Samrat Kumar Gupta	8	5
64	101404106	Sanamdeep Singh	4	3
65	101404108	Saurabh Kumar	5	3
66	101404109	Shailesh Verma	7	4
67	101404111	Sher Mohammed	7	4
68	101404112	Shivam Dochania	0	1
69	101404113	Shivam Gera	5	3
70	101404115	Shubham Bhardwaj	8	5
71	101404118	Shubham Kumar	5	3
72	101404120	Shubhdeep Singh	5	3
73	101404121	Siddharth Singh	0	1
74	101404122	Simran Mehra	6	4
75	101404123	Sukhman	5	3
76	101404124	Swapnil Singla	5	3
77	101404126	Taranjot Singh	7	4
78	101404128	Tarun Gupta	3	2
79	101404129	Tarun Kumar	7	4
80	101404132	Utkarsh Atri	7	4
81	101404133	Vandana Gora	5	3
82	101454002	Yash Motwani	7	4
83	101454003	Harshwardhan Soni	7	4
84	101454004	Simardeep Kaur	7	4
85	101454005	Tejas Kapila	7	4
86	101454009	Lariza Bansal	5	3
87	101584001	Amanjit Singh	7	4
88	101584002	Chetan Garg	7	4
89	101584003	Devinder Kumar	7	4
90	101584004	Gurpreet Singh	0	1
91	101584005	Gurpreet Singh	7	4
92	101584006	Harman Preet Singh	7	4
93	101584007	Karamjeet Singh	0	1
94	101584008	Lakshay Garg	7	4
95	101584009	Prince Kalia	8	5

S.No.	Roll No.	Name	Marks (10)	Score (1-5)
96	101584010	Rohit	5	3
97	101584011	Satvir Singh	5	3
98	101584012	Sharandeep Singh	6	4
99	101584013	Shashi Sharma	6	4
100	101584014	Sunnypreet Singh	2	2
101	101584015	Rajat Chandra	2	2
102	101584016	Gursimran Singh	2	2

The overall performance of students for the above criterion is summarized in Table PO-08 (A).4

**Table PO-08 (A).4: Average score of student performance in the course UEE522 for criteria PO-08 (A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE522	10.68	53.40	20.39	7.77	7.77	3.51

The data from Table PO-08 (A).2 and Table PO-08 (A).4 is used to evaluate the weighted average of direct measure through course portfolio for criteria ‘PO-08 (A)’ and summarized in Table PO-08 (A).5

**Table PO-08 (A).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-08 (A)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UHU081	25.58	27.13	41.09	5.43	0.78	3.71
UEE522	10.68	53.40	20.39	7.77	7.77	3.51
Weighted Average Score	18.13	40.26	30.74	6.60	4.27	3.61

**b) Indirect measures:**

The indirect measurement of performance criteria ‘PO-08 (A)’ has been assessed through Student Course Surveys and other surveys (Graduating student survey, Alumni survey and Employer survey). The weighted average score in respective surveys is summarized in Table PO-08 (A).6 and Table PO-08 (A).7.

**(i) Assessment Tools:** Student Course Surveys

The Course learning outcomes (CLO) as described below has been used for the measurement of attainment of ‘PO-08 (A)’.

UHU081	Be able to develop analytical skills essential for engineers to help to take decisions.
UEE522	Analyze about various energy related aspect of electrical system.

**Table PO-08 (A).6: Weighted average score of performance criterion ‘PO-08 (A)’ based on surveys.**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UHU081	51.88	29.24	13.20	1.8	3.7	4.24
UEE522	42.85	30.95	16.66	2.3	7.1	3.99
Weighted Average Score	47.36	30.09	14.93	2.05	5.4	4.11

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-08’ through indirect measurement using following question in the respective surveys.

Graduating Survey	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
Alumni Survey	
Employer Survey	Do our students have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context?

**Table PO-08 (A).7: Weighted average score of performance criterion ‘PO-08 (A)’ based on surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
Graduating student survey	32.39	53.52	14.08	00	00	4.18
Employer survey	20	73.33	6.67	00	00	4.13
Alumni survey	30.43	36.23	24.64	5.80	2.90	3.85
Weighted average score surveys	27.60	54.36	15.13	1.93	0.96	4.05

**c) Overall weighted average score of performance criterion ‘PO-08 (A)’**

The overall weighted average score of performance criterion ‘PO-08 (A)’ is summarized in Table PO-08 (A).8 from the data given in Table PO-08 (A).5, PO-08 (A).6 and PO-08 (A).7.

**Table PO-08 (A).8: Overall weighted average score of performance criterion ‘PO-08 (A)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	18.13	40.26	30.74	6.60	4.27	<b>3.61</b>	5
Score surveys	47.36	30.09	14.93	2.05	5.4	<b>4.11</b>	4
Score on other surveys	27.60	54.36	15.13	1.93	0.96	<b>4.05</b>	3
Overall weighted score	<b>30.24</b>	<b>40.39</b>	<b>21.56</b>	<b>3.91</b>	<b>3.81</b>	<b>3.88</b>	

### Assessment of Outcome 'PO-08' using performance criterion PO-08 (B)

**PO-08 (B): Analyze economic trade-offs in engineering systems.**

**a.) Assessment Tool: Students' performance using Course Portfolio**

Two courses namely *UEE522: Energy Auditing and Management* and *UHU081: Engineering Economics* were used to assess performance criteria PO-08 (B) as a direct measure. The analysis of this course is provided below:

**UEE522: Energy Auditing and Management**

The performance of the course *UEE522: Energy Auditing and Management* is used to measure the attainment of outcome 'PO-08 (B)' through the End Semester Examination (Question No. 9, July-December 2016, 20 marks).

**Question :**

<p>A energy audit has been carried out in a hostel. The following data has been collected before energy audit</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Appliance</th><th style="text-align: center;">Rating (watts)</th><th style="text-align: center;">Quantity</th><th style="text-align: center;">Operating time (hrs x days)</th><th style="text-align: center;">Price (₹)</th></tr> </thead> <tbody> <tr> <td>Fluorescent Lamb</td><td style="text-align: center;">40</td><td style="text-align: center;">422</td><td style="text-align: center;">8x365</td><td style="text-align: center;">60 ₹</td></tr> <tr> <td>Night lamp (CFL)</td><td style="text-align: center;">14</td><td style="text-align: center;">240</td><td style="text-align: center;">6x365</td><td style="text-align: center;">200₹</td></tr> <tr> <td>Fan (Ceiling)</td><td style="text-align: center;">60</td><td style="text-align: center;">589</td><td style="text-align: center;">18x245</td><td style="text-align: center;">1400₹</td></tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"></th><th style="text-align: center;">Existing TR</th><th style="text-align: center;">EER</th><th style="text-align: center;">Operating hours (hrs x days)</th><th style="text-align: center;">Price (₹)</th></tr> </thead> <tbody> <tr> <td>AC.No.1</td><td style="text-align: center;">1.5</td><td style="text-align: center;">2.05</td><td style="text-align: center;">12x120</td><td style="text-align: center;">25000</td></tr> <tr> <td>AC.No.2</td><td style="text-align: center;">1.5</td><td style="text-align: center;">2.05</td><td style="text-align: center;">12x120</td><td style="text-align: center;">25000</td></tr> <tr> <td>AC.No.3</td><td style="text-align: center;">1.5</td><td style="text-align: center;">2.19</td><td style="text-align: center;">12x120</td><td style="text-align: center;">25000</td></tr> <tr> <td>AC.No.4</td><td style="text-align: center;">1.5</td><td style="text-align: center;">2.30</td><td style="text-align: center;">12x120</td><td style="text-align: center;">25000</td></tr> <tr> <td>AC.No.5</td><td style="text-align: center;">1.5</td><td style="text-align: center;">2.40</td><td style="text-align: center;">12x120</td><td style="text-align: center;">25000</td></tr> <tr> <td>AC.No.6</td><td style="text-align: center;">2</td><td style="text-align: center;">2.80</td><td style="text-align: center;">24x120</td><td style="text-align: center;">30000</td></tr> <tr> <td>AC.No.7</td><td style="text-align: center;">2</td><td style="text-align: center;">2.90</td><td style="text-align: center;">24x120</td><td style="text-align: center;">30000</td></tr> </tbody> </table> <p>by the energy auditors, it has been recommending for the energy saving:</p> <ul style="list-style-type: none"> <li>(i) If the Fluorescent lamps in hostel are replaced with a good quality CFL bulbs with a rating of 29 W for the same luminance with a price of 100₹ each.</li> <li>(ii) All Night lamp will be replaced by LED lamp with a rating of 5 W price of each 80₹.</li> <li>(iii) All fans are replaced by a good quality energy efficient fan from Crompton Greaves company with a rating of 50 W with a price of 1600₹ (each).</li> <li>(iv) All ACs are replaced with three star labeled new ACs having Energy Efficiency Ratio (EER) of 2.50 kW/kW for 1.5 Tons and 3.25 for 2 Tons with a price of 30,000₹ and 35,000₹ respectively.</li> </ul>	Appliance	Rating (watts)	Quantity	Operating time (hrs x days)	Price (₹)	Fluorescent Lamb	40	422	8x365	60 ₹	Night lamp (CFL)	14	240	6x365	200₹	Fan (Ceiling)	60	589	18x245	1400₹		Existing TR	EER	Operating hours (hrs x days)	Price (₹)	AC.No.1	1.5	2.05	12x120	25000	AC.No.2	1.5	2.05	12x120	25000	AC.No.3	1.5	2.19	12x120	25000	AC.No.4	1.5	2.30	12x120	25000	AC.No.5	1.5	2.40	12x120	25000	AC.No.6	2	2.80	24x120	30000	AC.No.7	2	2.90	24x120	30000	(20)				
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AC.No.6	2	2.80	24x120	30000																																																													
AC.No.7	2	2.90	24x120	30000																																																													

	(v) Rate of energy is 5.00 ₹/kWh and a 50% of depreciation factor is considered for old products. Calculate the money saving by replacing old system with new one. Also comment on saving recommendations. What is simple payback period (if any).	
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The performance of the students in the above question is then summarized as given below in Table PO-08 (B).1 using rubrics defined in Table PO-08.1.

**Table PO-08 (B).1: Student's performance in question targeting 'PO-08 (B)'; course: UEE522**

S. No.	Roll No.	Name	Marks (20)	Score(1 - 5)
1	101404007	Ajay Singh	0	1
2	101404009	Alka Thakur	3	1
3	101404012	Ankush Goyal	15	5
4	101404014	Anmol Goyat	2	1
5	101404015	Anmol Rattan Kaur	5	2
6	101404017	Anubhav Kumar	0	1
7	101404018	Apeksha Goel	0	1
8	101404020	Arshiya	0	1
9	101404021	Arshjot Kaur	0	1
10	101404024	Bhawani Singh	0	1
11	101404026	Davileen Garg	8	3
12	101404029	Divyam Aggarwal	10	3
13	101404032	Garima	18	5
14	101404033	Garv Chahar	8	3
15	101404035	Gaurav Rathore	0	1
16	101404036	Gurpreet Singh	0	1
17	101404037	Gursagar Singh	4	2
18	101404038	Gurupinder Pal Singh	0	1
19	101404039	Harmanpreet Singh	0	1
20	101404041	Harshit Kaushik	6	2
21	101404042	Harshvir Singh	6	2
22	101404043	Harsimarjot Kaur	0	1
23	101404044	Harsimran Singh	2	1
24	101404046	Heema Gupta	6	2
25	101404047	Hitesh Kumar	0	1
26	101404048	Ishita Mahindru	0	1
27	101404049	Jagmeet Singh Bawa	10	3
28	101404051	Jashanpreet Singh	10	3
29	101404052	Jatin Bansal	18	5
30	101404053	Jatin Raheja	6	2

S. No.	Roll No.	Name	Marks (20)	Score(1 - 5)
31	101404056	Kirtish Madaan	0	1
32	101404057	Mahitosh Sharma	16	5
33	101404058	Manan Mittal	8	3
34	101404059	Mandeep Singh Panesar	14	4
35	101404060	Manisha Gupta	0	1
36	101404061	Manit Gupta	17	5
37	101404062	Manjosh Singh Dhillon	8	3
38	101404063	Manpreet Singh Brar	8	3
39	101404064	Manvir Kaur	6	2
40	101404066	Mithilesh Kumar	15	5
41	101404067	Mohit Goyal	18	5
42	101404068	Mridul Marwaha	8	3
43	101404070	Naveen Parashar	0	1
44	101404072	Nigam Wadhwa	10	3
45	101404073	Nikhil Danodia	10	3
46	101404075	Nitin Gupta	10	3
47	101404076	Nitish Arora	15	5
48	101404077	Nitish Bhardwaj	8	3
49	101404078	Omandeep Kaur	8	3
50	101404079	Pankaj Garg	14	4
51	101404081	Parmar Adhiraj Singh	10	3
52	101404083	Prabhdeep Kaur	0	1
53	101404089	Pulkit Bansal	16	5
54	101404090	Pushpinder Singh	10	3
55	101404091	Rachit Verma	2	1
56	101404092	Rahul Gautam	0	1
57	101404093	Rahul Goyal	18	5
58	101404094	Rajshree Vaidya	5	2
59	101404099	Sagar Bansal	12	4
60	101404100	Sahajdeep Kaur	6	2
61	101404102	Sahil Singla	15	5
62	101404103	Samarth Gupta	0	1
63	101404105	Samrat Kumar Gupta	0	1
64	101404106	Sanamdeep Singh	2	1
65	101404108	Saurabh Kumar	0	1
66	101404109	Shailesh Verma	0	1
67	101404111	Sher Mohammed	0	1
68	101404112	Shivam Dochania	5	2

S. No.	Roll No.	Name	Marks (20)	Score(1 - 5)
69	101404113	Shivam Gera	5	2
70	101404115	Shubham Bhardwaj	0	1
71	101404118	Shubham Kumar	6	2
72	101404120	Shubhdeep Singh	8	3
73	101404121	Siddharth Singh	0	1
74	101404122	Simran Mehra	6	2
75	101404123	Sukhman	10	3
76	101404124	Swapnil Singla	8	3
77	101404126	Taranjot Singh	6	2
78	101404128	Tarun Gupta	12	4
79	101404129	Tarun Kumar	2	1
80	101404132	Utkarsh Atri	10	3
81	101404133	Vandana Gora	2	1
82	101454002	Yash Motwani	4	2
83	101454003	Harshwardhan Soni	0	1
84	101454004	Simardeep Kaur	10	3
85	101454005	Tejas Kapila	15	5
86	101454009	Lariza Bansal	2	1
87	101584001	Amanjit Singh	16	5
88	101584002	Chetan Garg	18	5
89	101584003	Devinder Kumar	6	2
90	101584004	Gurpreet Singh	0	1
91	101584005	Gurpreet Singh	4	2
92	101584006	Harman Preet Singh	8	3
93	101584007	Karamjeet Singh	0	1
94	101584008	Lakshay Garg	10	3
95	101584009	Prince Kalia	8	3
96	101584010	Rohit	4	2
97	101584011	Satvir Singh	6	2
98	101584012	Sharandeep Singh	15	5
99	101584013	Shashi Sharma	15	5
100	101584014	Sunnypreet Singh	8	3
101	101584015	Rajat Chandra	0	1
102	101584016	Gursimran Singh	8	3

The overall performance of the students in the course based on marks in *UEEE522: Energy Auditing Management* is summarized as given below in Table PO-08 (B).2 using rubrics defined in Table PO-08.1.

**Table PO-08 (B).2:Average score of student performance in the course UEE522 for criteria PO-08 (B).**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE522	15.69	3.92	25.49	18.63	36.27	2.44

### **UHU081: Engineering Economics**

The performance of the course *UHU081: Engineering Economics* is used to measure the attainment of outcome ‘PO-08 (B)’ through the End Semester Examination (Question No. 6 (b), July-December 2016, 06 marks).

**Question:**

Q.6 (b)	In a year number of cars sold decreased by 20% during the year, prices of cars increased by 5%, per capita income declined by 2% and price of petrol increased by 10% income elasticity of demand for cars is estimated to be +1.5 and cross price elasticity of petrol and cars is estimated to be -0.30.	(6)
	I. What is the impact of decline in per capita income on the demand for cars? II. What is the impact of increase in price of petrol on the demand for cars? III. If sales decline because of increase in petrol and decrease in income are 3% and 3% respectively, the price elasticity of demand for cars would be	

The overall performance of the students in the above question is then summarized as given below in Table PO-08 (B).3.

**Table PO-08 (B).3: Student’s performance in question targeting ‘PO-08 (B)’; Course UHU081**

S.No.	Roll No.	Name	Marks ( 6 )	Score (1-5)
1	101304001	Aarushi Bajaj	4	4
2	101304002	Abhey Arora	3.5	3
3	101304003	Abhishek Taksali	3.5	3
4	101304004	Adhikaansh Tayal	3	3
5	101304005	Aditi Narang	4	4
6	101304006	Aditya	5	5
7	101304007	Akshat	2	2
8	101304008	Akshay Kapoor	3.5	3
9	101304009	Akshay Kumar	4	4
10	101304010	Akshay Kumar Chaudhary	4	4
11	101304011	Akshay Sharma	4	4

S.No.	Roll No.	Name	Marks ( 6 )	Score (1-5)
12	101304012	Amandeep Kaur	3	3
13	101304013	Amandeep Singh	4.5	5
14	101304014	Amaninder Singh Randhawa	4.5	5
15	101304015	Angad Kapoor	3.5	3
16	101304016	Ankita Garg	3.5	3
17	101304017	Ankur Malik*	5	5
18	101304018	Anmol Jawa	4	4
19	101304019	Anmolpreet Singh	3.5	3
20	101304020	Anyuti Tiwary	4	4
21	101304021	Arpit Sharma	3.5	3
22	101304022	Arsh Kundal	4	4
23	101304023	Arshbir Kaur	4	4
24	101304024	Arshdeep Singh Bagga	4	4
25	101304025	Ashish	4	4
26	101304026	Ashish Rajpal	3.5	3
27	101304028	Berry Lubana	4	4
28	101304029	Bhanu Duggal	3.5	3
29	101304030	Bhanu Marwaha	4	4
30	101304031	Chirag Gaba	3.5	3
31	101304032	Dipin Garg	3.5	3
32	101304033	Dishant Vanvari	3	3
33	101304034	Divyesh Pratap Singh	4.5	5
34	101304035	Elham Anwar	4.5	5
35	101304036	Gurseerat Singh Meen	4	4
36	101304037	Gursewak Singh	4	4
37	101304040	Hariansh Sehgal	4.5	5
38	101304041	Hartejdeep Singh	4	4
39	101304042	Himanshu Goyal	4	4
40	101304044	Jasjit Singh	5	5
41	101304045	Jassimran Singh Julka	3	3
42	101304046	Jessica Dhaliwal	3	3
43	101304047	Kanwarpal Singh	4	4
44	101304048	Karan Kumar	3	3
45	101304049	Karanjot Singh Kochar	5	5
46	101304050	Kashish Aggarwal	4.5	5
47	101304051	Kritika Singla	4	4
48	101304052	Love Gaba	3.5	3
49	101304054	Manik Mittal	3	3

S.No.	Roll No.	Name	Marks ( 6 )	Score (1-5)
50	101304055	Maninderjit Singh	2.5	3
51	101304056	Mayank Singla	4	4
52	101304057	Mridul Bhutani	5	5
53	101304058	Naman Garg	3.5	3
54	101304059	Navdeep Singh	3	3
55	101304060	Navdeep Singh	3.5	3
56	101304061	Nazuk Aggarwal	4	4
57	101304062	Nishant Garg	5	5
58	101304063	Nishtha Raheja	5	5
59	101304064	Paras Bawa	3	3
60	101304065	Parth Ahuja	3	3
61	101304066	Parushi	4.5	5
62	101304067	Pency Goyal	4.5	5
63	101304068	Piyush Jindal	4.5	5
64	101304069	Piyush Tripathi	5	5
65	101304070	Prachi Garg	5	5
66	101304071	Prashant Kataria	4.5	5
67	101304072	Preeti Garg	5	5
68	101304073	Priyank Arora	4	4
69	101304074	Priyanka	4.5	5
70	101304075	Priyanka Singh	4	4
71	101304076	Priyansh Mahajan	4	4
72	101304077	Rahul Meena	4	4
73	101304078	Rajan	5	5
74	101304079	Rajat Sharma	3	3
75	101304080	Ratul Goyal	3	3
76	101304081	Ravinder Singh	4	4
77	101304082	Rishabh Juneja	4	4
78	101304083	Robin Manktala	3.5	3
79	101304084	Rohan Ghai	4	4
80	101304085	Rohan Singla	3.5	3
81	101304086	Rohan Wadhawan	4	4
82	101304087	Rohit Goyal	4.5	5
83	101304088	Rubina Bamba	3	3
84	101304089	Sagar Pulani	1	1
85	101304090	Sahil Kataria	4	4
86	101304091	Sakshi	3.5	3
87	101304092	Sandal Singh Sidhu	2.5	3

S.No.	Roll No.	Name	Marks ( 6 )	Score (1-5)
88	101304093	Sandeep Kaur	4.0	4
89	101304094	Satripleen Kaur	3.0	3
90	101304095	Saurabh Mohan	3.5	3
91	101304096	Shagundeepraj Singh	3.0	3
92	101304097	Shailesh Gupta	2.5	3
93	101304098	Shaina	4.0	4
94	101304099	Shivika Gupta	3.0	3
95	101304100	Shresth Rai	2.0	2
96	101304101	Shubham Goyal	1.0	1
97	101304102	Shubham Gupta	2.0	2
98	101304103	Shubham Sharma	3.0	3
99	101304104	Shubham Sharma	3.5	3
100	101304105	Shubham Soin	2.0	2
101	101304106	Siddharth Goyal	3.0	3
102	101304107	Sidharth Garg	3.5	3
103	101304108	Simran Kaur	3.0	3
104	101304109	Simranjit Singh	2.5	3
105	101304111	Sumit Dhingra	4.0	4
106	101304112	Sumit Kaushik	4.0	4
107	101304113	Tushar Dheer	4.0	4
108	101304114	Tushar Sharma	4.0	4
109	101304116	Utsav Chhabra	3.0	3
110	101304117	Vaibhav Gupta	4.0	4
111	101304118	Vaishali	2.0	2
112	101304119	Varun Bansal	1.0	1
113	101304120	Veni Jindal	3.0	3
114	101304121	Vishal Arora	3.3	3
115	101304122	Yugesh Goyal	3.5	3
116	101484001	Amandeep Singh	2.5	3
117	101484002	Amrinder Singh	4.0	4
118	101484003	Ashmeen Singh	5.0	5
119	101484004	Azad Singh	4.5	5
120	101484005	Chandan Garg	4.5	5
121	101484007	Deepak Singla	4.5	5
122	101484008	Diljeet Singh	4.0	4
123	101484009	Jyoti Kaushal	4.0	4
124	101484011	Pawan Kumar	4.0	4
125	101484012	Rajat Singla	4.5	5

S.No.	Roll No.	Name	Marks ( 6 )	Score (1-5)
126	101484013	Satveer Kaur	3.0	3
127	101484014	Saurabh Kumar Wadhawan	3.5	3
128	101484015	Shweta Sharma	3.5	3
129	101484016	Sukheet Singh	2.5	3

The overall performance of the students in the above question is then summarized as given below in Table PO-08 (B).4

**Table PO-08 (B).4 Average score of student performance in the course UHU081 for criteria PO-08 (B).**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UHU081	21.71	31.78	40.31	3.88	2.33	3.67

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-08 (B) as given below in Table PO-08 (B).5.

**Table PO-08 (B).5:Weighted Average Student class performance (course portfolio) for criteria PO-08 (B)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE522	15.69	3.92	25.49	18.63	36.27	2.44
UHU081	21.71	31.78	40.31	3.88	2.33	3.67
Weighted Average Score	18.70	17.85	32.90	11.25	19.30	3.05

### b) Indirect measures for Performance criteria PO-08 (B) (Surveys)

- (i) Assessment Tools:** Student Course Surveys are used to assess the attainment of program outcome 'PO-08 (A)' through indirect measurement using following course learning objectives in the respective courses.

UEE522	Decide about energy management in more effective way.
UHU081	Better understand the markets and their pricing strategies

**Table PO-08 (B).6: Weighted average score of performance criterion 'PO-08 (B)' based on surveys.**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE522	42.85	30.95	16.66	2.3	7.1	3.99
UHU081	51.88	29.24	13.20	1.8	3.7	4.24
Weighted Average Score	47.36	30.09	14.93	2.05	5.4	4.11

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome 'H' through indirect measurement is summarized in Table PO-08 (A).7.

**c) Overall weighted average score of performance criterion 'PO-08 (B)'**

Finally overall weighted average score of performance criterion 'PO-08 (B)' is evaluated as given below in Table PO-08 (B).7:

**Table PO-08 (B).7: Overall weighted average score of performance criterion 'PO-08 (B)'**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	18.70	17.85	32.90	11.25	19.30	<b>3.05</b>	5
Score surveys	47.36	30.09	14.93	2.05	5.4	<b>4.11</b>	4
Score on other surveys	27.60	54.36	15.13	1.93	0.96	<b>4.05</b>	3
Overall weighted score	<b>30.47</b>	<b>31.05</b>	<b>22.46</b>	<b>5.85</b>	<b>10.08</b>	<b>3.65</b>	

## Assessment of Outcome 'PO-08' using performance criterion PO-08 (C)

**PO-08 (C): Evaluates engineering solutions considering environmental constraints.**

### a.) Assessment Tool: Students' performance using Course Portfolio

Two courses namely *UEN002: Energy and Environment* and *UEE804: Operation and Control of power systems* were used to assess performance criteria PO-08 (C) as a direct measure. The analysis of this course is provided below:

#### **UEN002: Energy and Environment**

The performance of the course *UE002: Energy and Environment* is used to measure the attainment of outcome 'PO-08 (C)' through the End Semester Examination (Question No. 1, May 2017, 20 marks).

#### **Question:**

Q1	<p>(a) As India is facing an increasing demand-supply gap in energy, it is important to harvest the solar potential to meet the energy needs. In this context, analyze the availability of solar energy as a resource in India. Formulate various strategies to tap this resource.</p> <p>(b) Deforestation influences the climate and contributes to a loss of biodiversity. Discuss the various drivers for deforestation.</p> <p>(c) Describe the mechanisms involved in particle collection by fabric collector.</p>	(20)
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The performance of the students in the above question is then summarized as given below in Table PO-08 (C).1 using rubrics defined in Table PO-08.1

**Table PO-08 (C).1: Student's performance in question targeting 'PO-08 (C)'; course: UEN002**

S. No.	Roll No.	Name	Marks (20)	Score(1-5)
1	101504002	Aastha Jain	5	2
2	101504004	Aayush Vohra	9	3
3	101504005	Aayush Rai Anand	11.5	3
4	101504006	Abhijeet Singh Bhatia	12.5	4
5	101504007	Abhinandan Narang	10.5	3
6	101504008	Abhishek Agarwal	12	4
7	101504009	Abhishek Pandey	6	2
8	101504010	Abhishek Prasad	5	2
9	101504011	Adarsh Agarwal	7.5	2
10	101504012	Aditi Mishra	11	3
11	101504013	Akshita Kamthan	7.5	2
12	101504014	Amandeep Singh Dhillon	15	5
13	101504015	Amarjot Singh	11	3
14	101504017	Amrit Kaler	9	3
15	101504018	Anahita	15	5

S. No.	Roll No.	Name	Marks (20)	Score(1-5)
16	101504019	Ankit Gupta	15	5
17	101504020	Ankit Mahajan	16	5
18	101504021	Anmol Saluja	15	5
19	101504022	Anurag Dewangan	11.5	3
20	101504024	Ashish Nagpal	12.5	4
21	101504025	Ashish Kumar Yadav	11	3
22	101504026	Ashwini Anand Pateriya	11	3
23	101504027	Avantika Dhiman	10.5	3
24	101504028	Avinash Chaturvedi	14	4
25	101504029	Badshah Singh	7	2
26	101504030	Baninder Singh Phull	14.5	4
27	101504031	Bhanu Pratap	8	3
28	101504032	Bhavay Gudwani	12.5	4
29	101504034	Bikram Pathania	10.5	3
30	101504035	Charika Mehta	12	4
31	101504036	Daman Aggarwal	7.5	2
32	101504037	Deen Dayal	11.5	3
33	101504038	Deepak Goyal	12.5	4
34	101504039	Divanshu Garg	12.5	4
35	101504040	Divyam Soni	10	3
36	101504041	Fiza Singh Multani	13.5	4
37	101504043	Gurjot Singh Kocher	11	3
38	101504044	Gurleen Kang	13.5	4
39	101504045	Gurleen Kaur	11.5	3
40	101504047	Gursimratpal Singh Sidhu	13.5	4
41	101504049	Harnishan Singh Kang	12	4
42	101504050	Harshit Lohaan	9.5	3
43	101504052	Harshjot Singh Pahuja	16	5
44	101504053	Hashmeet Singh Ganda	8.5	3
45	101504055	Himanshu Sahwal	8	3
46	101504057	Jaideep Grover	4.5	2
47	101504059	Jasjit Singh	14	4
48	101504060	Jaskirat Kaur Gill	9.5	3
49	101504061	Jatinder Pal Singh	11	3
50	101504063	Kuljeet Singh	3.5	1
51	101504064	Kunwar Achint Singh	11	3
52	101504065	Lakhan Sharma	9	3
53	101504132	Abhishek Singhal	3.5	1

S. No.	Roll No.	Name	Marks (20)	Score(1-5)
54	101554001	Aditya	13.5	4
55	101554002	Aditya Kumar	9.5	3
56	101554004	Apoorv Gupta	6	2
57	101554005	Archit Rawat	8.5	3
58	101554007	Deepika Gandhi	15	5
59	101554010	Gurmehar Singh	12.5	4
60	101554011	Gursidak Singh	11	3
61	101554012	Harmanjit Singh	15.5	5
62	101554013	Harshit Sethi	10.5	3
63	101554018	Madhur	8.5	3
64	101554021	Piyush Kumar Gupta	10	3
65	101554023	Prakhar Srivastava	9	3
66	101554034	Savi	13.5	4
67	101554036	Simran Saluja	12.5	4
68	101684001	Abhishek Kumar	14	4
69	101684002	Ajay Kumar	10.5	3
70	101684003	Deepak Bansal	13	4
71	101684004	Jashandeep Singh	12	4
72	101684005	Karanveer Singh	12	4
73	101684006	Khuhaiash Pandey	12	4
74	101684019	Hitesh Gulati	12.5	4
75	101684020	Kanishk Agarwal	16.5	5
76	101554016	Ishan Kashyap	10	3

The overall performance of the students in the course based on marks in Energy and Environment (UEN002) is summarized as given below in Table PO-08 (C).2.

**Table PO-08 (C).2: Average score of student performance in the course UEN002 for criteria PO-08 (C).**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEEN002	11.84	31.58	42.11	11.84	2.63	<b>3.38</b>

## UEE804 Operation and Control of Power Systems

The performance of the course *UEE804: Operation and Control of Power Systems* is used to measure the attainment of outcome ‘PO-08 (C)’ through the End Semester Examination (Question No. 1, July-December 2016, 20 marks).

**Question :**

<p>Q1 A two-plant system having a steam plant near the load centre and a hydro-plant at a remote location is shown in Fig. 1. The load is 500MW for 16hr a day and 350MW, for 8hr a day.</p> <p>The characteristics of the units are</p> $C_1 = 120 + 45P_{GT} + 0.075P_{GT}^2 \text{ ₹/hr.}$ $w_2 = 0.6P_{GH} + 0.00283P_{GH}^2 m^3/s.$ <p>Loss coefficient, <math>B_{22} = 0.001 \text{ per MW}</math>. Find the generation schedule, daily water used by the hydro-plant and daily operating cost of the thermal plant for <math>\gamma_j = 85.5 \text{ ₹}/m^3 - hr.</math></p>	<p>(20)</p>
<p style="text-align: center;">Fig. 1</p>	

The performance of the students in the above question is then summarized as given below in Table PO-08 (C).3 using rubrics defined in Table PO-08.1.

**Table PO-08 (C).3: Student’s performance in question targeting ‘PO-08 (C)’ course: UEE804**

No.	Roll No	Name	Marks (20)	Score(1-5)
1	101304001	Aarushi Bajaj	7	2
2	101304002	Abhey Arora	12	4
3	101304005	Aditi Narang	10	3
4	101304006	Aditya	11	3
5	101304007	Akshat	11	3
6	101304008	Akshay Kapoor	7	2
7	101304009	Akshay Kumar	4	2
8	101304010	Akshay Kumar Chaudhary	4	2
9	101304011	Akshay Sharma	10	3
10	101304012	Amandeep Kaur	5	2
11	101304013	Amandeep Singh	11	3
12	101304014	Amaninder Singh Randhawa	11	3
13	101304015	Angad Kapoor	5	2

No.	Roll No	Name	Marks (20)	Score(1-5)
14	101304016	Ankita Garg	13	4
15	101304018	Anmol Jawa	14	4
16	101304019	Anmolpreet Singh	4	2
17	101304020	Anyuti Tiwary	5	2
18	101304021	Arpit Sharma	5	2
19	101304023	Arshbir Kaur	9	3
20	101304024	Arshdeep Singh Bagga	9	3
21	101304025	Ashish	7	2
22	101304026	Ashish Rajpal	10	3
23	101304028	Berry Lubana	3	1
24	101304029	Bhanu Duggal	15	5
25	101304030	Bhanu Marwaha	6	2
26	101304031	Chirag Gaba	9	3
27	101304032	Dipin Garg	4	2
28	101304034	Divyesh Pratap Singh	12	4
29	101304035	Elham Anwar	8	3
30	101304036	Gurseerat Singh Meen	6	2
31	101304037	Gursewak Singh	9	3
32	101304040	Hariansh Sehgal	5	2
33	101304042	Himanshu Goyal	7	2
34	101304044	Jasjit Singh	4	2
35	101304045	Jassimran Singh Julka	4	2
36	101304046	Jessica Dhaliwal	9	3
37	101304047	Kanwarpal Singh	4	2
38	101304048	Karan Kumar	4	2
39	101304049	Karanjot Singh Kochar	5	2
40	101304050	Kashish Aggarwal	15	5
41	101304052	Love Gaba	13	4
42	101304054	Manik Mittal	3	1
43	101304055	Maninderjit Singh	10	3
44	101304056	Mayank Singla	10	3
45	101304057	Mridul Bhutani	8	3
46	101304059	Navdeep Singh	7	2
47	101304062	Nishant Garg	5	2
48	101484004	Azad Singh	7	2
49	101484007	Deepak Singla	4	2
50	101484008	Diljeet Singh	8	3

The overall performance of the students in the course based on marks in *UEEE804: Operation and Control of Power Systems* is summarized as given below in Table PO-08 (C).2.

**Table PO-08 (C).4:Average score of student performance in the course UEE804 for criteria PO-08 (C).**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE804	4.00	10.00	34.00	48.00	4.00	<b>2.62</b>

The above data is used to evaluate weighted average student class performance (course portfolio) for criteria PO-08 (C) as given below in Table PO-08 (C).5.

**Table PO-08 (C).5:Weighted Average Student class performance (course portfolio) for criteria PO-08 (C)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEN002	11.84	31.58	42.11	11.84	2.63	<b>3.38</b>
UEE804	4.00	10.00	34.00	48.00	4.00	<b>2.62</b>
Weighted Average Score	<b>7.92</b>	<b>20.79</b>	<b>38.05</b>	<b>29.92</b>	<b>3.32</b>	<b>3.00</b>

### b) Indirect measures for Performance criteria PO-08 (C) (Surveys)

**(i) Assessment Tools:** Student Course Surveys are used to assess the attainment of program outcome 'PO-08 (A)' through indirect measurement using following course learning objectives in the respective courses.

UEE804	Decide the scheduling of thermal units and hydro-thermal units for overall economy
UEN002	Define opportunities available for energy conservation and for use of renewable energy resources in local and regional entities.

**Table PO-08 (C).6: Weighted average score of performance criterion 'PO-08 (C)' based on surveys.**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEN002	52	29.6	12.8	3.7	2.4	<b>4.26</b>
UEE804	36.17	25.53	29.78	6.38	2.12	<b>3.87</b>
Weighted Average Score	<b>44.08</b>	<b>27.56</b>	<b>21.29</b>	<b>5.04</b>	<b>2.26</b>	<b>4.06</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome 'PO-08' through indirect measurement is summarized in Table PO-08 (A).7

**c) Overall weighted average score of performance criterion ‘PO-08 (C)’**

Finally overall weighted average score of performance criterion ‘PO-08 (C)’ is evaluated as given below in Table PO-08 (C).7

**Table PO-08 (C).7: Overall weighted average score of performance criterion ‘PO-08 (C)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance</b>	7.92	20.79	38.05	29.92	3.32	<b>3.00</b>	5
<b>Score surveys</b>	44.08	27.56	21.29	5.04	2.26	<b>4.06</b>	4
<b>Score on other surveys</b>	27.60	54.36	15.13	1.93	0.96	<b>4.05</b>	3
<b>Overall weighted score</b>	<b>24.89</b>	<b>31.43</b>	<b>26.73</b>	<b>14.62</b>	<b>2.37</b>	<b>3.61</b>	

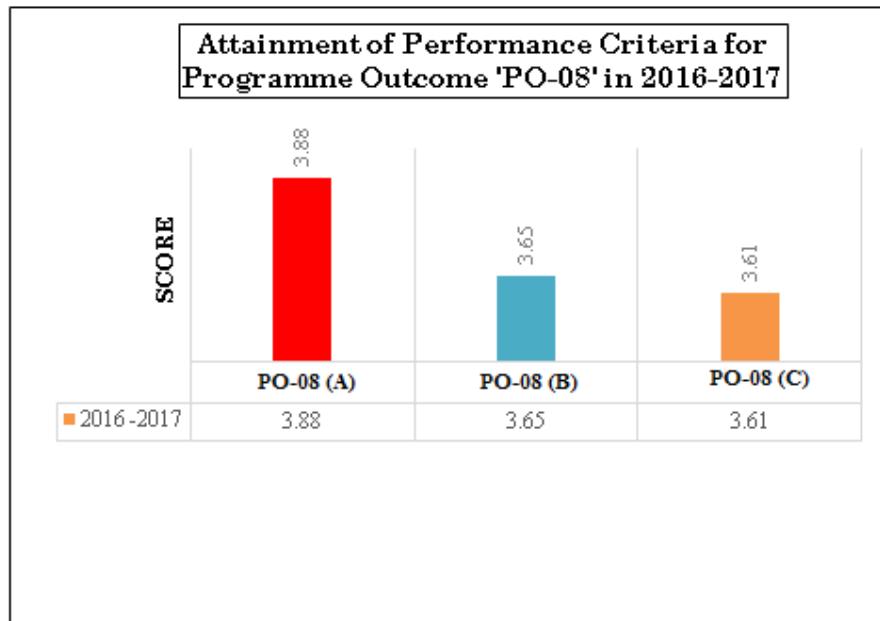
**Overall assessment of program outcome PO-08 using scores of PO-08 (A), PO-08 (B) and PO-08 (C)**

In the previous sections, each of the individual performance criteria PO-08 (A), PO-08 (B) and PO-08 (C) have been assessed. The performance for attainment of outcome PO-08 has been completed using the attainment values for PO-08 (A), PO-08 (B) and PO-08 (C) and is provided below:

Table PO-08.2 summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome PO-08.

**Table PO-08.2: Overall score for outcome PO-08 at the program level**

Performance criteria	% of students in each score					Overall weighted average score
	5	4	3	2	1	
<b>PO-08 (A)</b>	30.24	40.39	21.56	3.91	3.81	<b>3.88</b>
<b>PO-08 (B)</b>	30.47	31.05	22.46	5.85	10.08	<b>3.65</b>
<b>PO-08 (C)</b>	24.89	31.43	26.73	14.62	2.37	<b>3.61</b>
<b>Overall score</b>	<b>28.53</b>	<b>34.29</b>	<b>23.59</b>	<b>8.12</b>	<b>5.42</b>	<b>3.71</b>



**Figure PO-08.2: Performance criteria-wise assessment score distribution of outcome 'PO-08'**

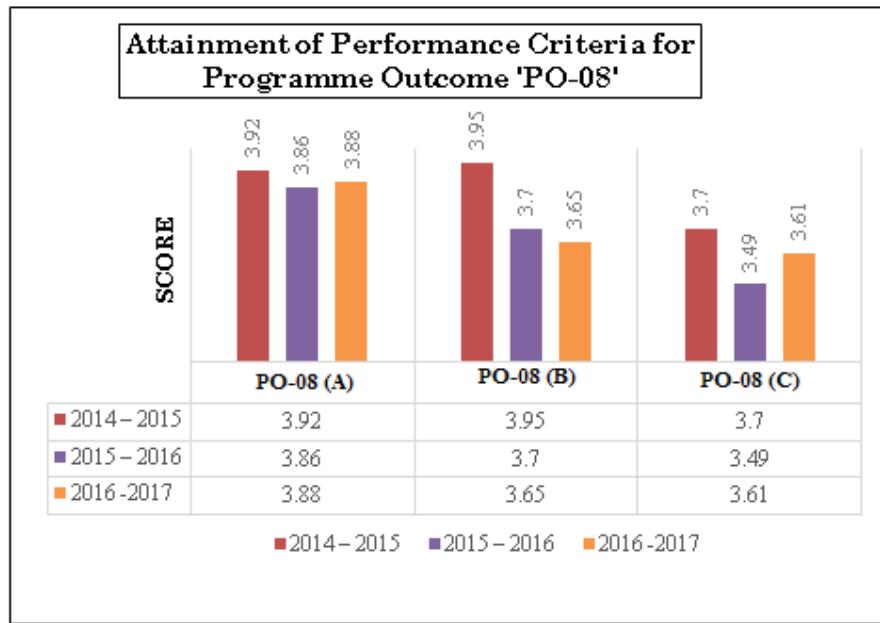
#### **Track record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessment scores distribution and overall weighted score for outcome 'PO-08' for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section. The Table PO-08.3 presents the performance criteria-wise assessment score distribution for outcome 'PO-08'.

**Table PO-08.3 Performance criteria-wise assessment score distribution for each outcome 'PO-08'.**

Program outcome and performance criteria	Academic year			
		2014 – 2015	2015 – 2016	2016 -2017
<b>PO-08</b>	<b>PO-08 (A)</b>	<b>3.92</b>	<b>3.86</b>	<b>3.88</b>
	<b>PO-08 (B)</b>	<b>3.95</b>	<b>3.70</b>	<b>3.65</b>
	<b>PO-08 (C)</b>	<b>3.70</b>	<b>3.49</b>	<b>3.61</b>
<b>Overall weighted score of outcome PO-08</b>		<b>3.85</b>	<b>3.68</b>	<b>3.71</b>

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome 'PO-08' over a period of last three years.



**Figure PO-08.3: Performance criteria-wise assessment score distribution of outcome 'PO-08'**

#### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

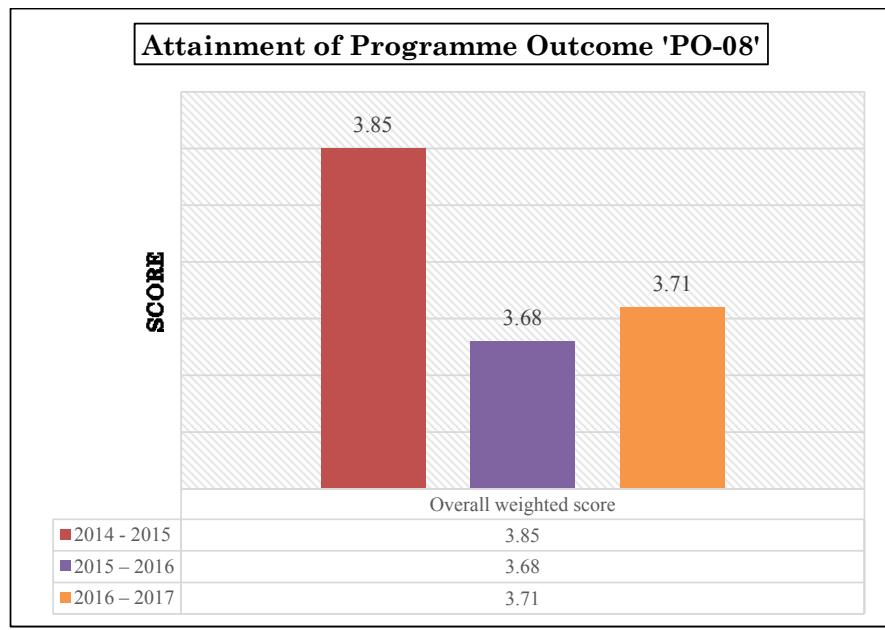
- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- Very good:** Overall weighted score for the outcome is between 4 and 4.5 on a scale of 1 to 5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4 on a scale of 1 to 5.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.
- Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

The Table PO-08.4 presents the overall weighted score of outcome 'PO-08' over the last three academic years.

**Table PO-08.4:Overall weighted score of the outcome 'PO-08' over a period of last three academic years.**

Academic year	Overall weighted score	Level of attainment
2014 - 2015	<b>3.85</b>	Good
2015 – 2016	<b>3.68</b>	Good
2016 – 2017	<b>3.71</b>	Good

Figure PO-08.4 shows the overall weighted score of outcome 'PO-08' over a period of last three academic years.



**Figure PO-08.4: Overall weighted score of outcome 'PO-08' over a period of last three academic years.**

# **Assessment of Attainment of Program outcome**

## **PO-09**

*A recognition of the need for, and an ability to engage in life-long learning  
(2016-17)*

*for the  
Bachelor of Engineering  
in  
Electrical Engineering*



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

**Electrical & Instrumentation Engineering Department  
Thapar Institute of Engineering and Technology Patiala  
(Punjab) -INDIA**

## **Attainment of Program outcome ‘PO-09’**

The attainment of program outcome **PO-09**: *A recognition of the need for, and an ability to engage in life-long learning* has been measured using a standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-09’ has been classified into following performance criteria:

**PO-09(A):** *Able to use resources to adopt new technologies not included in curriculum*

**PO-09(B):** *Ability to identify directions for continuing education opportunities*

**PO-09(C):** *Recognizes the need to embrace personal responsibility for lifelong learning.*

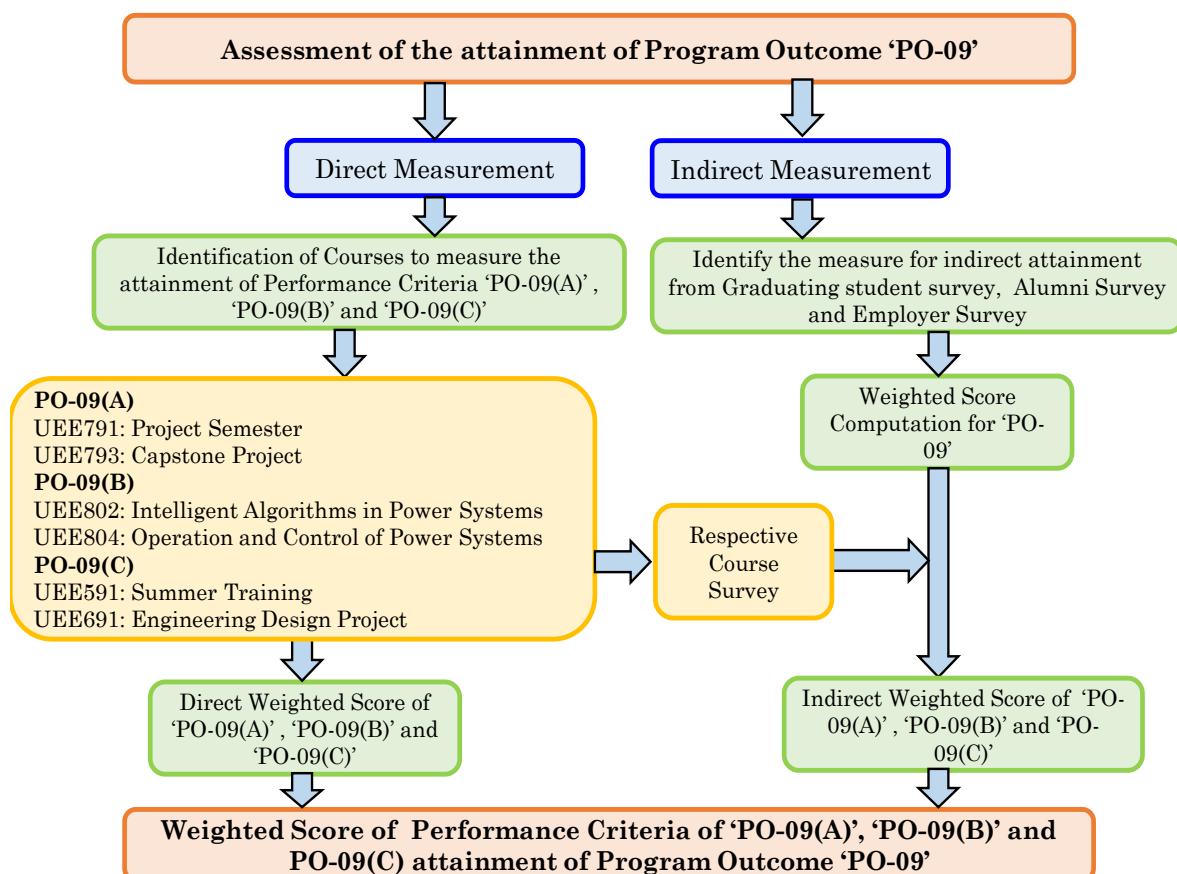
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-09’: The courses used for assessment during three academic years are marked bold

- UMA007: Numerical Analysis
- UTA008: Engineering Design I
- UTA010: Engineering Design II
- UMA031: Optimization Techniques
- UEE504: Power Electronics
- **UEE591: Summer Training**
- UEE601: Flexible AC Transmission Systems
- UEE603: Switchgear and Protection
- **UEE691: Engineering Design Project**
- **UEE791: Project Semester**
- **UEE793: Capstone Project**
- UEE801: Electric Drives
- **UEE802: Intelligent Algorithms in Power Systems**
- **UEE804: Operation and Control of Power Systems**
- UEI841: Advanced Control Systems

Outcome PO-09 has been assessed through three performance criteria PO-09(A), PO-09(B) and PO-09(C). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-09(A)’, ‘PO-09(B)’ and ‘PO-09(C)’ in the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-09(A)	UEE791: Project Semester	UEE793: Capstone Project
PO-09(B)	UEE802: Intelligent Algorithms in Power Systems	UEE804: Operation and Control of Power Systems
PO-09(C)	UEE591: Summer Training	UEE691: Engineering Design Project

The step by step methodology used to measure the attainment of program outcome PO-09 is shown in Fig. PO-09.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-09’ for all three academic years under consideration.



**Fig. PO-09.1: Process for measurement of attainment of outcome ‘PO-09’ for the year 2016-17**

The following Rubric has been used to convert marks obtained by the students to a Likert scale in the range of 1 to 5 is described in Table PO-09.1(a) and PO-09.1(b) in most cases unless specifically mentioned.

**Table PO-09.1(a): Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	80≤ Marks <100	5
2	60≤ Marks <80	4
3	40≤ Marks <60	3
4	20≤ Marks <40	2
5	0≤ Marks <20	1

**Table PO-09.1(b): Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	75≤ Marks <100	5
2	60≤ Marks <80	4
3	40≤ Marks <60	3
4	20≤ Marks <40	2
5	0≤ Marks <20	1

The following sections summarize separate assessments for each of the performance criteria using the courses mentioned.

## **Assessment of Outcome PO-09 using Performance Criterion PO-09(A)**

### **PO-09(A): Able to use resources to adopt new technologies not included in curriculum.**

The performance criteria ‘PO-09’ has been measured through direct assessment using the course portfolio and indirect assessment using surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students' performance using course portfolio**

Two courses namely *UEE 791: Project Semester* and *UEE793: Capstone Project* are used to assess performance criteria PO-09(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE791: Project Semester**

The performance of course *UEE791: Project Semester* is used to measure the attainment of outcome ‘PO-09(A)’ through the **Goal Report** (Jan-June 2017, 5 marks) which includes adaptation of new ideas to do the project.

The performance of the students in the above component is summarized in Table PO-09(A).1 using rubrics defined in Table PO-09.1(a).

**Table PO-09(A).1: Students' performance in component targeting ‘PO-09(A)’: Course UEE791**

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	3	4
2	101304002	Abhey Arora	2	3
3	101304003	Abhishek Taksali	4	5
4	101304004	Adhikaansh Tayal	4	5
5	101304005	Aditi Narang	4	5
6	101304006	Aditya	3	4
7	101304007	Akshat	1	2
8	101304008	Akshay Kapoor	2	3
9	101304009	Akshay Kumar	1	2
10	101304011	Akshay Sharma	2	3
11	101304012	Amandeep Kaur	3	4
12	101304013	Amandeep Singh	3	4
13	101304014	Amaninder Singh Randhawa	2	3
14	101304015	Angad Kapoor	3	4
15	101304016	Ankita Garg	3.5	4
16	101304018	Anmol Jawa	4	5
17	101304019	Anmolpreet Singh	3.5	4

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
18	101304020	Anyuti Tiwary	5	5
19	101304021	Arpit Sharma	3	4
20	101304023	Arshbir Kaur	4	5
21	101304024	Arshdeep Singh Bagga	3	4
22	101304025	Ashish	2	3
23	101304026	Ashish Rajpal	3	4
24	101304028	Berry Lubana	2	3
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	3	4
28	101304032	Dipin Garg	2	3
29	101304033	Dishant Vanvari	5	5
30	101304034	Divyesh Pratap Singh	4	5
31	101304035	Elham Anwar	4	5
32	101304036	Gurseerat Singh Meen	3	4
33	101304037	Gursewak Singh	1	2
34	101304040	Hariansh Sehgal	2	3
35	101304041	Hartejdeep Singh	4	5
36	101304042	Himanshu Goyal	3.5	4
37	101304044	Jasjit Singh	3.5	4
38	101304045	Jassimran Singh Julka	2	3
39	101304046	Jessica Dhaliwal	4	5
40	101304047	Kanwarpal Singh	2	3
41	101304048	Karan Kumar	5	5
42	101304049	Karanjot Singh Kochar	3.5	4
43	101304050	Kashish Aggarwal	3	4
44	101304051	Kritika Singla	2	3
45	101304052	Love Gaba	3	4
46	101304054	Manik Mittal	2	3
47	101304055	Maninderjit Singh	2	3
48	101304056	Mayank Singla	3	4
49	101304057	Mridul Bhutani	5	5
50	101304058	Naman Garg	3	4
51	101304059	Navdeep Singh	3	4
52	101304060	Navdeep Singh	3	4
53	101304061	Nazuk Aggarwal	4	5
54	101304062	Nishant Garg	3	4
55	101304063	Nishtha Raheja	2	3
56	101304064	Paras Bawa	2	3
57	101304065	Parth Ahuja	3	4

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
58	101304066	Parushi	4.5	5
59	101304067	Pency Goyal	4.5	5
60	101304068	Piyush Jindal	4	5
61	101304069	Piyush Tripathi	3	4
62	101304070	Prachi Garg	3	4
63	101304071	Prashant Kataria	1	2
64	101304072	Preeti Garg	5	5
65	101304073	Priyank Arora	3	4
66	101304074	Priyanka	4	5
67	101304075	Priyanka Singh	2	3
68	101304076	Priyansh Mahajan	1	2
69	101304077	Rahul Meena	4	5
70	101304079	Rajat Sharma	2	3
71	101304080	Ratul Goyal	3	4
72	101304081	Ravinder Singh	2	3
73	101304082	Rishabh Juneja	4	5
74	101304083	Robin Manktala	3	4
75	101304084	Rohan Ghai	2	3
76	101304085	Rohan Singla	3	4
77	101304086	Rohan Wadhawan	2	3
78	101304087	Rohit Goyal	2	3
79	101304088	Rubina Bamba	4	5
80	101304089	Sagar Pulani	3	4
81	101304090	Sahil Kataria	3	4
82	101304091	Sakshi	1	2
83	101304092	Sandal Singh Sidhu	4	5
84	101304093	Sandeep Kaur	3	4
85	101304094	Satripleen Kaur	4	5
86	101304095	Saurabh Mohan	3	4
87	101304097	Shailly Gupta	4	5
88	101304098	Shaina	3	4
89	101304099	Shivika Gupta	4	5
90	101304100	Shresth Rai	1	2
91	101304101	Shubham Goyal	4	5
92	101304102	Shubham Gupta	4	5
93	101304103	Shubham Sharma	4	5
94	101304104	Shubham Sharma	2	3
95	101304105	Shubham Soin	2	3
96	101304106	Siddharth Goyal	1	2
97	101304107	Sidharth Garg	5	5

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
98	101304108	Simran Kaur	3	4
99	101304109	Simranjit Singh	1	2
100	101304111	Sumit Dhingra	3	4
101	101304112	Sumit Kaushik	4	5
102	101304113	Tushar Dheer	4	5
103	101304114	Tushar Sharma	4	5
104	101304116	Utsav Chhabra	4	5
105	101304117	Vaibhav Gupta	3.5	4
106	101304118	Vaishali	4	5
107	101304119	Varun Bansal	5	5
108	101304120	Veni Jindal	5	5
109	101304121	Vishal Arora	3	4
110	101304122	Yugesh Goyal	4.5	5
111	101484001	Amandeep Singh	3	4
112	101484002	Amrinder Singh	3	4
113	101484004	Azad Singh	2	3
114	101484005	Chandan Garg	2	3
115	101484007	Deepak Singla	4	5
116	101484008	Diljeet Singh	3	4
117	101484009	Jyoti Kaushal	3	4
118	101484011	Pawan Kumar	1	2
119	101484012	Rajat Singla	3	4
120	101484013	Satveer Kaur	3	4
121	101484014	Saurabh Kumar Wadhawan	3.5	4
122	101484015	Shweta Sharma	2	3
123	101484016	Sukhjeet Singh	2	3

The performance of students through the course UEE791 for criteria ‘PO-09(A)’ is summarized in Table PO-09(A).2

**Table PO-09(A).2: Average score of student performance in the course UEE791 for criteria ‘PO-09(A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	33.33	36.59	21.95	8.13	0.00	3.95

### UEE793: Capstone Project

The performance of course *UEE793: Capstone Project* used to measure the attainment of outcome ‘PO-09(A)’ through the ability of students for selection of new techniques and tools through **Design and Simulation of process/system** component (July-Dec 2016, 5 Marks).

Component of Evaluation	Poor(1)	Average(2)	Good(3-4)	Excellent(5)
<b>Design and Simulation of process / system:</b>  Using engineering knowledge and concepts /codes / standards /design and device manuals/ literature etc. Application of software/mathematical tools	No or erroneous application of engineering principles yielding unreasonable solution. No or erroneous application of software /mathematical tools. Improper selection of devices.	Serious deficiencies in proper selection and use of engineering principles. Serious deficiencies in application of software/mathematical tools. No use of modern devices.	Effective application of engineering principles resulting in reasonable solution. Moderate application of software/ mathematical tools. Selection of modern devices.	Critical selection and application of engineering principles ensuring reasonable results. Adequate application of simulation design tools. Selection of proper device/equipment specifications, Assembly of circuit is completed.

The performance of the students in the above component is summarized in Table PO-09(A).3 using rubrics defined in Table PO-09.1(a).

**Table PO-09(A).3: Students' performance in component targeting ‘PO-09(A)’: Course UEE793**

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	2.5	3
2	101304002	Abhey Arora	2.5	3
3	101304003	Abhishek Taksali	2.5	3
4	101304004	Adhikaansh Tayal	2.5	3
5	101304005	Aditi Narang	2	3
6	101304006	Aditya	3	4
7	101304007	Akshat	2.5	3
8	101304008	Akshay Kapoor	3	4
9	101304009	Akshay Kumar	2.5	3
10	101304010	Akshay Kumar Chaudhary	4	5
11	101304011	Akshay Sharma	3	4
12	101304012	Amandeep Kaur	3	4
13	101304013	Amandeep Singh	4	5
14	101304014	Amaninder Singh Randhawa	2	3
15	101304015	Angad Kapoor	3	4
16	101304016	Ankita Garg	3	4
17	101304018	Anmol Jawa	3	4

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
18	101304019	Anmolpreet Singh	4	5
19	101304020	Anyuti Tiwary	3	4
20	101304021	Arpit Sharma	4	5
21	101304022	Arsh Kundal	3	4
22	101304023	Arshbir Kaur	3	4
23	101304024	Arshdeep Singh	2.5	3
24	101304025	Ashish	3	4
25	101304026	Ashish Rajpal	4	5
26	101304028	Berry	3.5	4
27	101304029	Bhanu	4.5	5
28	101304030	Bhanu	4	5
29	101304031	Chirag Gaba	2.5	3
30	101304032	Dipin	3	4
31	101304033	Dishant	3	4
32	101304034	Divyesh Pratap	4	5
33	101304035	Elham	3	4
34	101304036	Gurseerat	3.5	4
35	101304037	Gursewak Singh	2.5	3
36	101304040	Harvensh	4	5
37	101304041	Hartejdeep Singh	2.5	3
38	101304042	Himanshu Goyal	4	5
39	101304044	Jasjit Singh	2.5	3
40	101304045	Jassimran Singh	3.5	4
41	101304046	Jessica	4	5
42	101304047	Kanwarpal singh	2.5	3
43	101304048	Karan Kumar	2	3
44	101304049	Karamjot Singh	2.5	3
45	101304050	Kashish Agarwal	4	5
46	101304051	Kritika	3.5	4
47	101304052	Love gaba	2	3
48	101304054	Manik Mittal	4	5
49	101304055	Maninderjit Singh	2.5	3
50	101304056	Mayank Singla	2	3
51	101304057	Mridul	2.5	3
52	101304058	Naman Garg	4	5
53	101304059	Navdeep Singh	3	4
54	101304060	Navdeep Singh	2.5	3
55	101304061	Nazuk Agarwal	3	4
56	101304062	Nishant Garg	3.5	4
57	101304063	Nishtha Raheja	4	5

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
58	101304064	Paras Bawa	3	4
59	101304065	Parth Ahuja	2.5	3
60	101304066	Parushi	2.5	3
61	101304067	Pency Goyal	3.5	4
62	101304068	Piyush Jindal	3	4
63	101304069	Piyush Tripathi	4	5
64	101304070	Prachi Garg	2.5	3
65	101304071	Prashant Kataria	2.5	3
66	101304072	Preeti Garg	2.5	3
67	101304073	Priyank Arora	2.5	3
68	101304074	Priyanka	3.5	4
69	101304075	Priyanka Singh	4	5
70	101304076	Priyansh Mahajan	3	4
71	101304077	Rahul Meena	2.5	3
72	101304078	Rajan	2	3
73	101304079	Rajat Sharma	2.5	3
74	101304080	Ratul Goyal	4	5
75	101304081	Ravinder Singh	3	4
76	101304082	Rishabh Juneja	2	3
77	101304083	Robin Manktala	3	4
78	101304084	Rohan Ghai	4	5
79	101304085	Rohan Singla	4	5
80	101304086	Rohan Wadhawan	2.5	3
81	101304087	Rohit Goyal	4	5
82	101304088	Rubina Bamba	2.5	3
83	101304089	Sagar Pulani	4	5
84	101304090	Sahil Kataria	3	4
85	101304091	Sakshi	3.5	4
86	101304092	Sandal Singh Sidhu	2.5	3
87	101304093	Sandeep Kaur	2.5	3
88	101304094	SatRipleen kaur	4	5
89	101304095	Saurabh Mohan	2.5	3
90	101304096	Shagundeepraj Singh	3.5	4
91	101304097	Shailly Gupta	3	4
92	101304098	Shaina	4	5
93	101304099	Shivika Gupta	2.5	3
94	101304100	Shresth Rai	3.5	4
95	101304101	Shubham Goyal	3	4
96	101304102	Shubham Gupta	2.5	3
97	101304103	Shubham Sharma	4	5

S. No.	Roll No	Name of Student	Marks (5)	Score (1-5)
98	101304104	Shubham Sharma	4	5
99	101304105	Shubham Soin	4	5
100	101304106	Siddharth Goyal	2.5	3
101	101304107	Sidharth Garg	3.5	4
102	101304108	Simran Kaur	3	4
103	101304109	Simranjit Singh	3	4
104	101304111	Sumit Dhingra	4	5
105	101304112	Sumit Kaushik	4	5
106	101304113	Tushar Dheer	3	4
107	101304114	Tushar Sharma	3.5	4
108	101304116	Utsav Chhabra	3	4
109	101304117	Vaibhav Gupta	3	4
110	101304118	Vaishali	3	4
111	101304119	Varun Bansal	3	4
112	101304120	Veni Jindal	3	4
113	101304121	Vishal Arora	3	4
114	101304122	Yugesh Goyal	3.5	4
115	101484001	Amandeep Singh	4	5
116	101484002	Amrinder Singh	4	5
117	101484003	Ashmeen Singh	3.5	4
118	101484004	Azad Singh	2.5	3
119	101484005	Chardan Garg	2.5	3
120	101484007	Deepak	3	4
121	101484008	Diljeet Singh	3	4
122	101484009	Jyoti Kaushal	3	4
123	101484011	Pawan Kumar	3	4
124	101484012	Rajat Singla	3	4
125	101484013	Satveer Kaur	3.5	4
126	101484014	Saurabh Kumar Wadhawan	2	3
127	101484015	Shweta Sharma	3	4
128	101484016	Sukhjeet Singh	2	3

The performance of students through the course UEE793 for criteria ‘PO-09(A)’ is summarized in Table PO-09(A).4

**Table PO-09(A).4: Average score of student performance in the course UEE793 for criteria ‘PO-09(A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE793	24.22	42.19	33.59	0.00	0.00	3.91

The data from Table PO-09(A).2 and Table PO-09(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-09(A)’ and is summarised in Table PO-09(A).5.

**Table PO-09(A).5: Weighted Average Student class performance (course portfolio) for criteria ‘PO-09(A)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	33.33	36.59	21.95	8.13	0.00	<b>3.95</b>
UEE793	24.22	42.19	33.59	0.00	0.00	<b>3.91</b>
Weighted Average Score	<b>28.78</b>	<b>39.39</b>	<b>27.77</b>	<b>4.07</b>	<b>0.00</b>	<b>3.93</b>

**b) Indirect measures:**

The indirect measurement of performance criteria ‘PO-09(A)’ has been assessed through Student Course Surveys and surveys (Graduating student survey, Alumni survey and Employer survey). The weighted average score in respective surveys is summarised in Table PO-09(A).6 and Table PO-09(A).7.

**(i) Assessment Tool: Student Course Surveys**

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-09(A)’.

UEE791	Acquire knowledge and experience of software and hardware practices in the area of project.
UEE793	To design an electrical engineering project implementing an integrated design approach applying knowledge accrued in various professional courses.

**Table PO-09(A).6: Weighted average score of performance criterion ‘PO-09(A)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE791	30.08	27.64	34.96	4.88	2.44	<b>3.78</b>
UEE793	35.16	32.03	28.12	3.12	1.56	<b>3.96</b>
<b>Weighted average score</b>	<b>32.62</b>	<b>29.835</b>	<b>31.54</b>	<b>4</b>	<b>2</b>	<b>3.87</b>

**(ii) Assessment Tool: Graduating Student Survey, Alumni Survey and Employer Survey**

(Other surveys) are used to assess the attainment of program outcome ‘PO-09’ through indirect measurement using following question in the respective surveys.

Graduating Survey	A recognition of the need for, and an ability to engage in life-long learning
Alumni Survey	
Employer Survey	Do our students have recognition of the need for, and an ability to engage in life-long learning?

**Table PO-09(A).7: Weighted average score of performance criterion ‘PO-09(A)’ based on surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
Graduating student survey	45.07	47.89	7.04	0	0	<b>4.38</b>
Employer survey	53.33	33.33	13.33	0.00	0.00	<b>4.40</b>
Alumni survey	33.33	36.23	24.64	4.35	1.45	<b>3.95</b>
<b>Weighted average score</b>	<b>43.91</b>	<b>39.15</b>	<b>15.00</b>	<b>1.45</b>	<b>0.48</b>	<b>4.25</b>

**c) Overall weighted average score of performance criterion ‘PO-09(A)’**

The overall weighted average score of performance criterion ‘PO-09(A)’ is summarised in Table PO-09(A).8 from the data given in Tables PO-09(A).5, PO-09(A).6 and PO-09(A).7.

**Table PO-09(A).8: Overall weighted average score of performance criterion ‘PO-09(A)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	28.78	39.39	27.77	4.07	0.00	<b>3.93</b>	5
Course surveys	32.62	29.835	31.54	4	2	<b>3.87</b>	4
Other surveys	43.91	39.15	15	1.45	0.48	<b>4.25</b>	3
<b>Overall weighted score</b>	<b>33.84</b>	<b>36.15</b>	<b>25.83</b>	<b>3.39</b>	<b>0.79</b>	<b>3.99</b>	

## **Assessment of Outcome ‘PO-09’ using Performance Criterion ‘PO-09(B)’**

### **PO-09(B): Ability to identify directions for continuing education opportunities.**

The performance criteria ‘PO-09(B)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE802: Intelligent Algorithms in Power Systems* and *UEE804: Operation Control of Power* are used to assess performance criteria PO-09(B) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE802: Intelligent Algorithms in Power Systems**

The performance of course *UEE802: Intelligent Algorithms in Power Systems* is used to measure the attainment of outcome ‘PO-09(B)’ (July-Dec, 2016, 100 marks).

The performance of the students in the above course is summarized in Table PO-09(B).1 using rubrics defined in Table PO-09.1(b).

**Table PO-09(B).1: Students’ performance in course targeting ‘PO-09(B)’: Course UEE802**

S. No.	Roll No	Name of Student	Marks (100)	Score (1-5)
1	101254015	Kuldeep Singh Deora	47.78	3
2	101304001	Aarushi Bajaj	77.7	5
3	101304002	Abhey Arora	51.25	3
4	101304003	Abhishek Taksali	44.35	3
5	101304004	Adhikaansh Tayal	28.6	2
6	101304005	Aditi Narang	80	5
7	101304006	Aditya	77.15	5
8	101304007	Akshat	60.75	4
9	101304008	Akshay Kapoor	81.4	5
10	101304009	Akshay Kumar	53.65	3
11	101304010	Akshay Kumar Chaudhary	36.15	2
12	101304011	Akshay Sharma	58.8	3
13	101304012	Amandeep Kaur	60.55	4
14	101304013	Amandeep Singh	57.55	3
15	101304014	Amaninder Singh Randhawa	40.9	3
16	101304015	Angad Kapoor	71.05	4
17	101304016	Ankita Garg	78.7	5
18	101304017	Ankur Malik	0	1

S. No.	Roll No	Name of Student	Marks (100)	Score (1-5)
19	101304018	Anmol Jawa	79.45	5
20	101304019	Anmolpreet Singh	58.9	3
21	101304020	Anyuti Tiwary	74.85	4
22	101304021	Arpit Sharma	59.8	3
23	101304022	Arsh Kundal	32.65	2
24	101304023	Arshbir Kaur	59	3
25	101304024	Arshdeep Singh Bagga	39.3	2
26	101304025	Ashish	41.85	3
27	101304026	Ashish Rajpal	51.25	3
28	101304028	Berry Lubana	62.15	4
29	101304029	Bhanu Duggal	76.45	5
30	101304030	Bhanu Marwaha	44.85	3
31	101304031	Chirag Gaba	58.15	3
32	101304032	Dipin Garg	58.75	3
33	101304033	Dishant Vanvari	59.45	3
34	101304034	Divyesh Pratap Singh	72.15	4
35	101304035	Elham Anwar	61.55	4
36	101304036	Gurseerat Singh Meen	35.2	2
37	101304037	Gursewak Singh	57.6	3
38	101304040	Hariansh Sehgal	49.4	3
39	101304041	Hartejdeep Singh	54.25	3
40	101304042	Himanshu Goyal	69.95	4
41	101304044	Jasjit Singh	43.4	3
42	101304045	Jassimran Singh Julka	45.45	3
43	101304046	Jessica Dhaliwal	85.75	5
44	101304047	Kanwarpal Singh	53.45	3
45	101304048	Karan Kumar	33.55	2
46	101304049	Karanjot Singh Kochar	63.15	4
47	101304050	Kashish Aggarwal	75.85	5
48	101304052	Love Gaba	69.25	4
49	101304054	Manik Mittal	58.45	3
50	101304055	Maninderjit Singh	33.15	2
51	101304056	Mayank Singla	62.95	4
52	101304057	Mridul Bhutani	63.45	4
53	101304058	Naman Garg	83.15	5
54	101304059	Navdeep Singh	67.05	4
55	101304060	Navdeep Singh	60.42	4
56	101304062	Nishant Garg	75.15	5
57	101304094	Satripleen Kaur	70.2	4
58	101484001	Amandeep Singh	62.65	4

S. No.	Roll No	Name of Student	Marks (100)	Score (1-5)
59	101484002	Amrinder Singh	64.35	4
60	101484003	Ashmeen Singh	35.3	2
61	101484004	Azad Singh	55.95	3
62	101484005	Chandan Garg	50	3
63	101484007	Deepak Singla	58.05	3
64	101484008	Diljeet Singh	60.85	4
65	101304051	Kritika Singla	75.9	5
66	101304061	Nazuk Aggarwal	76	5
67	101304063	Nishtha Raheja	69.7	4
68	101304064	Paras Bawa	51.9	3
69	101304065	Parth Ahuja	76.5	5
70	101304066	Parushi	75.2	5
71	101304067	Pency Goyal	57.2	3
72	101304068	Piyush Jindal	45.5	3
73	101304069	Piyush Tripathi	46.6	3
74	101304070	Prachi Garg	74.2	4
75	101304071	Prashant Kataria	38.9	2
76	101304072	Preeti Garg	62.8	4
77	101304073	Priyank Arora	67.7	4
78	101304074	Priyanka	64.5	4
79	101304075	Priyanka Singh	82.5	5
80	101304076	Priyansh Mahajan	69.2	4
81	101304077	Rahul Meena	49.9	3
82	101304078	Rajan	62.1	4
83	101304079	Rajat Sharma	62.5	4
84	101304080	Ratul Goyal	52.9	3
85	101304081	Ravinder Singh	56.7	3
86	101304082	Rishabh Juneja	63.6	4
87	101304083	Robin Manktala	54	3
88	101304084	Rohan Ghai	73.4	4
89	101304085	Rohan Singla	57.5	3
90	101304086	Rohan Wadhawan	65.4	4
91	101304087	Rohit Goyal	61.5	4
92	101304088	Rubina Bamba	62.2	4
93	101304089	Sagar Pulani	69.2	4
94	101304090	Sahil Kataria	71.6	4
95	101304091	Sakshi	59.3	3
96	101304092	Sandal Singh Sidhu	49.3	3
97	101304093	Sandeep Kaur	52	3
98	101304095	Saurabh Mohan	61.9	4

S. No.	Roll No	Name of Student	Marks (100)	Score (1-5)
99	101304096	Shagundeepraj Singh	41.4	3
100	101304097	Shailesh Gupta	66.2	4
101	101304098	Shaina	70.8	4
102	101304099	Shivika Gupta	58	3
103	101304100	Shresth Rai	65	4
104	101304101	Shubham Goyal	72.6	4
105	101304102	Shubham Gupta	79.6	5
106	101304103	Shubham Sharma	71.1	4
107	101304104	Shubham Sharma	80.3	5
108	101304105	Shubham Soin	76.3	5
109	101304106	Siddharth Goyal	57.8	3
110	101304107	Sidharth Garg	66.8	4
111	101304108	Simran Kaur	62.6	4
112	101304109	Simranjit Singh	22.8	2
113	101304111	Sumit Dhingra	62.8	4
114	101304112	Sumit Kaushik	82.4	5
115	101304113	Tushar Dheer	64.3	4
116	101304114	Tushar Sharma	53.4	3
117	101304116	Utsav Chhabra	39.4	2
118	101304117	Vaibhav Gupta	61.4	4
119	101304118	Vaishali	56.7	3
120	101304119	Varun Bansal	59.1	3
121	101304120	Veni Jindal	90.8	5
122	101304121	Vishal Arora	59.6	3
123	101304122	Yugesh Goyal	57.7	3
124	101484009	Jyoti Kaushal	54.9	3
125	101484011	Pawan Kumar	51.6	3
126	101484012	Rajat Singla	59.5	3
127	101484013	Satveer Kaur	83.9	5
128	101484014	Saurabh Kumar Wadhawan	54.7	3
129	101484015	Shweta Sharma	50.6	3
130	101484016	Sukhjeet Singh	58.4	3

The performance of students through the course UEE802 for criteria ‘PO-09(B)’ is summarized in Table PO-09(B).2.

**Table PO-09(B).2: Average score of student performance in the course UEE802 for criteria ‘PO-09(B)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	16.92	33.85	40.00	8.46	0.77	3.58

## UEE804: Operation and Control of Power Systems

The performance of course *UEE804: Operation and Control of Power Systems* is used to measure the attainment of outcome ‘PO-09(B)’ (July-Dec, 2016, 100 marks).

The performance of the students in the above course is summarized in Table PO-09(B).3 using rubrics defined in Table PO-09.1(b).

**Table PO-09(B).3: Students' performance in course targeting 'PO-09(B)': Course UEE804**

S. No.	Roll No.	Name of Student	Marks (100)	Score (1-5)
1	101304001	Aarushi Bajaj	68.4	4
2	101304002	Abhey Arora	36.2	2
3	101304003	Abhishek Taksali	33.3	2
4	101304004	Adhikaansh Tayal	15.9	1
5	101304005	Aditi Narang	65.3	4
6	101304006	Aditya	57.5	3
7	101304007	Akshat	53.3	3
8	101304008	Akshay Kapoor	62.5	4
9	101304009	Akshay Kumar	42.5	3
10	101304010	Akshay Kumar Chaudhary	34.2	2
11	101304011	Akshay Sharma	50.4	3
12	101304012	Amandeep Kaur	46.2	3
13	101304013	Amandeep Singh	50.1	3
14	101304014	Amaninder Singh Randhawa	16.5	1
15	101304015	Angad Kapoor	39.9	2
16	101304016	Ankita Garg	68.7	4
17	101304017	Ankur Malik	0	1
18	101304018	Anmol Jawa	65.1	4
19	101304019	Anmolpreet Singh	48.6	3
20	101304020	Anyuti Tiwary	60.6	4
21	101304021	Arpit Sharma	46.1	3
22	101304022	Arsh Kundal	33.8	2
23	101304023	Arshbir Kaur	53.3	3
24	101304024	Arshdeep Singh Bagga	45.2	3
25	101304025	Ashish	55.2	3
26	101304026	Ashish Rajpal	50.5	3
27	101304028	Berry Lubana	40.2	3
28	101304029	Bhanu Duggal	71.2	4
29	101304030	Bhanu Marwaha	39.1	2
30	101304031	Chirag Gaba	46	3
31	101304032	Dipin Garg	56.3	3
32	101304033	Dishant Vanvari	48.8	3
33	101304034	Divyesh Pratap Singh	49.3	3

34	101304035	Elham Anwar	51.3	3
35	101304036	Gurseerat Singh Meen	28.6	2
36	101304037	Gursewak Singh	45.4	3
37	101304040	Hariansh Sehgal	44.4	3
38	101304041	Hartejdeep Singh	24.9	2
39	101304042	Himanshu Goyal	46.9	3
40	101304044	Jasjit Singh	30	2
41	101304045	Jassimran Singh Julka	41.5	3
42	101304046	Jessica Dhaliwal	66.1	4
43	101304047	Kanwarpal Singh	25.4	2
44	101304048	Karan Kumar	35	2
45	101304049	Karanjot Singh Kochhar	57.4	3
46	101304050	Kashish Aggarwal	65.7	4
47	101304052	Love Gaba	58.5	3
48	101304054	Manik Mittal	39.8	2
49	101304055	Maninderjit Singh	37.4	2
50	101304056	Mayank Singla	48.6	3
51	101304057	Mridul Bhutani	48.1	3
52	101304058	Naman Garg	87.6	5
53	101304059	Navdeep Singh	58.9	3
54	101304060	Navdeep Singh	44.7	3
55	101304062	Nishant Garg	50.3	3
56	101304094	Satripleen Kaur	64.8	4
57	101484001	Amandeep Singh	61.2	4
58	101484002	Amrinder Singh	61.8	4
59	101484003	Ashmeen Singh	36.4	2
60	101484004	Azad Singh	44.7	3
61	101484005	Chandan Garg	35.95	2
62	101484007	Deepak Singla	46.2	3
63	101484008	Diljeet Singh	46.1	3

The performance of students through the course UEE804 for criteria ‘PO-09(B)’ is summarized in Table PO-09(B).4.

**Table PO-09(B).4: Average score of student performance in the course UEE804 for criteria ‘PO-09(B)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE804	1.59	19.05	50.79	23.81	4.76	2.89

The data from Table PO-09(B).2 and Table PO-09(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-09(B)’ and is summarised in Table PO-09(B).5.

**Table PO-09(B).5: Weighted Average Student class performance (course portfolio) for criteria ‘PO-09(B)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	16.92	33.85	40.00	8.46	0.77	<b>3.58</b>
UEE804	1.59	19.05	50.79	23.81	4.76	<b>2.89</b>
<b>Weighted Average Score</b>	<b>9.26</b>	<b>26.45</b>	<b>45.40</b>	<b>16.14</b>	<b>2.77</b>	<b>3.23</b>

**b) Indirect measures:**

The indirect measurement of performance criteria ‘PO-09(B)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-09(B).6.

**(ii) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-09(B)’.

UEE802	<ul style="list-style-type: none"> <li>• Appraise the behaviour of different neural networks.</li> <li>• Use neural networks for application such as classification, optimization and control problems.</li> <li>• Appraise the behaviour of genetic algorithm as stochastic search methods. Obtain the optimum solution of formulated optimization problem using genetic algorithm.</li> <li>• Examine the fuzzy system and implement fuzzy controllers for control and classification.</li> <li>• Explain hybrid intelligent algorithms and apply it for typical electrical application.</li> </ul>
UEE804	<ul style="list-style-type: none"> <li>• Decide the scheduling of thermal units and hydro-thermal units for overall economy</li> <li>• Develop small scale model of alternator excitation and governing systems.</li> <li>• Design and apply control for frequency and voltage of power system represented by single or multi-area.</li> <li>• Comprehend power system security and contingency.</li> <li>• Computation of small scale and voltage stability.</li> </ul>

**Table PO-09(B).6: Weighted average score of performance criterion ‘PO-09(B)’ based on student course surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE802	29.69	33.28	31.56	2.03	3.44	3.84
UEE804	39.21	23.10	23.68	6.42	7.58	3.80
<b>Weighted average score</b>	<b>34.45</b>	<b>28.19</b>	<b>27.62</b>	<b>4.225</b>	<b>5.51</b>	<b>3.82</b>

**(iii) Assessment Tools:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-09’ through indirect measurement using Table PO-09(A).7

**c) Overall weighted average score of performance criterion ‘PO-09(B)’**

The overall weighted average score of performance criterion ‘PO-09(B)’ is summarised in Table PO-09(B).7 from the data given in Tables PO-09(B).5, PO-09(B).6 and PO-09(A).7.

**Table PO-09(B).7: Overall weighted average score of performance criterion ‘PO-09(B)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance</b>	9.26	26.45	45.40	16.14	2.77	<b>3.23</b>	5
<b>Course surveys</b>	34.45	28.19	27.62	4.225	5.51	<b>3.82</b>	4
<b>Other surveys</b>	43.91	39.15	15	1.45	0.48	<b>4.25</b>	3
<b>Overall weighted score</b>	<b>26.32</b>	<b>30.21</b>	<b>31.87</b>	<b>8.50</b>	<b>3.11</b>	<b>3.68</b>	

## **Assessment of Outcome ‘PO-09’ using Performance Criterion ‘PO-09(C)’**

### **PO-09(C): Recognizes the need to embrace personal responsibility for lifelong learning.**

The performance criteria ‘PO-09(C)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students’ performance using Course Portfolio**

Two courses namely *UEE591: Summer Training* and *UEE691: Engineering Design Project* are used to assess performance criteria ‘PO-09(C)’ as a direct measure. The analysis for each of these courses is provided below:

#### **UEE591: Summer Training**

The performance of course *UEE591: Summer Training* is used to measure the attainment of outcome ‘PO-09(C)’ through evaluation of six weeks summer training (June-July 2016, 10 marks) which includes **Presentation of industrial experience of the candidate for lifelong learning.**

The performance of the students in the above component is summarized in Table PO-09(C).1 using rubrics defined in Table PO-09.1(a).

**Table PO-09(C).1: Students’ performance in component targeting ‘PO-09(C)’: Course UEE591**

S. No.	Roll No	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	6	4
2	101404002	Abhijeet Singh Sankhla	6	4
3	101404004	Abhinav Arora	6	4
4	101404006	Abhishek Sharma	8	5
5	101404007	Ajay Singh	6	4
6	101404009	Alka Thakur	6	4
7	101404012	Ankush Goyal	6	4
8	101404013	Anmol Arjun Bharaj	6	4
9	101404014	Anmol Goyat	6	4
10	101404015	Anmol Rattan Kaur	8	5
11	101404017	Anubhav Kumar	6	4
12	101404018	Apeksha Goel	8	5
13	101404019	Arnish Jain	8	5
14	101404020	Arshiya	8	5
15	101404021	Arshjot Kaur	8	5
16	101404023	Ayush Jain	6	4
17	101404024	Bhawani Singh	6	4

S. No.	Roll No	Name of Student	Marks (10)	Score (1-5)
18	101404025	Chirag Jain	6	4
19	101404026	Davileen Garg	8	5
20	101404027	Dilpreet Kaur	6	4
21	101404028	Divesh Kamdar	8	5
22	101404029	Divyam Aggarwal	8	5
23	101404031	Divyanshu Siddharth	6	4
24	101404032	Garima	8	5
25	101404033	Garv Chahar	6	4
26	101404035	Gaurav Rathore	6	4
27	101404036	Gurpreet Singh	6	4
28	101404037	Gursagar Singh	6	4
29	101404038	Gurupinder Pal Singh	6	4
30	101404039	Harmanpreet Singh	6	4
31	101404041	Harshit Kaushik	8	5
32	101404042	Harshvir Singh	6	4
33	101404043	Harsimarjot Kaur	8	5
34	101404044	Harsimran Singh	8	5
35	101404045	Hartej Singh Bains	8	5
36	101404046	Heema Gupta	6	4
37	101404047	Hitesh Kumar	8	5
38	101404048	Ishita Mahindru	8	5
39	101404049	Jagmeet Singh Bawa	6	4
40	101404050	Jagnoor Kaur	8	5
41	101404051	Jashanpreet Singh	6	4
42	101404052	Jatin Bansal	6	4
43	101404053	Jatin Raheja	6	4
44	101404054	Kanishak Sharma	6	4
45	101404055	Karan Sanjeev Bajaj	6	4
46	101404056	Kirtish Madaan	6	4
47	101404057	Mahitosh Sharma	8	5
48	101404058	Manan Mittal	8	5
49	101404059	Mandeep Singh Panesar	8	5
50	101404060	Manisha Gupta	6	4
51	101404061	Manit Gupta	6	4
52	101404062	Manjosh Singh Dhillon	8	5
53	101404063	Manpreet Singh Brar	6	4
54	101404064	Manvir Kaur	8	5
55	101404065	Mehak Bhatia	8	5
56	101404066	Mithilesh Kumar	6	4
57	101404067	Mohit Goyal	8	5

S. No.	Roll No	Name of Student	Marks (10)	Score (1-5)
58	101404068	Mridul Marwaha	8	5
59	101404069	Mudit Arora	8	5
60	101404070	Naveen Parashar	6	4
61	101404072	Nigam Wadhwa	6	4
62	101404073	Nikhil Danodia	8	5
63	101404074	Nishita Kumari	8	5
64	101404075	Nitin Gupta	6	4
65	101404076	Nitish Arora	6	4
66	101404077	Nitish Bhardwaj	6	4
67	101404078	Omandeep Kaur	8	5
68	101404079	Pankaj Garg	6	4
69	101404080	Paramjot Singh	6	4
70	101404081	Parmar Adhiraj Singh	6	4
71	101404083	Prabhdeep Kaur	8	5
72	101404084	Prachur Maharwal	6	4
73	101404087	Prashant Khare	8	5
74	101404089	Pulkit Bansal	8	5
75	101404090	Pushpinder Singh	8	5
76	101404091	Rachit Verma	8	5
77	101404092	Rahul Gautam	6	4
78	101404093	Rahul Goyal	8	5
79	101404094	Rajshree Vaidya	6	4
80	101404096	Rishabh Gupta	8	5
81	101404099	Sagar Bansal	8	5
82	101404100	Sahajdeep Kaur	8	5
83	101404102	Sahil Singla	8	5
84	101404103	Samarth Gupta	6	4
85	101404104	Sambhav Jain	6	4
86	101404105	Samrat Kumar Gupta	6	4
87	101404106	Sanamdeep Singh	6	4
88	101404107	Sanket Gupta	6	4
89	101404109	Shailesh Verma	8	5
90	101404110	Shaihya Thapliyal	6	4
91	101404111	Sher Mohammed	6	4
92	101404112	Shivam Dochania	6	4
93	101404113	Shivam Gera	8	5
94	101404114	Shivam Kumar Kedia	6	4
95	101404115	Shubham Bhardwaj	6	4
96	101404116	Shubham Chaturvedi	8	5
97	101404117	Shubham Garg	6	4

S. No.	Roll No	Name of Student	Marks (10)	Score (1-5)
98	101404118	Shubham Kumar	8	5
99	101404119	Shubham Verma	8	5
100	101404120	Shubhdeep Singh	6	4
101	101404121	Siddharth Singh	8	5
102	101404122	Simran Mehra	8	5
103	101404123	Sukhman	8	5
104	101404124	Swapnil Singla	6	4
105	101404125	Tanish Gupta	6	4
106	101404126	Taranjot Singh	6	4
107	101404127	Tarun Garg	6	4
108	101404128	Tarun Gupta	8	5
109	101404129	Tarun Kumar	6	4
110	101404130	Tushar Goel	8	5
111	101404132	Utkarsh Atri	8	5
112	101404133	Vandana Gora	8	5
113	101404135	Vasu Mittal	8	5
114	101404136	Yashika Chopra	8	5
115	101404137	Yatin Gudwani	8	5
116	101404138	Yogesh Garg	8	5
117	101454001	Yatendra Agrawal	8	5
118	101454002	Yash Motwani	6	4
119	101454003	Harshwardhan Soni	6	4
120	101454004	Simardeep Kaur	8	5
121	101454005	Tejas Kapila	8	5
122	101454006	Nitish Dewan	8	5
123	101454007	Abhishek Nigam	6	4
124	101454008	Tarun Puri	8	5
125	101454009	Lariza Bansal	6	4
126	101454010	Tanish Goyal	8	5
127	101454011	Aditi	8	5
128	101584001	Amanjit Singh	8	5
129	101584002	Chetan Garg	6	4
130	101584003	Devinder Kumar	8	5
131	101584004	Gurpreet Singh	6	4
132	101584005	Gurpreet Singh	8	5
133	101584006	Harman Preet Singh	6	4
134	101584007	Karamjeet Singh	6	4
135	101584008	Lakshay Garg	8	5
136	101584009	Prince Kalia	6	4
137	101584010	Rohit	8	5

S. No.	Roll No	Name of Student	Marks (10)	Score (1-5)
138	101584011	Satvir Singh	6	4
139	101584012	Sharandeep Singh	8	5
140	101584013	Shashi Sharma	8	5
141	101584014	Sunnypreet Singh	8	5
142	101584015	Rajat Chandra	6	4
143	101584016	Gursimran Singh	6	4

The performance of students through the course UEE591 for criteria ‘PO-09(C)’ is summarized in Table PO-09(C).2

**Table PO-09(C).2: Average score of student performance in the course UEE591 for criteria ‘PO-09(C)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE591	48.95	51.05	0.00	0.00	0.00	4.49

## UEE691: Engineering Design Project

The performance of course *UEE691: Engineering Design Project* is used to measure the attainment of outcome ‘PO-09(C)’ through **Design Procedure and Use of Standards components** (Jan-June, 2017, 30 Marks).

The performance of the students in the above components is summarized in Table PO-09(C).3 using rubrics defined in Table PO-09.1(a).

**Table PO-09(C).3: Students' performance in component targeting 'PO-09(C)': Course UEE691**

S. No.	Roll No	Name of Student	Marks (30)	Score (1-5)
1	101454003	H. Soni	18.00	4
2	101454004	Simardeep	18.00	4
3	101454006	Nitesh	18.00	4
4	101454008	Tarunpuri	18.00	4
5	101404067	M. Goyal	21.00	4
6	101404076	Nitish Arora	21.00	4
7	101454001	Y. Agarwal	21.00	4
8	101454005	Tejas Kapila	21.00	4
9	101404109	Shailesh	20.00	4
10	101404110	Shaivya	20.00	4
11	101404111	Sher Mohmad	20.00	4
12	101404113	Sivam Gera	20.00	4
13	101404099	Sagar Bansal	19.00	4
14	101404090	Pushpinder Singh	18.00	4
15	101404102	Sahil Singla	19.00	4
16	101584003	Devender Kumar	18.00	4
17	101404117	Shubham Garg	18	4
18	101404122	Simran	18	4
19	101404128	Tarun Gupta	18	4
20	101584014	Sunny Preet	18	4
21	101404089	Pulkit Bansal	19	4
22	101404091	Rachit	19	4
23	101404093	Rahul Goyal	19	4
24	101404106	Simardeep	19	4
25	101404114	Shivam Kedia	18	4
26	101404115	S.Bhardwaj	18	4
27	101404116	S.Chaturvedi	18	4
28	101404120	S. Singla	18	4
29	101404083	Prabhdeep K	18	4
30	101404100	Sahajdeep K	18	4
31	101404123	Sukhman	18	4

<b>S. No.</b>	<b>Roll No</b>	<b>Name of Student</b>	<b>Marks (30)</b>	<b>Score (1-5)</b>
32	101584011	Satvir	18	4
33	101404104	Sambhav Jain	17	3
34	101404127	Abhishek	17	3
35	101454007	Tarun Goyal	17	3
36	101454010	Tanish Goyal	17	3
37	101404062	M. Dhillon	18	4
38	101404063	M.Brar	18	4
39	101404072	Nigam Wadha	18	4
40	101404080	Paramjot Singh	18	4
41	101454009	Lariza Bansal	18	4
42	101454011	Aditi	18	4
43	101404124	Swapnil Singla	18	4
44	101404125	Tanish Gupta	18	4
45	101404054	K.Sharma	19	4
46	101404053	Jatin	19	4
47	101404138	Yogesh Garg	19	4
48	101404055	K. Bajaj	19	4
49	101404057	Mahitosh Sharma	20	4
50	101404058	Manan Mittal	19	4
51	101404059	Mandeep Singh	19	4
52	101404006	Abhishek Sharma	16	3
53	101404065	Mehak	16	3
54	101404078	Omandeep Kaur	16	3
55	101404136	Yashika	16	3
56	101404107	Sanket Gupta	18	4
57	101404118	Shubham Kumar	18	4
58	101404119	Shubham Verma	18	4
59	101404126	Taranjot Singh	18	4
60	101404027	Dilpreet Kaur	21	4
61	101404043	Harsimarjot Kaur	21	4
62	101404046	Heema Gupta	21	4
63	101584008	Lakshay Garg	22	4
64	101404084	Prachur	19	4
65	101404087	Prashant Khare	19	4
66	101404096	Rishabh Gupta	19	4
67	101404108	Saurabh Kumar	19	4
68	101404023	Ayush Jain	23	4
69	101404024	Bhawani Singh	23	4
70	101404028	Divesh Kumar	23	4
71	101404029	Divyam Aggarwal	23	4

S. No.	Roll No	Name of Student	Marks (30)	Score (1-5)
72	101404025	Chirag Jain	18	4
73	101404031	Divyanshu	18	4
74	101404135	Vasu Mittal	18	4
75	101404137	Yatin Gudwani	18	4
76	101404037	Gursagar Singh	23	4
77	101404038	Gurinder Pal Singh	23	4
78	101404041	Harshit	23	4
79	101404042	Harshvir Singh	23	4
80	101404002	Abhijeet Singh	17	3
81	101404013	Anmol Bharag	17	3
82	101404017	Anubhav Kumar	17	3
83	101404132	Utkarsh Atri	17	3
84	101404012	Ankush Goyal	25	5
85	101404015	Anmol Rattan	25	5
86	101404020	Arshya Bansal	25	5
87	101404130	Tushar Goel	25	5
88	101404007	Ajay Singh	22	4
89	101404014	Anmol Goyat	22	4
90	101404056	Kirtish Madaan	22	4
91	101404129	Tarun Naagar	22	4
92	101404009	Alka Thakur	21	4
93	101404036	Gurpreet Singh	21	4
94	101404039	Harmanpreet Singh	21	4
95	101404048	Ishita	22	4
96	101404001	Abhay Mahipal	20	4
97	101404018	Apeksha Goyal	21	4
98	101404019	Arnish Jain	19	4
99	101404133	Vandana Gora	19	4
100	101404047	Hitesh Kumar	18	4
101	101404061	Manit Gupta	18	4
102	101454002	Yash Motwani	19	4
103	101584010	Rohit Gupta	19	4
104	101404069	Mudit Arora	20	4
105	101404073	Nikhil Danodia	19	4
106	101404074	Nishita Kumari	19	4
107	101404068	Mridul Marwaha	19	4
108	101404050	Jagnoor Kaur	17	3
109	101404060	Manisha Gupta	17	3
110	101584012	Sharandeep Singh	17	3
111	101584002	Chetan Garg	18	4

S. No.	Roll No	Name of Student	Marks (30)	Score (1-5)
112	101404052	Jatin Bansal	18	4
113	101404049	Jagmeet Singh	18	4
114	101404044	Harsimran Singh	18	4
115	101404051	Jashanpreet Singh	19	4
116	101404070	Naveen Prashar	18	4
117	101404077	Nitish Bhardwaj	17	3
118	101404066	Mithilesh Kumar	17	3
119	101404033	Garv Chahar	17	3
120	101404081	Adhiraj Singh	22	4
121	101584009	Prince Kalia	22	4
122	101584013	Shashi Sharma	22	4
123	101584007	Karamjeet Singh	22	4
124	101404004	Abhinav Arora	21	4
125	101404021	Arshjot Kaur	21	4
126	101404026	Davileen Garg	20	4
127	101584001	Amanjeet Singh	21	4
128	101404032	Garima	20	4
129	101404094	Rajshree Vaidya	20	4
130	101404035	Gaurav Rathore	19	4
131	101404112	Shivam Dochania	19	4
132	101584015	Rajat Chandra	17	3
133	101584016	Gursimran Singh	16	3
134	101404021	Siddharth Singh	16	3
135	101404105	Samrat Kumar Gupta	17	3
136	101404092	Rahul Gautam	18	4
137	101404103	Samarth Gupta	18	4
138	101404064	Manvir Kaur	19	4
139	101404079	Pankaj Garg	19	4
140	101404075	Nitin Gupta	21	4

The performance of students through the course UEE691 for criteria ‘PO-09(C)’ is summarized in Table PO-09(C).4.

**Table PO-09(C).4: Average score of student performance in the course UEE691 for criteria ‘PO-09(C)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE691	2.86	81.43	15.71	0.00	0.00	3.87

The data from Table PO-09(C).2 and Table PO-09(C).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-09(C)’ and is summarised in Table PO-09(C).5.

**Table PO-09(C).5: Weighted Average Student class performance (course portfolio) for criteria ‘PO-09(C)’**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE591	48.95	51.05	0.00	0.00	0.00	<b>4.49</b>
UEE691	2.86	81.43	15.71	0.00	0.00	<b>3.87</b>
<b>Weighted Average Score</b>	<b>25.90</b>	<b>66.24</b>	<b>7.86</b>	<b>0.00</b>	<b>0.00</b>	<b>4.18</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-09(C)’ has been assessed through surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-09(C).6.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-09(C)’.

UEE591	Use resources to adopt latest technologies				
UEE691	To identify design goals and analyze possible approaches to meet given specifications with realistic engineering constraints.				

**Table PO-09(C).6: Weighted average score of performance criterion ‘PO-09(C)’ based on student course surveys**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE591	29.37	28.67	34.27	3.50	4.20	<b>3.76</b>
UEE691	67.39	23.61	40.28	9.72	12.50	<b>3.17</b>
<b>Weighted average score</b>	<b>48.38</b>	<b>26.14</b>	<b>37.28</b>	<b>6.61</b>	<b>8.35</b>	<b>3.47</b>

**(ii) Assessment Tools:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-09’ through indirect measurement using Table PO-09(A).7.

**c) Overall weighted average score of performance criterion ‘PO-09(C)’**

The overall weighted average score of performance criterion ‘PO-09(C)’ is summarised in Table PO-09(C).7 from the data given in Tables PO-09(C).5, PO-09(C).6 and PO-09(A).7.

**Table PO-09(C).7: Overall weighted average score of performance criterion ‘PO-09(C)’**

Assessment Tool	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	25.90	66.24	7.86	0.00	0.00	<b>4.18</b>	5
Course surveys	48.38	26.14	37.28	6.61	8.35	<b>3.47</b>	4
Other surveys	43.91	39.15	15	1.45	0.48	<b>4.25</b>	3
<b>Overall weighted score</b>	<b>37.90</b>	<b>46.10</b>	<b>19.45</b>	<b>2.57</b>	<b>2.90</b>	<b>3.96</b>	

### ***Assessment of Outcome ‘PO-09’ using Performance Criterion ‘PO-09(A)’, ‘PO-09(B)’ and ‘PO-09(C)’***

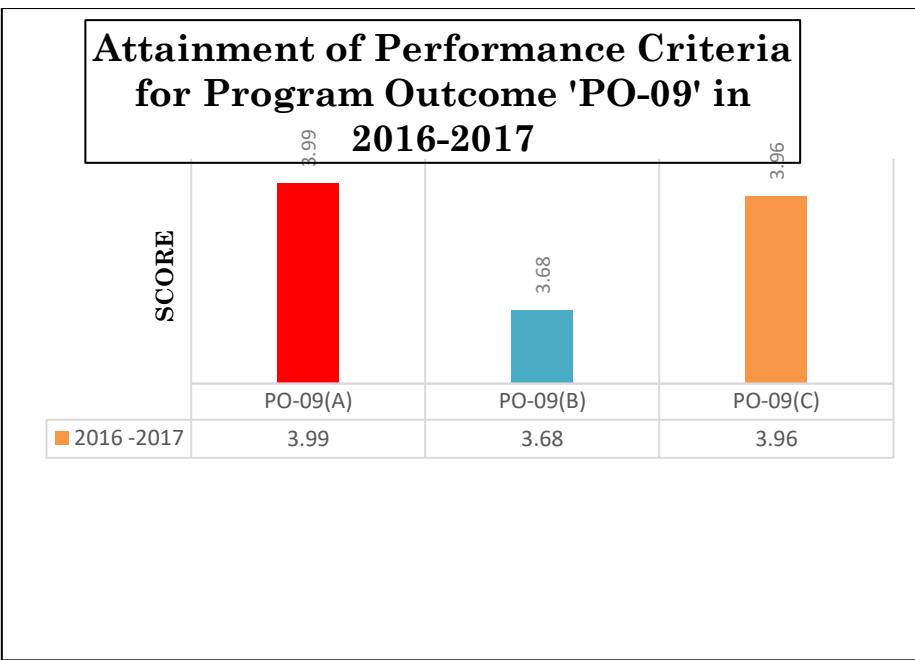
In the previous sections, each of the individual performance criteria PO-09(A), PO-09(B) and PO-09(C) have been assessed. The performance for attainment of outcome ‘PO-09’ has been completed using the attainment values for ‘PO-09(A)’, ‘PO-09(B)’ and ‘PO-09(C)’ and is provided below:

Table PO-09.2 summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome ‘PO-09’.

**Table PO-09.2: Overall score for outcome ‘PO-09’ at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-09(A)	33.84	36.15	25.83	3.39	0.79	<b>3.99</b>	5
PO-09(B)	26.32	30.21	31.87	8.50	3.11	<b>3.68</b>	5
PO-09(C)	37.90	46.10	19.45	2.57	2.90	<b>3.96</b>	5
<b>Overall score</b>	<b>32.69</b>	<b>37.49</b>	<b>25.72</b>	<b>4.82</b>	<b>2.27</b>	<b>3.88</b>	

The performance criteria wise assessment score distribution of outcome ‘PO-09’ is shown in Fig. PO-09.2.



**Figure PO-09.2: Performance criteria-wise assessment score distribution of outcome 'PO-09'**

**Track record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessments score distribution and overall weighted score for outcome 'PO-09' for last three years, i.e. 2014 - 2015, 2015 - 2016, and 2016 - 2017 are presented in this section.

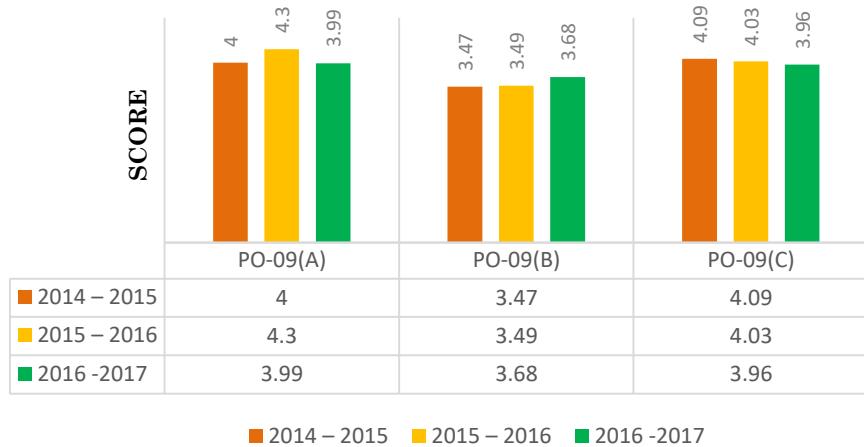
The Table PO-09.3 presents the performance criteria-wise assessment score distribution for outcome 'PO-09'.

**Table PO-09.3 Performance criteria-wise assessment scores distribution for each outcome 'PO-09'.**

Program outcome and performance criteria	Academic year			Weight	
	2014 – 2015	2015 – 2016	2016 - 2017		
<b>PO-09</b>	<b>PO-09(A)</b>	<b>4.0</b>	<b>4.30</b>	<b>3.99</b>	5
	<b>PO-09(B)</b>	<b>3.47</b>	<b>3.49</b>	<b>3.68</b>	5
	<b>PO-09(C)</b>	<b>4.09</b>	<b>4.03</b>	<b>3.96</b>	5
<b>Overall weighted score of outcome PO-09</b>		<b>3.85</b>	<b>3.94</b>	<b>3.88</b>	

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome 'PO-09' over a period of last three years and is shown in Figure PO-09.3

### Attainment of Performance Criteria for Program outcome ‘PO-09’



**Fig. PO-09.3: Performance criteria-wise assessment score distribution of outcome ‘PO-09’**

### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

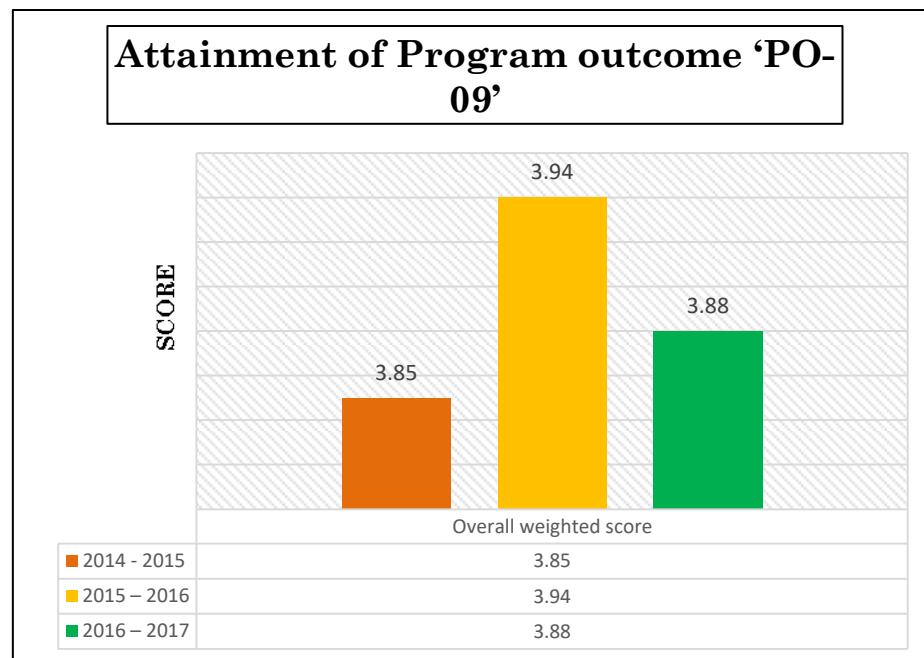
- i. **Excellent:** Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- ii. **Very Good:** Overall weighted score for the outcome is between 3.5 and 4.5 on a scale of 1 to 5.
- iii. **Good:** Overall weighted score for the outcome is between 3.5 and 4.0 on a scale of 1 to 5.
- iv. **Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.
- v. **Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

The Table PO-09.4 presents the overall weighted score of outcome ‘PO-09’ over the last three academic years.

**Table PO-09.4: Overall weighted score of the outcome ‘PO-09’ over a period of last three academic years**

Academic year	Overall weighted score	Level of attainment
2014 – 2015	<b>3.85</b>	Good
2015 – 2016	<b>3.94</b>	Good
2016 – 2017	<b>3.88</b>	Good

Figure PO-09.4 shows the overall weighted score of outcome ‘PO-09’ over a period of last three academic years.



**Fig. PO-09.4: Overall weighted score of outcome ‘PO-09’ over a period of last three academic years.**

The data presented above pertains to the courses offered during academic year 2016-17. The attainment of the program outcome ‘PO-09’ through assessment of PO-09(A), PO-09(B) and PO-09(C) in the selected course is achieved as “Good”. Similar data is available for the previous two academic years (2015-16 and 2014-15).

# **Assessment of Attainment of Program Outcome**

## **PO-10**

*A Knowledge Of Contemporary Issues*  
**(2016-17)**

*for the*  
*Bachelor of Engineering*  
*in*  
***Electrical Engineering***



**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering and Technology, Patiala**  
**(Punjab) -INDIA**

## **Attainment of Program Outcome ‘PO-10’**

The attainment of program outcome PO-10: *A knowledge of contemporary issues* has been measured using standard procedure for the BE Electrical Engineering program. The program outcome ‘PO-10’ has been classified into following performance criteria :

**PO-10(A): Comprehends the relevance of contemporary issues**

**PO-10(B): Recognizes the impact of engineering decisions on energy resources and environment**

The program assessment committee identified the following courses for the assessment of program outcome ‘PO-10’. The courses used for the assessment during three academic years are marked bold.

- **UEN002: Energy and Environment**
- UEE504: Power Electronics
- UEE591: Summer Training
- **UEE502: High Voltage Engineering**
- **UEE522: Energy Auditing and Management**
- **UEE603: Switchgear and Protection**
- **UEE604: Flexible AC Transmission Systems**
- **UEE802: Intelligent Algorithms in Power Systems**
- **UEE804: Operation and Control of Power Systems**
- **UEE791: Project Semester**

Outcome PO-10 has been assessed through two performance criteria PO-10(A) and PO-10(B). The following courses have been considered by the program assessment committee for assessment of performance criteria ‘PO-10(A)’, ‘PO-10(B)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2
PO-10(A)	UEE604: Flexible AC Transmission Systems	UEE791: Project Semester
PO-10(B)	UEN002 : Energy and Environment	UEE791: Project Semester

The step by step methodology used to measure the attainment of Program outcome ‘PO-10’ is shown in Fig. PO-10.1 for academic year (AY) 2016-17. The similar procedure is followed to

measure the attainment of Program outcome 'PO-10' for all three academic years under consideration.

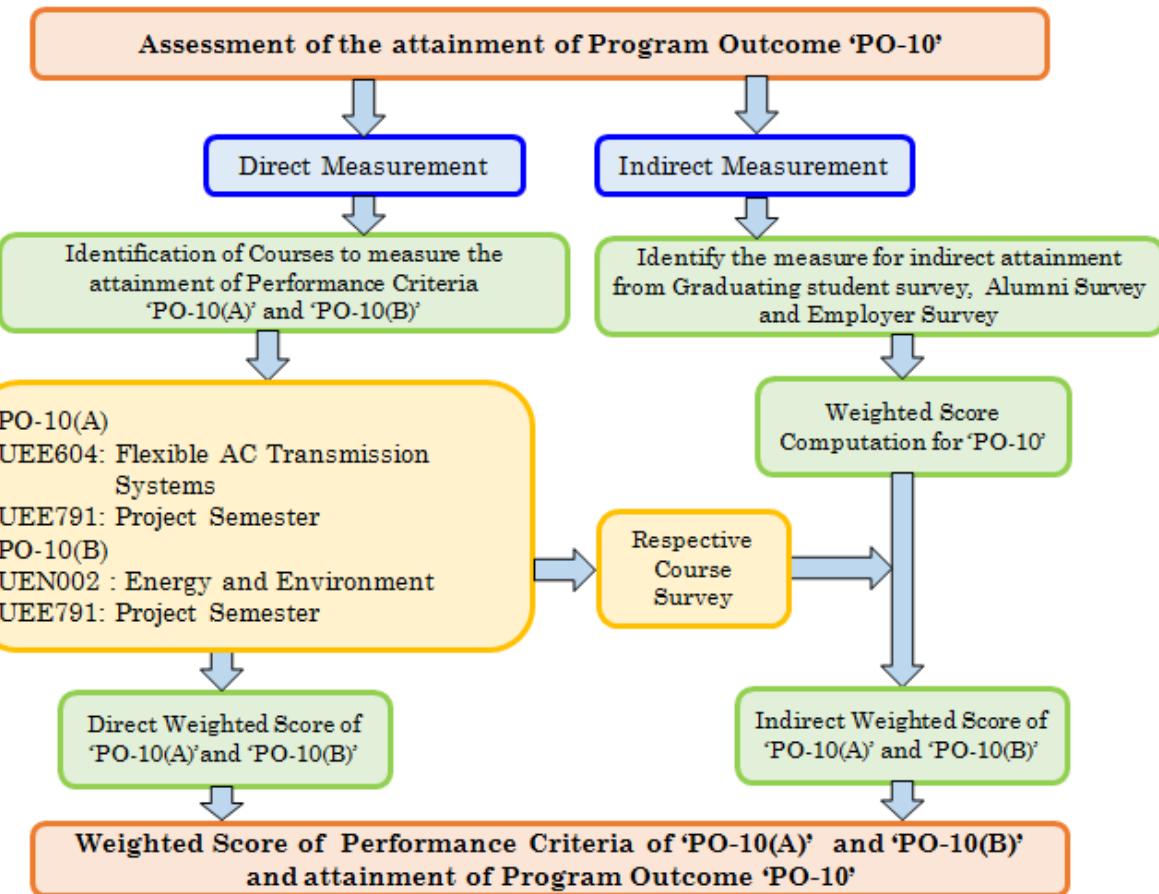


Fig. PO-10.1: Process for measurement of attainment of outcome 'PO-10' for the year 2016-17

The following Rubric has been used to convert marks obtained by the students to a Likert scale in the range of 1 to 5 and is as described in Table PO-10.1(a) and PO-10.1 (b) in most cases unless specifically mentioned.

**Table PO-10.1(a) : Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

**Table PO-10.1 (b): Rubric for Outcome Measurement**

S. No.	Range of Marks %)	Score (1-5)
1	$80 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criteria using the courses mentioned.

## **Assessment of Outcome 'PO-10' using performance criterion 'PO-10(A)'**

### **PO-10(A): Comprehends the relevance of contemporary issues.**

The performance criteria 'PO-10(A)' has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys ( Graduating Student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **(i) Assessment Tool: Students' performance using course portfolio**

Two courses namely *UEE604: Flexible AC Transmission Systems* and *UEE791: Project Semester* are used to assess performance criteria PO-10(A) as a direct measure. The analysis for each of these courses is provided below:

#### **UEE604: Flexible AC Transmission Systems**

The performance of course *UEE604: Flexible AC Transmission Systems* is used to measure the attainment of outcome 'PO-10(A)' through End Semester Examination (Question No. 6, Jan-June 2017, 10 marks).

#### **Question:**

Q.6	Discuss the objectives of series compensation. Explain mathematically the effect of k {where k=(Xc/X)} in series compensation. Draw the P- $\delta$ curve for different k and its effect on real and reactive power flow.	(10)
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The performance of the Students in the above question is summarized as given below in Table PO-10(A).1 using Rubrics defined in Table PO-10.1(a)

**Table PO-10(A).1: Students' performance in question targeting 'PO-10(A)'; Course UEE604**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	9	5
2	101404002	Abhijeet Singh Sankhla	2	2
3	101404004	Abhinav Arora	5	3
4	101404006	Abhishek Sharma	6	4
5	101404009	Alka Thakur	2	2
6	101404012	Ankush Goyal	6	4
7	101404013	Anmol Arjun Bharaj	0	1
8	101404014	Anmol Goyat	6	4
9	101404015	Anmol Rattan Kaur	2	2
10	101404017	Anubhav Kumar	0	1
11	101404018	Apeksha Goel	10	5
12	101404019	Arnish Jain	8	5
13	101404020	Arshiya	10	5
14	101404021	Arshjot Kaur	8	5

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
15	101404023	Ayush Jain	7	4
16	101404024	Bhawani Singh	8	5
17	101404025	Chirag Jain	9	5
18	101404026	Davileen Garg	7	4
19	101404027	Dilpreet Kaur	4	3
20	101404028	Divesh Kamdar	10	5
21	101404029	Divyam Aggarwal	5	3
22	101404031	Divyanshu Siddharth	7	4
23	101404032	Garima	7	4
24	101404033	Gary Chahar	7	4
25	101404035	Gaurav Rathore	5	3
26	101404037	Gursagar Singh	7	4
27	101404038	Gurupinder Pal Singh	9	5
28	101404041	Harshit Kaushik	9	5
29	101404042	Harshvir Singh	7	4
30	101404043	Harsimarjot Kaur	7	4
31	101404044	Harsimran Singh	10	5
32	101404046	Heema Gupta	10	5
33	101404047	Hitesh Kumar	4	3
34	101404048	Ishita Mahindru	10	5
35	101404049	Jagmeet Singh Bawa	2	2
36	101404050	Jagnoor Kaur	10	5
37	101404051	Jashanpreet Singh	8	5
38	101404052	JatinBansal	7	4
39	101404054	Kanishak Sharma	8	5
40	101404055	Karan Sanjeev Bajaj	8	5
41	101404057	Mahitosh Sharma	10	5
42	101404058	Manan Mittal	8	5
43	101404059	Mandeep Singh Panesar	8	5
44	101404060	Manisha Gupta	8	5
45	101404061	Manit Gupta	10	5
46	101404062	Manjosh Singh Dhillon	7	4
47	101404063	Manpreet Singh Brar	10	5
48	101404064	ManvirKaur	7	4
49	101404065	Mehak Bhatia	9	5
50	101404066	Mithilesh Kumar	8	5
51	101404067	Mohit Goyal	8	5
52	101404068	Mridul Marwaha	8	5
53	101404069	Mudit Arora	8	5
54	101404070	Naveen Parashar	5	3

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
55	101404072	Nigam Wadhwa	6	4
56	101404073	Nikhil Danodia	1	1
57	101404074	Nishita Kumari	8	5
58	101404075	Nitin Gupta	8	5
59	101404076	Nitish Arora	8	5
60	101404077	Nitish Bhardwaj	4	3
61	101404078	Omandeep Kaur	9	5
62	101404079	Pankaj Garg	7	4
63	101404080	Paramjot Singh	6	4
64	101404081	Parmar Adhiraj Singh	8	5
65	101404083	Prabhdeep Kaur	8	5
66	101404087	Prashant Khare	7	4
67	101404089	Pulkit Bansal	8	5
68	101404090	Pushpinder Singh	4	3
69	101404091	Rachit Verma	5	3
70	101404092	Rahul Gautam	8	5
71	101404093	Rahul Goyal	9	5
72	101404094	RajshreeVaidya	6	4
73	101404096	Rishabh Gupta	7	4
74	101404099	Sagar Bansal	8	5
75	101404100	Sahajdeep Kaur	9	5
76	101404102	Sahil Singla	6	4
77	101404103	Samarth Gupta	8	5
78	101404104	Sambhav Jain	7	4
79	101404105	Samrat Kumar Gupta	1	1
80	101404106	Sanamdeep Singh	7	4
81	101404107	Sanket Gupta	4	3
82	101404108	Saurabh Kumar	1	1
83	101404109	Shailesh Verma	7	4
84	101404110	Shaivya Thapliyal	6	4
85	101404111	Sher Mohammed	7	4
86	101404112	Shivam Dochania	0	1
87	101404113	Shivam Gera	4	3
88	101404114	Shivam Kumar Kedia	5	3
89	101404115	Shubham Bhardwaj	8	5
90	101404116	Shubham Chaturvedi	7	4
91	101404117	Shubham Garg	10	5
92	101404118	Shubham Kumar	4	3
93	101404119	ShubhamVerma	6	4
94	101404120	Shubhdeep Singh	4	3

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
95	101404122	SimranMehra	10	5
96	101404123	Sukhman	8	5
97	101404124	Swapnil Singla	8	5
98	101404125	Tanish Gupta	7	4
99	101404126	Taranjot Singh	6	4
100	101404127	Tarun Garg	10	5
101	101404128	Tarun Gupta	9	5
102	101404129	Tarun Kumar	6	4
103	101404130	Tushar Goel	5	3
104	101404132	Utkarsh Atri	5	3
105	101404133	Vandana Gora	9	5
106	101404135	Vasu Mittal	9	5
107	101404136	Yashika Chopra	10	5
108	101404137	Yatin Gudwani	8	5
109	101404138	Yogesh Garg	8	5
110	101454001	Yatendra Agrawal	7	4
111	101454002	Yash Motwani	0	1
112	101454003	Harshwardhan Soni	4	3
113	101454004	Simardeep Kaur	7	4
114	101454005	Tejas Kapila	8	5
115	101454006	Nitish Dewan	8	5
116	101454007	Abhishek Nigam	6	4
117	101454008	Tarun Puri	8	5
118	101454009	LarizaBansal	10	5
119	101454010	Tanish Goyal	5	3
120	101454011	Aditi	8	5
121	101584002	Chetan Garg	8	5
122	101584003	Devinder Kumar	1	1
123	101584007	Karamjeet Singh	8	5
124	101584008	LakshayGarg	8	5
125	101584009	Prince Kalia	7	4
126	101584010	Rohit	4	3
127	101584011	Satvir Singh	5	3
128	101584013	Shashi Sharma	10	5
129	101584015	Rajat Chandra	3	2
130	101584016	Gursimran Singh	0	1

The performance of students through the course UEE604 for criteria 'PO-10(A)' is summarized in Table PO-10(A).2

**Table PO-10(A).2: Average score of Students performance in the course UEE604 for criteria PO-10(A)**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEE604	46.92	26.92	15.38	3.85	6.92	4.03

## **UEE791: Project Semester**

The performance of course *UEE791: Project Semester* is used to measure the attainment of outcome ‘PO-10(A)’ with the help of following component of Mid way report assessment (Jan-June, 2017, 5 marks).

<b>Criterion</b>	<b>Excellent</b>	<b>Good</b>	<b>Average</b>	<b>Poor</b>
	<b>5</b>	<b>3-4</b>	<b>2</b>	<b>1</b>
Have the ability to redesign products, processes or systems in order to improve productivity, quality, safety and other desired needs	Design is achieved/ being achieved after review of reasonable alternatives.	Alternative approaches identified to some degree.	Serious deficiencies in exploring and identifying alternative designs.	Only one design presented or clearly infeasible alternative given.

The performance of the students in the above component is summarized as given below in Table PO-10(A).3 using Rubrics defined in Table PO-10.1(b).

**Table PO-10(A).3: Students' performance in question targeting ‘PO-10(A)’; Course UEE791**

<b>S. No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (5)</b>	<b>Score (1-5)</b>
1	101304001	Aarushi Bajaj	2	3
2	101304002	Abhey Arora	2	3
3	101304003	Abhishek Taksali	3	4
4	101304004	Adhikaansh Tayal	3	4
5	101304005	Aditi Narang	4	5
6	101304006	Aditya	3	4
7	101304007	Akshat	3	4
8	101304008	Akshay Kapoor	4	5
9	101304009	Akshay Kumar	2	3
10	101304011	Akshay Sharma	0	1
11	101304012	Amandeep Kaur	3	4
12	101304013	Amandeep Singh	3	4
13	101304014	Amaninder Singh Randhawa	3	4
14	101304015	Angad Kapoor	3	4
15	101304016	Ankita Garg	4	5
16	101304018	Anmol Jawa	4	5

17	101304019	Anmolpreet Singh	3.5	4
18	101304020	Anyuti Tiwari	5	5
19	101304021	Arpit sharma	3	4
20	101304023	Arshbir Kaur	0	1
21	101304024	Arshdeep Singh Bagga	4	5
22	101304025	Ashish	2	3
23	101304026	Ashish rajpal	4	5
24	101304028	Berry lubana	3	4
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	3	4
28	101304032	Dipin Garg	3	4
29	101304033	Dishant Vanvari	0	1
30	101304034	Divyesh Pratap Singh	3	4
31	101304035	Elham Anwar	0	1
32	101304036	Gurseerat Singh Meen	3	4
33	101304037	Gursewak Singh	2	3
34	101304040	Hariansh Sehgal	2	3
35	101304041	Hartejdeep Singh	3	4
36	101304042	Himanshu Goyal	3	4
37	101304044	Jasjit Singh	4	5
38	101304045	Jassimran Singh Julka	3	4
39	101304046	Jessica Dhaliwal	0	1
40	101304047	Kanwarpal Singh	2	3
41	101304048	Karan Kumar	4	5
42	101304049	Karanjot	4	5
43	101304050	Kashish Aggarwal	3	4
44	101304051	Kritika Singla	0	1
45	101304052	Love Gaba	3	4
46	101304054	Manik Mittal	3	4

47	101304055	Maninderjit Singh	2	3
48	101304056	Mayank Singla	3	4
49	101304057	Mridul Bhutani	4	5
50	101304058	Naman Garg	2	3
51	101304059	Navdeep Singh	3.5	4
52	101304060	Navdeep Singh	3	4
53	101304061	Nazuk Aggarwal	4	5
54	101304062	Nishant garg	2	3
55	101304063	Nishtha Raheja	0	1
56	101304064	Paras Bawa	3	4
57	101304065	Parth ahuja	3	4
58	101304066	Parushi	3	4
59	101304067	Pency goyal	3	4
60	101304068	Piyush Jindal	3	4
61	101304069	Piyush Tripathi	3	4
62	101304070	Prachi Garg	3	4
63	101304071	Prashant Kataria	0	1
64	101304072	Preeti Garg	3	4
65	101304073	Priyank Arora	3	4
66	101304074	Priyanka	4	5
67	101304075	Priyanka Singh	0	1
68	101304076	Priyansh Mahajan	4	5
69	101304077	Rahul meena	3	4
70	101304079	Rajat Sharma	2	3
71	101304080	Ratul Goyal	4	5
72	101304081	Ravinder Singh	2	3
73	101304082	Rishabh juneja	0	1
74	101304083	Robin Manktala	4	5
75	101304084	Rohan Ghai	0	1
76	101304085	Rohan Singla	4	5

77	101304086	Rohan Wadhawan	0	1
78	101304087	Rohit Goyal	2	3
79	101304088	Rubina Bamba	4.5	5
80	101304089	Sagar Pulani	4	5
81	101304090	Sahil Kataria	2	3
82	101304091	Sakshi	3	4
83	101304092	Sandal Singh Sidhu	4	5
84	101304093	Sandeep Kaur	3	4
85	101304094	Satripleen Kaur	4	5
86	101304095	Saurabh Mohan	2	3
87	101304097	Shailly Gupta	3	4
88	101304098	Shaina	2	3
89	101304099	Shivika Gupta	4	5
90	101304100	Shresth Rai	3	4
91	101304101	Shubham Goyal	3	4
92	101304102	Shubham Gupta	3	4
93	101304103	Shubham Sharma	3.5	4
94	101304104	Shubham Sharma	4	5
95	101304105	Shubham Soin	3	4
96	101304106	Siddharth Goyal	4	5
97	101304107	Sidharth Garg	4	5
98	101304108	Simran Kaur	0	1
99	101304109	Simranjit Singh	0	1
100	101304111	Sumit Dhingra	4	5
101	101304112	Sumit Kaushik	3.5	4
102	101304113	Tushar Dheer	4	5
103	101304114	Tushar sharma	3	4
104	101304116	Utsav Chhabra	3	4
105	101304117	Vaibhav Gupta		1
106	101304118	Vaishali	3	4

107	101304119	Varun Bansal	5	5
108	101304120	Veni Jindal	4	5
109	101304121	Vishal Arora	3	4
110	101304122	Yugesh Goyal	4	5
111	101484001	Amandeep Singh	0	1
112	101484002	Amrinder Singh	0	1
113	101484004	Azad Singh	2	3
114	101484005	Chandan Garg	2	3
115	101484007	Deepak Singla	4	5
116	101484008	Diljeet Singh	2	3
117	101484009	Jyoti Kaushal	3	4
118	101484011	Pawan Kumar	3	4
119	101484012	Rajat Singla	2	3
120	101484013	Satveer Kaur	3	4
121	101484014	Saurabh Kumar Wadhawan	4	5
122	101484015	Shweta Sharma	3	4
123	101484016	Sukhjeet Singh	2	3

The performance of students through the course UEE791 for criteria 'PO-10(A)' is summarized in Table PO-10(A).4:

**Table PO-10(A).4: Average score of student performance in the course UEE791 for criteria PO-10(A)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE791	27.64	41.46	17.07	0.00	13.82	3.69

The data from Table PO-10(A).2 and Table PO-10(A).4 is used to evaluate weighted average of direct measure through course portfolio for criteria PO-10(A), and is summarised in Table PO-10(A).5.

**Table 4.PO-10(A).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-10(A)**

Courses	% of Students in each Score					Average Score
	5	4	3	2	1	
UEE604	46.92	26.92	15.38	3.85	6.92	4.03
UEE791	27.64	41.46	17.07	0.00	13.82	3.69

<b>Weighted Average Score</b>	<b>37.28</b>	<b>34.19</b>	<b>16.23</b>	<b>1.93</b>	<b>10.37</b>	<b>3.86</b>
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**b) Indirect Measures:**

The indirect measurement of performance criteria 'PO-10(A)' has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-10(A).6 and Table PO-10(A).7.

**(i) Assessment Tools: Student Course Surveys**

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of 'PO-10(A)'.

UEE604	To classify various compensators suited for various power system purposes
UEE791	Carry out design calculations and implementations in the area of project

**Table PO-10(A).6: Weighted average score of performance criterion 'PO-10(A)' based on Student course surveys.**

Course	% of Students in each score					<b>Average Score</b>
	5	4	3	2	1	
UEE604	8.22	28.77	32.88	12.33	17.81	<b>2.97</b>
UEE791	29.27	30.08	35.77	3.25	2.44	<b>3.79</b>
<b>Weighted average score</b>	<b>18.74</b>	<b>29.42</b>	<b>34.32</b>	<b>7.79</b>	<b>10.12</b>	<b>3.38</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of Program outcome 'PO-10' through indirect measurement using following question in the respective surveys.

Graduating Survey	A knowledge of contemporary issues.
Alumni Survey	
Employer Survey	Do our Programs have knowledge of contemporary issues?

**Table PO-10(A).7: Weighted average score of performance criterion 'PO-10(A)' based on other surveys.**

Course	% of Students in each score					<b>Average Score</b>
	5	4	3	2	1	
Graduating Student survey	29.58	46.48	23.94	00	00	4.06
Employer survey	46.67	40	13.33	00	00	4.33

<b>Alumni survey</b>	26.09	39.13	25.12	7.25	2.42	3.79
<b>Weighted average score</b>	<b>34.11</b>	<b>41.87</b>	<b>20.79</b>	<b>2.41</b>	<b>0.80</b>	<b>4.06</b>

**c) Overall weighted average score of performance criterion ‘PO-10(A)’**

The overall weighted average score of performance criterion ‘PO-10(A)’ is summarised in Table PO-10(A).8 from the data given in Table PO-10(A).5 , PO-10(A).6 and PO-10(A).7.

**Table PO-10(A).8: Overall weighted average score of performance criterion ‘PO-10(A)’**

<b>Assessment Tool</b>	<b>% of Students in each score</b>					<b>Average Score</b>	<b>Assessment Tool Weight</b>
	5	4	3	2	1		
<b>Student class performance</b>	<b>37.28</b>	<b>34.19</b>	<b>16.23</b>	<b>1.93</b>	<b>10.37</b>	<b>3.86</b>	5
<b>Course surveys</b>	<b>18.74</b>	<b>29.42</b>	<b>34.32</b>	<b>7.79</b>	<b>10.12</b>	<b>3.38</b>	4
<b>Other surveys</b>	<b>34.11</b>	<b>41.87</b>	<b>20.79</b>	<b>2.41</b>	<b>0.80</b>	<b>4.06</b>	3
<b>Overall weighted score</b>	<b>30.3</b>	<b>34.52</b>	<b>23.4</b>	<b>4</b>	<b>7.89</b>	<b>3.75</b>	-

## **Assessment of Outcome 'PO-10' using performance criterion PO-10(B)**

### **PO-10(B): Recognizes the impact of engineering decisions on energy resources and environment**

The performance criteria 'PO-10(B)' has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys ( Graduating Student survey, Alumni survey and Employer survey).

#### **a) Direct Measures:**

##### **a.) Assessment Tool: Students' performance using course portfolio**

Two courses namely *UEN002: Energy and Environment* and *UEE791: Project Semester* are used to assess performance criteria 'PO-10(B)' as a direct measure. The analysis for each of these courses is provided below:

#### **UEN002: Energy and Environment**

The performance of course *UEN002: Energy and Environment* is used to measure the attainment of outcome 'PO-10(B)' through End Semester Examination (Question No. 4, Jul-Dec 2016, 20 marks).

#### **Question:**

Q.4 (a)	Residents across Beijing city work to an environmental state of emergency on Dec.8,2015 as poisonous air quality prompted the government to close schools, force motorists off the road and shut down factories. Identify the root causes and meteorological conditions that resulted in this environmentally hazardous condition.	(10)
Q.4 (b)	A 200MW coal fired power plant is 35% efficient. If the coal contains 40% ash and 1% sulphur content, calculate the amount of ash and $SO_2$ produced in tons per day. Assume the calorific value of coal to be 6000KJ Kg Coal.	(10)

The performance of the Students in the above question is summarized as given below in Table PO-10(B).1 using Rubrics defined in Table PO-10.1(a).

**Table PO-10(B).1: Students' performance in question targeting 'PO-10(B)'; Course UEN002**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101504002	Aastha Jain	5	2
2	101504004	Aayush Vohra	9	3
3	101504005	Aayush Rai Anand	11.5	3
4	101504006	Abhijeet Singh Bhatia	12.5	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
5	101504007	Abhinandan Narang	10.5	3
6	101504008	Abhishek Agarwal	12	4
7	101504009	Abhishek Pandey	6	2
8	101504010	Abhishek Prasad	5	2
9	101504011	Adarsh Agarwal	7.5	2
10	101504012	Aditi Mishra	11	3
11	101504013	Akshita Kamthan	7.5	2
12	101504014	Amandeep Singh Dhillon	15	5
13	101504015	Amarjot Singh	11	3
14	101504017	Amrit Kaler	9	3
15	101504018	Anahita	15	5
16	101504019	Ankit Gupta	15	5
17	101504020	Ankit Mahajan	16	5
18	101504021	Anmol Saluja	15	5
19	101504022	Anurag Dewangan	11.5	3
20	101504024	Ashish Nagpal	12.5	4
21	101504025	Ashish Kumar Yadav	11	3
22	101504026	Ashwini Anand Pateriya	11	3
23	101504027	Avantika Dhiman	10.5	3
24	101504028	Avinash Chaturvedi	14	4
25	101504029	Badshah Singh	7	2
26	101504030	Baninder Singh Phull	14.5	4
27	101504031	Bhanu Pratap	8	3
28	101504032	Bhavay Gudwani	12.5	4
29	101504034	Bikram Pathania	10.5	3
30	101504035	Charika Mehta	12	4
31	101504036	Daman Aggarwal	7.5	2
32	101504037	Deen Dayal	11.5	3
33	101504038	Deepak Goyal	12.5	4
34	101504039	Divanshu Garg	12.5	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
35	101504040	Divyam Soni	10	3
36	101504041	Fiza Singh Multani	13.5	4
37	101504043	Gurjot Singh Kocher	11	3
38	101504044	Gurleen Kang	13.5	4
39	101504045	Gurleen Kaur	11.5	3
40	101504047	Gursimratpal Singh Sidhu	13.5	4
41	101504049	Harnishan Singh Kang	12	4
42	101504050	Harshit Lohaan	9.5	3
43	101504052	Harshjot Singh Pahuja	16	5
44	101504053	Hashmeet Singh Ganda	8.5	3
45	101504055	Himanshu Sahwal	8	3
46	101504057	Jaideep Grover	4.5	2
47	101504059	Jasjit Singh	14	4
48	101504060	Jaskirat Kaur Gill	9.5	3
49	101504061	Jatinder Pal Singh	11	3
50	101504063	Kuljeet Singh	3.5	1
51	101504064	Kunwar Achint Singh	11	3
52	101504065	Lakhan Sharma	9	3
53	101504132	Abhishek Singhal	3.5	1
54	101554001	Aditya	13.5	4
55	101554002	Aditya Kumar	9.5	3
56	101554004	Apoorv Gupta	6	2
57	101554005	Archit Rawat	8.5	3
58	101554007	Deepika Gandhi	15	5
59	101554010	Gurmehar Singh	12.5	4
60	101554011	Gursidak Singh	11	3
61	101554012	Harmanjit Singh	15.5	5
62	101554013	Harshit Sethi	10.5	3
63	101554018	Madhur	8.5	3
64	101554021	Piyush Kumar Gupta	10	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
65	101554023	Prakhar Srivastava	9	3
66	101554034	Savi	13.5	4
67	101554036	Simran Saluja	12.5	4
68	401504001	Abhishek Garg	13.5	4
69	401504002	Divya Kumar Gupta	7.5	2
70	401684001	Abhinav Aggarwal	14.5	4
71	101684001	Abhishek Kumar	14	4
72	101684002	Ajay Kumar	10.5	3
73	101684003	Deepak Bansal	13	4
74	101684004	Jashandeep Singh	12	4
75	101684005	Karanveer Singh	12	4
76	101684006	Khuaish Pandey	12	4
77	101684019	Hitesh Gulati	12.5	4
78	101684020	Kanishk Agarwal	16.5	5
79	101554016	Ishan Kashyap	10	3
80	101504030	Sahil Virk	9	3
81	101504032	Sanchit Sharma	11	3
82	101504033	Saransh Sehgal	16	5
83	101504046	Gurnoor Kaur	10	3
84	101504054	Himanshu Gupta	11.5	3
85	101504067	Malay Chand	8.5	3
86	101504069	Mayank	8	3
87	101504070	Mehul Natu	13	4
88	101504071	Mohit	14.5	4
89	101504073	Neha Bhargava	14.5	4
90	101504074	Neha Singla	8	3
91	101504075	Nihal	6	2
92	101504076	Nikhil	12	4
93	101504078	Nitin	12	4
94	101504079	Nitish	11.5	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
95	101504081	Osho	8.5	3
96	101504082	Pankaj	3.5	1
97	101504083	Parmeet Sangha	10	3
98	101504084	Parth Gupta	11.5	3
99	101504085	Pinak Bhardwaj	14.5	4
100	101504086	Prabhav Pande	12.5	4
101	101504087	Pragati Sharma	9.5	3
102	101504088	Pranav Joshi	14.5	4
103	101504089	Pranav Mathur	10.5	3
104	101504094	Prateek Gupta	3	1
105	101504096	Praveen Kumar Yadav	7	2
106	101504097	Raghav Tiwari	7.5	2
107	101504098	Ramandeep Singh Gill	7	2
108	101504099	Ramandeep Singh	11	3
109	101504100	Ramneet Kaur	11	3
110	101504101	Ravneet Sharma	5.5	2
111	101504103	Rohan Malhotra	13	4
112	101504104	Rohit Arora	9.5	3
113	101504105	Rushil Krishna	10	3
114	101504107	Sahil Bansal	9.5	3
115	101504108	Sahil Virk	16	5
116	101504109	Sainesh	10	3
117	101504114	Satyam	11.5	3
118	101504117	Sheikh Najam	8	3
119	101504118	Shrey Arora	7.5	2
120	101504119	Shubham Gupta	8	3
121	101504120	Stuti Sidhu	9	3
122	101504121	Suhas Mahajan	13.5	4
123	101504122	Swanav Swaroop	11.5	3
124	101504124	Utkarsh Verma	10.5	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
125	101504125	Vaibhav Chawla	8	3
126	101504126	Vaibhav Singh	13.5	4
127	101504127	Vikram Kumawat	5.5	2
128	101504128	Viraj Baswana	10.5	3
129	101504130	Vishal Bansal	13.5	4
130	101504131	Vishu Jain	14.5	4
131	101504133	Riya Gupta	8.5	3
132	101554006	Bhisham Mittal	12	4
133	101554008	Evan Garg	11	3
134	101554009	Gayatri Bansal	10	3
135	101554014	Himanshu Mittal	11	3
136	101554017	Kratika Aggarwal	9.5	3
137	101554019	Mahima Goel	13.5	4
138	101554020	Mannat Batish	11	3
139	101554022	Prabhjot Singh Saini	12.5	4
140	101554024	Rajat Dixit	13	4
141	101554026	Ritunjay	13.5	4
142	101554027	Rohit Mehta	12.5	4
143	101554028	Romil Garg	12.5	4
144	101554029	Sahil Sharma	11	3
145	101554031	Sajan Goyal	11.5	3
146	101554035	Shishant Airon	15.5	5
147	101684007	Khushdeep Singh	9	3
148	101684008	Mandeep	14.5	4
149	101684010	Nikhil Dhiman	10.5	3
150	101684011	Nitin Garg	13	4
151	101684012	Paras Arora	12	4
152	101684013	Pratik Bal	7	2
153	101684014	Simranjeet Singh	12	4
154	101684015	Sahib Singh	13	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
155	101684016	Sukhwinder	10.5	3
156	101684017	Ketan Singla	10.5	3
157	101684018	Vaneet	9	3
158	401504007	Simarpreet	13.5	4
159	401504008	Uday Bhandari	10.5	3
160	401554001	Kunal	10.5	3

The performance of Students through the course UEN002 for the criteria 'PO-10(B)' is summarized in Table PO-10(B).2:

**Table PO-10(B).2: Average score of Student performance in the course UEN002 for criteria PO-10(B)**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEN002	7.50	32.50	46.25	11.25	2.50	3.31

## **UEE791 : Project semester**

The performance of course *UEE791: Project semester* is used to measure the attainment of outcome ‘PO-10(B)’ using the approach of final design process optimized through engineering, social, environmental, ethical, economic, financial, institutional and commercial considerations. The evaluation of the above is obtained by the marks in one of the components of industry mentor assessment (Jan-June, 2017, 5 marks).

The performance of the students in the above component is summarized as given below in Table PO-10(B).3 using Rubrics defined in Table PO-10.1(b).

**Table PO-10(B).3: Students' performance in Project work targeting ‘PO-10(B)’; Course UEE791**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101304001	Aarushi Bajaj	5	5
2	101304002	Abhey Arora	4	5
3	101304003	Abhishek Taksali	3	4
4	101304004	Adhikaansh Tayal	5	5
5	101304005	Aditi Narang	5	5
6	101304006	Aditya	5	5
7	101304007	Akshat	4	5
8	101304008	Akshay Kapoor	5	5
9	101304009	Akshay Kumar	5	5
10	101304011	Akshay Sharma	4	5
11	101304012	Amandeep Kaur	5	5
12	101304013	Amandeep Singh	4	5
13	101304014	Amaninder Singh Randhawa	4	5
14	101304015	Angad Kapoor	5	5
15	101304016	Ankita garg	5	5
16	101304018	Anmol Jawa	5	5
17	101304019	Anmolpreet Singh	4	5
18	101304020	Anyuti Tiwari	5	5
19	101304021	Arpit sharma	4	5
20	101304023	Arshbir Kaur	5	5
21	101304024	Arshdeep Singh Bagga	4	5
22	101304025	Ashish	5	5
23	101304026	Ashish Rajpal	4	5

24	101304028	Berry lubana	4	5
25	101304029	Bhanu Duggal	5	5
26	101304030	Bhanu Marwaha	5	5
27	101304031	Chirag Gaba	4	5
28	101304032	Dipin Garg	5	5
29	101304033	Dishant Vanvari	4	5
30	101304034	Divyesh Pratap Singh	5	5
31	101304035	Elham Anwar	5	5
32	101304036	Gurseerat Singh Meen	5	5
33	101304037	Gursewak Singh	4	5
34	101304040	Hariansh Sehgal	4	5
35	101304041	Hartejdeep Singh	3	4
36	101304042	Himanshu Goyal	5	5
37	101304044	Jasjit Singh	5	5
38	101304045	Jassimran Singh Julka	5	5
39	101304046	Jessica Dhaliwal	5	5
40	101304047	Kanwarpal Singh	4	5
41	101304048	Karan Kumar	4	5
42	101304049	Karanjot	4	5
43	101304050	Kashish Aggarwal	4	5
44	101304051	Kritika Singla	5	5
45	101304052	Love Gaba	4	5
46	101304054	Manik Mittal	3.5	4
47	101304055	Maninderjit Singh	4	5
48	101304056	Mayank Singla	4	5
49	101304057	Mridul Bhutani	5	5
50	101304058	Naman Garg	5	5
51	101304059	Navdeep Singh	5	5
52	101304060	Navdeep Singh	3.5	4
53	101304061	Nazuk Aggarwal	4	5
54	101304062	Nishant Garg	5	5
55	101304063	Nishtha Raheja	5	5

56	101304064	Paras Bawa	5	5
57	101304065	Parth ahuja	5	5
58	101304066	Parushi	3	4
59	101304067	Pency Goyal	5	5
60	101304068	Piyush Jindal	5	5
61	101304069	Piyush Tripathi	5	5
62	101304070	Prachi Garg	4	5
63	101304071	Prashant Kataria	3	4
64	101304072	Preeti Garg	4	5
65	101304073	Priyank Arora	4	5
66	101304074	Priyanka	5	5
67	101304075	Priyanka Singh	5	5
68	101304076	Priyansh Mahajan	5	5
69	101304077	Rahul Meena	4	5
70	101304079	Rajat Sharma	4	5
71	101304080	Ratul Goyal	4	5
72	101304081	Ravinder Singh	3	4
73	101304082	Rishabh Juneja	4	5
74	101304083	Robin Manktala	4	5
75	101304084	Rohan Ghai	5	5
76	101304085	Rohan Singla	3	4
77	101304086	Rohan Wadhawan	4	5
78	101304087	Rohit Goyal	4	5
79	101304088	Rubina Bamba	4	5
80	101304089	Sagar Pulani	4	5
81	101304090	Sahil Kataria	3	4
82	101304091	Sakshi	4	5
83	101304092	Sandal Singh Sidhu	5	5
84	101304093	Sandeep Kaur	5	5
85	101304094	Satripleen Kaur	5	5
86	101304095	saurabh mohan	5	5
87	101304097	Shailly Gupta	5	5

88	101304098	Shaina	4	5
89	101304099	Shivika Gupta	4.5	5
90	101304100	Shresth Rai	4	5
91	101304101	Shubham Goyal	4	5
92	101304102	Shubham Gupta	4	5
93	101304103	Shubham Sharma	4	5
94	101304104	Shubham Sharma	5	5
95	101304105	Shubham Soin	5	5
96	101304106	Siddharth Goyal	5	5
97	101304107	Sidharth Garg	4	5
98	101304108	Simran Kaur	3	4
99	101304109	Simranjit Singh	4	5
100	101304111	Sumit Dhingra	5	5
101	101304112	Sumit Kaushik	4.5	5
102	101304113	Tushar Dheer	5	5
103	101304114	Tushar sharma	5	5
104	101304116	Utsav Chhabra	4	5
105	101304117	Vaibhav Gupta	5	5
106	101304118	Vaishali	4	5
107	101304119	Varun Bansal	4	5
108	101304120	Veni Jindal	5	5
109	101304121	Vishal Arora	5	5
110	101304122	Yugesh Goyal	4	5
111	101484001	Amandeep Singh	4	5
112	101484002	Amrinder Singh	4	5
113	101484004	Azad Singh	4	5
114	101484005	Chandan Garg	4	5
115	101484007	Deepak Singla	5	5
116	101484008	Diljeet Singh	3	4
117	101484009	Jyoti Kaushal	5	5
118	101484011	Pawan Kumar	4	5
119	101484012	Rajat Singla	4	5

120	101484013	Satveer Kaur	4.5	5
121	101484014	Saurabh Kumar Wadhawan	5	5
122	101484015	Shweta Sharma	3	4
123	101484016	Sukhjeet Singh	3	4

The performance of Students through the course UEE791 for criteria 'PO-10(B)' is summarized in Table PO-10(B).4

**Table PO-10(B).4: Average score of Student performance in the course UEE791 for criteria PO-10(B)**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEE791	89.43	10.57	0.00	0.00	0.00	4.89

The data from Table PO-10(B).2 and Table PO-10(B).4 is used to evaluate weighted average of direct measure through course portfolio for criteria PO-10(B), and is summarised in Table PO-10(B).5.

**Table PO-10(A).5: Weighted Average Student class performance (Course Portfolio) for criteria PO-10(B)**

Course	% of Students in each Score					Average Score
	5	4	3	2	1	
UEN002	7.50	32.50	46.25	11.25	2.50	3.31
UEE791	89.43	10.57	0.00	0.00	0.00	4.89
Weighted Average Score	48.47	21.53	23.13	5.63	1.25	4.10

**b) Indirect measures**

The indirect measurement of performance criteria 'PO-10(B)' has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-10(B).6 and Table PO-10(A).7.

**(i) Assessment Tools:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of 'PO-10(B)'.

UEN002	Correlate major local and regional environmental issues with changes in ecology and human health				
UEE791	Demonstrate the knowledge of professional responsibilities and respect for ethics				

**Table PO-10(B).6: Weighted average score of performance criterion 'PO-10(B)' based on Student course surveys.**

Course	% of Students in each score					Average Score
	5	4	3	2	1	
UEN002	41.39	32.55	19.06	3.72	3.25	<b>4.05</b>
UEE791	28.46	30.08	35.77	3.25	2.44	<b>3.79</b>
<b>Weighted average score</b>	<b>34.92</b>	<b>31.31</b>	<b>27.41</b>	<b>3.48</b>	<b>2.84</b>	<b>3.92</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of Program outcome 'PO-10' through indirect measurement is summarised in Table PO-10(A).7.

**c) Overall weighted average score of performance criterion 'PO-10(B)'**

The overall weighted average score of performance criterion 'PO-10(B)' is summarised in Table PO-10(B).8 from the data given in Table PO-10(B).5 , PO-10(B).6 and PO-10(A).7.

**Table PO-10(B).8: Overall weighted average score of performance criterion 'PO-10(B)'**

Assessment Tool	% of Students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
Student class performance	<b>48.47</b>	<b>21.53</b>	<b>23.13</b>	<b>5.63</b>	<b>1.25</b>	<b>4.10</b>	5
Course surveys	<b>34.92</b>	<b>31.31</b>	<b>27.41</b>	<b>3.48</b>	<b>2.84</b>	<b>3.92</b>	4
Other surveys	<b>34.11</b>	<b>41.87</b>	<b>20.79</b>	<b>2.41</b>	<b>0.8</b>	<b>4.06</b>	3
<b>Overall weighted score</b>	<b>40.36</b>	<b>29.87</b>	<b>23.97</b>	<b>4.1</b>	<b>1.66</b>	<b>4.03</b>	

### Overall assessment of Program outcome PO-10 using scores of PO-10(A) and PO-10(B)

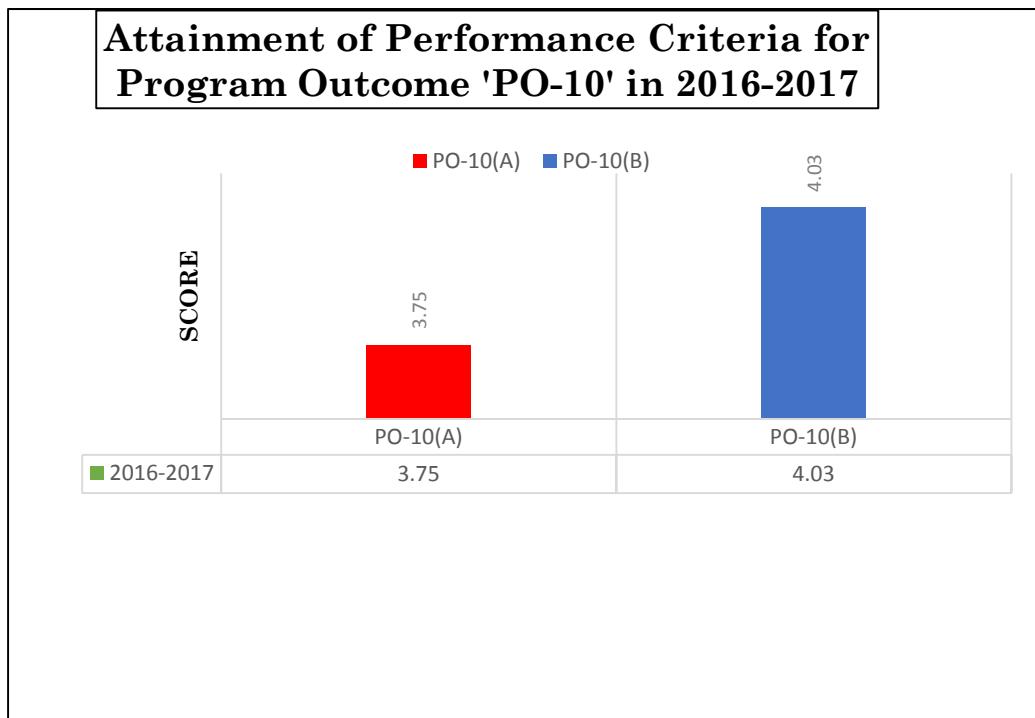
In the previous sections, each of the individual performance criteria PO-10(A) and PO-10(B) have been assessed. The performance for attainment of outcome PO-10 has been completed using the attainment values for PO-10(A) and PO-10(B) and is provided below:

Table PO-10.2 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome PO-10.

**Table PO-10.2: Overall score for outcome PO-10 at the program level**

Performance criteria	% of Students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-10(A)	30.3	34.52	23.4	4	7.89	3.75	5
PO-10(B)	40.36	29.87	23.97	4.1	1.66	4.03	5
<b>Overall score</b>	<b>35.33</b>	<b>32.19</b>	<b>23.68</b>	<b>4.05</b>	<b>4.77</b>	<b>3.89</b>	

The performance criteria wise assessment score distribution of outcome ‘PO-10’ is shown in Fig. PO-10.2.



**Figure PO-10.2: Performance criteria-wise assessment score distribution of outcome ‘PO-10’**

## **Track Record and assessment of attainment of Program outcomes over the last three academic years**

The performance criteria-wise assessment scores distribution and overall weighted score for outcome ‘PO-10’ for last three years, i.e. 2014-2015, 2015-2016, and 2016-2017 are presented in this section.

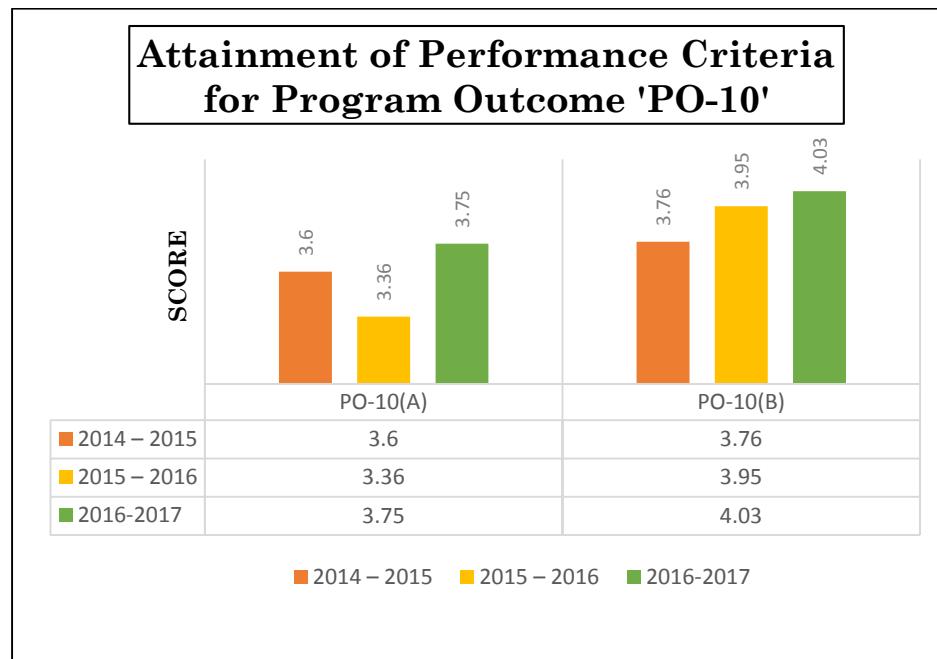
### ***Attainment of Outcomes***

The Table PO-10.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-10’.

**Table PO-10.3 Performance criteria-wise assessment score distribution for each outcome ‘PO-10’**

Program outcome and performance criteria	Academic year			Weight	
	2014 – 2015	2015 – 2016	2016 -2017		
<b>PO-10</b>	<b>PO-10(A)</b>	<b>3.60</b>	<b>3.36</b>	<b>3.75</b>	5
	<b>PO-10(B)</b>	<b>3.76</b>	<b>3.95</b>	<b>4.03</b>	5
<b>Overall weighted score of outcome PO-10</b>		<b>3.68</b>	<b>3.65</b>	<b>3.89</b>	

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-10’ over a period of last three years.



**Figure PO-10.3 :Performance criteria-wise assessment score distribution of outcome ‘PO-10’**

### **Level of attainment of Program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

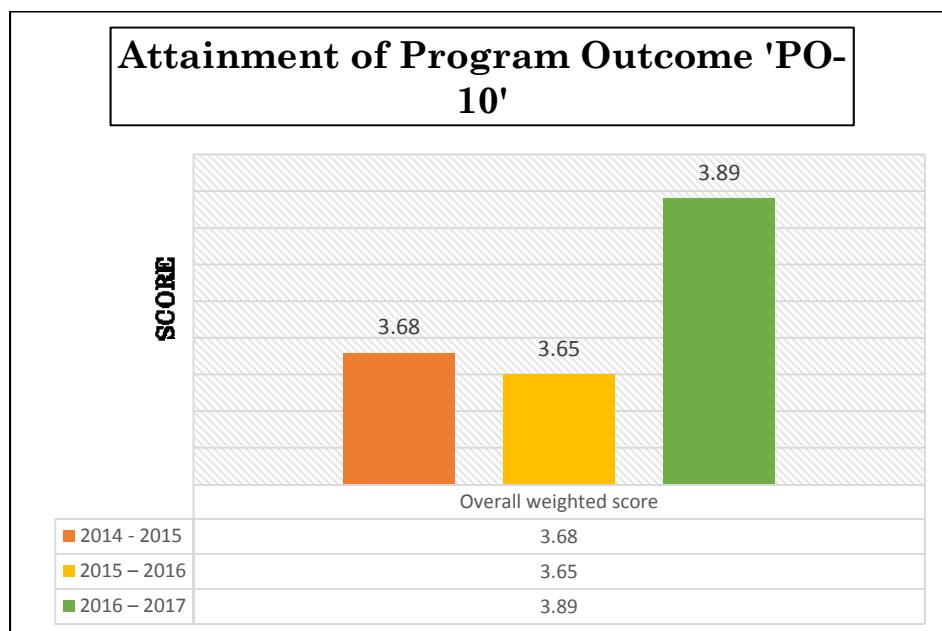
- i. Excellent: Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- ii. Very Good : Overall weighted score for the outcome is between 4 and 4.5 on a scale of 1 to 5.
- iii. Good: Overall weighted score for the outcome is between 3.5 and 4 on a scale of 1 to 5.
- iv. Satisfactory: Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.
- v. Unsatisfactory: Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

The Table PO-10.3 presents the overall weighted score of outcome ‘PO-10’ over the last three academic years.

**Table PO-10.3: Overall weighted score of the outcome ‘PO-10’ over a period of last three academic years.**

Academic year	Overall Weighted Score	Level of Attainment
2014 - 2015	3.68	Good
2015 – 2016	3.65	Good
2016 – 2017	3.89	Good

Figure PO-10.4 shows the overall weighted score of outcome ‘PO-10’ over a period of last three academic years.



**Figure PO-10.4:Overall weighted score of outcome ‘PO-10’ over a period of last three academic years**

The data presented above pertains to the courses offered during the academic year 2016-17.  
Similar data is available for the previous two academic years (2014-15 and 2015-16).

# **Assessment of Attainment of Program Outcome**

## **PO-11**

*An ability to use the techniques, skills, and modern engineering tools necessary  
for engineering practice*  
**(2016-17)**

*for the*  
**Bachelor of Engineering**  
*in*  
**Electrical Engineering**



**Electrical & Instrumentation Engineering Department**  
**Thapar Institute of Engineering & Technology, Patiala**  
**(Punjab) –INDIA**

## **Attainment of Program Outcome ‘PO-11’**

The attainment of student outcome **PO-11** : *An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice* has been measured for the BE Electrical Engineering program. The program outcome ‘PO-11’ has been classified into following performance criteria;

**PO-11(A): Able to use modern engineering equipment/techniques**

**PO-11(B): Able to develop systems for engineering applications**

**PO-11(C): Able to analyze engineering problems using software tools**

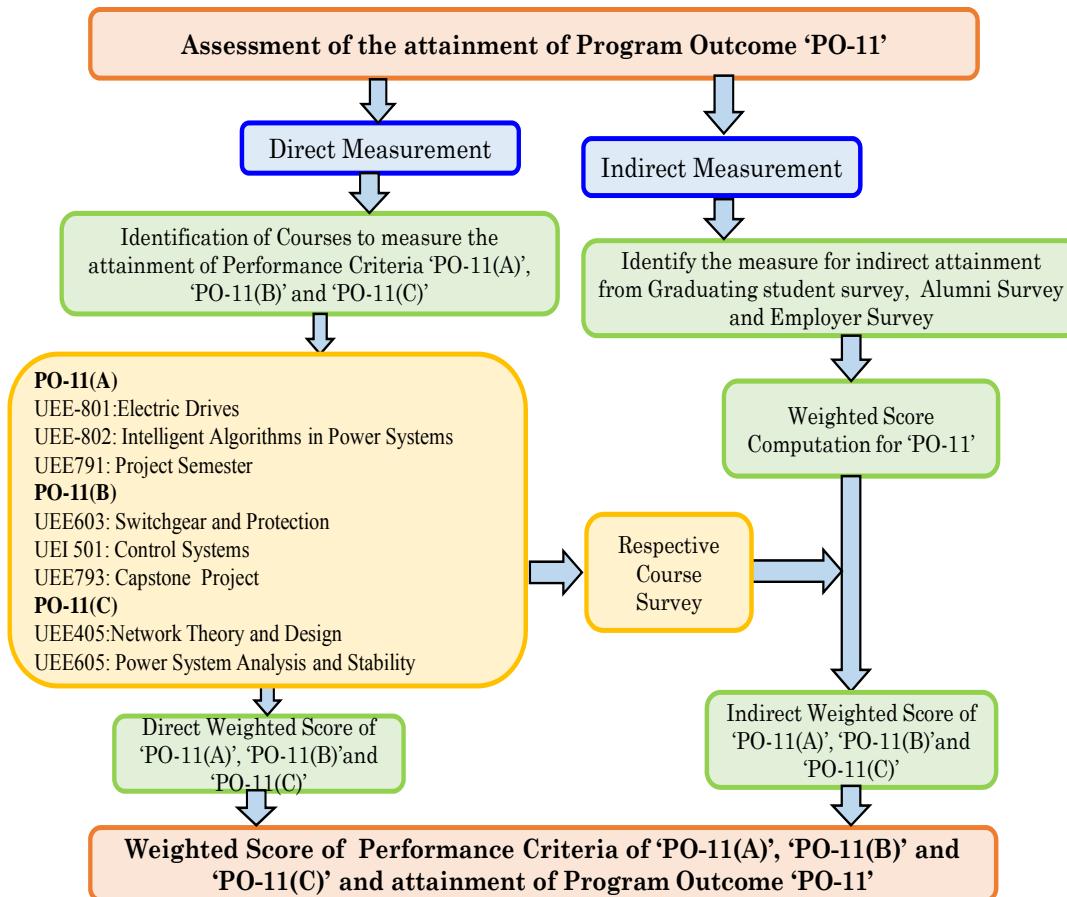
The program assessment committee identified the following courses for the assessment of program outcome ‘PO-11’. The courses used for the assessment during three academic years are marked bold.

- **UEI201: Analog Electronic Devices and Circuits**
- **UEE301: DC Machines and Transformers**
- **UEE401: Alternate Current Machines**
- UEI404: Digital Signal Processing Fundamentals
- **UEE405: Network Theory and Design**
- **UEI501: Control Systems**
- **UEE502: High Voltage Engineering**
- **UEE504: Power Electronics**
- **UEE601: Flexible AC Transmission Systems**
- **UEE603: Switchgear & Protection**
- **UEE605: Power System Analysis and Stability**
- UEI609: Fundamentals of Microprocessors and Microcontrollers
- **UEE791: Project Semester**
- **UEE793: Capstone Project**
- **UEE801: Electric Drives**
- **UEE802: Intelligent Algorithms in Power Systems**
- **UEE804: Operation and Control of Power Systems**
- **UEI841: Advanced Control Systems**

Outcome PO-11 has been assessed through three performance criteria PO-11(A), PO-11(B) and PO-11(C). The following courses have been considered by the program assessment committee for the assessment of performance criteria ‘PO-11(A)’, ‘PO-11(B)’ and ‘PO-11(C)’ for the academic year 2016-17.

Performance Criteria	Course -1	Course-2	Course-3
PO-11(A)	UEE801: Electric Drives	UEE802: Intelligent Algorithms in Power Systems	UEE791: Project Semester
PO-11(B)	UEE603: Switchgear & Protection	UEI501: Control Systems	UEE793: Capstone Project
PO-11(C)	UEE405: Network Theory and Design	UEE605: Power System Analysis and Stability	

The step by step methodology used to measure the attainment of program outcome ‘PO-11’ is shown in Fig. PO-11.1 for academic year (AY) 2016-17. The similar procedure is followed to measure the attainment of program outcome ‘PO-11’ for all three academic years under consideration.



**Fig. PO-11.1: Process for measurement of attainment of outcome 'PO-11' for the year 2016-17**

The following Rubric has been used to convert marks obtained by the students to a Likert scale in the range of 1 to 5 and is described in Table PO-11.1(a) and Table PO-11.1(b) in most cases unless specifically mentioned.

**Table PO-11.1(a): Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$75 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 75$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

**Table PO-11.1(b): Rubric for Outcome Measurement**

S. No.	Range of Marks (%)	Score (1-5)
1	$80 \leq \text{Marks} < 100$	5
2	$60 \leq \text{Marks} < 80$	4
3	$40 \leq \text{Marks} < 60$	3
4	$20 \leq \text{Marks} < 40$	2
5	$0 \leq \text{Marks} < 20$	1

The following sections summarize separate assessments for each of the performance criterion using the courses mentioned.

**Assessment of Outcome ‘PO-11’ using performance criterion PO-11(A)**

**PO-11(A): Able to use modern engineering techniques/equipment.**

The performance criteria ‘PO-11(A)’ has been measured through direct measurement using the course portfolio and indirect assessment using course surveys and other surveys ( Graduating student survey, Alumni survey and Employer survey).

**a) Direct Measures:**

**(i) Assessment Tool: Student’s performance using Course Portfolio**

Three courses namely *UEE801: Electric Drives*, *UEE802: Intelligent Algorithms in Power Systems* and *UEE791: Project Semester* are used to assess performance criteria PO-11(A) as a direct measure. The analysis for each of these courses is provided below:

**UEE801: Electric Drives**

The performance of course *UEE801: Electric Drives* is used to measure the attainment of outcome ‘PO-11(A)’ through the End Semester Examination (Question No. 4, July-Dec 2016, 10 marks).

**Question:**

Q.4	Explain the operation of 3-φ VSI fed induction motor drive. Obtain Fourier series of corresponding line voltage $V_{AB}$ and summarize the drawbacks of stepped wave inverter. What will be the schematics to implement VSI fed drive if input is three-phase AC.	(10)
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The performance of the students in the above question is then summarized as given below in Table PO-11(A).1 using rubrics defined in Table PO-11.1(a).

**Table PO-11(A).1: Students' performance in question targeting 'PO-11(A)'; Course UEE801**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101304001	Aarushi Bajaj	7	4
2	101304002	Abhey Arora	6	4
3	101304003	Abhishek Taksali	1	1
4	101304004	Adhikaansh Tayal	0	1
5	101304005	Aditi Narang	5	3
6	101304006	Aditya	3	2
7	101304007	Akshat	3	2
8	101304008	Akshay Kapoor	6	4
9	101304009	Akshay Kumar	4	3
10	101304010	Akshay Kumar Chaudhary	1	1
11	101304011	Akshay Sharma	4	3
12	101304012	AmandeepKaur	3	2
13	101304013	Amandeep Singh	7	4
14	101304014	Amaninder Singh	1	1
15	101304015	Angad Kapoor	5	3
16	101304016	Ankita Garg	6	4
17	101304018	Anmol Jawa	4	3
18	101304019	Anmolpreet Singh	7	4
19	101304020	Anyuti Tiwary	3	2
20	101304021	Arpit Sharma	5	3
21	101304022	Arsh Kundal	0	1
22	101304023	Arshbir Kaur	6	4
23	101304024	Arshdeep Singh Bagga	0	1
24	101304025	Ashish	1	1
25	101304026	Ashish Rajpal	2	2
26	101304028	Berry Lubana	3	2
27	101304029	Bhanu Duggal	7	4
28	101304030	Bhanu Marwaha	2	2
29	101304031	Chirag Gaba	5	3
30	101304032	Dipin Garg	3	2

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
31	101304033	Dishant Vanvari	2	2
32	101304034	Divyesh Pratap Singh	5	3
33	101304035	Elham Anwar	4	3
34	101304036	Gurseerat Singh Meen	1	1
35	101304037	Gursewak Singh	0	1
36	101304040	Hariansh Sehgal	4	3
37	101304041	Hartejdeep Singh	3	2
38	101304042	Himanshu Goyal	2	2
39	101304044	Jasjit Singh	1	1
40	101304045	Jassimran Singh Julka	4	3
41	101304046	Jessica Dhaliwal	7	4
42	101304047	Kanwarpal Singh	0	1
43	101304048	Karan Kumar	4	3
44	101304049	Karanjot Singh Kochar	7	4
45	101304050	Kashish Aggarwal	6	4
46	101304051	Kritika Singla	7	4
47	101304052	Love Gaba	4	3
48	101304054	Manik Mittal	0	1
49	101304055	Maninderjit Singh	2	2
50	101304056	Mayank Singla	4	3
51	101304057	Mridul Bhutani	0	1
52	101304058	Naman Garg	6	4
53	101304059	Navdeep Singh	2	2
54	101304060	Navdeep Singh	1	1
55	101304061	Nazuk Aggarwal	6	4
56	101304062	Nishant Garg	3	2
57	101304063	Nishtha Raheja	2	2
58	101304064	Paras Bawa	2	2
59	101304065	Parth Ahuja	4	3
60	101304066	Parushi	5	3
61	101304067	Pency Goyal	3	2
62	101304068	Piyush Jindal	4	3
63	101304069	Piyush Tripathi	3	2
64	101304070	Prachi Garg	3	2
65	101304071	Prashant Kataria	0	1
66	101304072	Preeti Garg	5	3
67	101304073	Priyank Arora	4	3
68	101304074	Priyanka	0	1
69	101304075	Priyanka Singh	1	1
70	101304076	Priyansh Mahajan	0	1

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
71	101304077	Rahul Meena	0	1
72	101304078	Rajan	6	4
73	101304079	Rajat Sharma	3	2
74	101304080	RatulGoyal	3	2
75	101304081	Ravinder Singh	7	4
76	101304082	Rishabh Juneja	2	2
77	101304083	Robin Manktala	0	1
78	101304084	Rohan Ghai	2	2
79	101304085	Rohan Singla	2	2
80	101304086	Rohan Wadhawan	6	4
81	101304087	Rohit Goyal	0	1
82	101304088	Rubina Bamba	4	3
83	101304089	Sagar Pulani	2	2
84	101304090	Sahil Kataria	6	4
85	101304091	Sakshi	6	4
86	101304092	Sandal Singh Sidhu	3	2
87	101304093	Sandeep Kaur	1	1
88	101304094	Satripleen Kaur	7	4
89	101304095	Saurabh Mohan	0	1
90	101304096	Shagundeepr Singh	0	1
91	101304097	Shailly Gupta	5	3
92	101304098	Shaina	4	3
93	101304099	Shivika Gupta	3	2
94	101304100	Shresth Rai	0	1
95	101304101	Shubham Goyal	3	2
96	101304102	Shubham Gupta	9	5
97	101304103	Shubham Sharma	3	2
98	101304104	Shubham Sharma	6	4
99	101304105	Shubham Soin	3	2
100	101304106	Siddharth Goyal	2	2
101	101304107	Sidharth Garg	4	3
102	101304108	Simran Kaur	3	2
103	101304109	Simranjit Singh	2	2
104	101304111	Sumit Dhingra	1	1
105	101304112	Sumit Kaushik	4	3
106	101304113	Tushar Dheer	4	3
107	101304114	Tushar Sharma	5	3
108	101304116	Utsav Chhabra	0	1
109	101304117	Vaibhav Gupta	6	4
110	101304118	Vaishali	0	1

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
111	101304119	Varun Bansal	2	2
112	101304120	Veni Jindal	6	4
113	101304121	Vishal Arora	0	1
114	101304122	YugeshGoyal	3	2
115	101484001	Amandeep Singh	7	4
116	101484002	Amrinder Singh	6	4
117	101484003	Ashmeen Singh	1	1
118	101484004	Azad Singh	1	1
119	101484005	Chandan Garg	2	2
120	101484007	Deepak Singla	4	3
121	101484008	Diljeet Singh	7	4
122	101484009	Jyoti Kaushal	1	1
123	101484011	Pawan Kumar	5	3
124	101484012	Rajat Singla	0	1
125	101484013	Satveer Kaur	5	3
126	101484014	Saurabh Kumar Wadhawan	0	1
127	101484015	Shweta Sharma	5	3
128	101484016	Sukhjeet Singh	2	2

The performance of students through the course UEE801 for criterion ‘PO-11(A)’ is summarized in Table PO-11(A).2

**Table PO-11(A).2: Average score of student performance in the course UEE801 for criteria PO-11(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE801	0.78	20.31	23.44	28.91	26.56	2.40

### **UEE802: Intelligent Algorithms in Power Systems**

The performance of course *UEE802: Intelligent Algorithms in Power Systems* is used to measure the attainment of outcome ‘PO-11(A)’ through the End Semester Examination (Question No. 2(a) and 2(b), July-Dec 2016, 15 marks).

#### **Question:**

Q.2(a)	Suppose a genetic algorithm uses chromosomes of the form $x = abcdefgh$ with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual $x$ be calculated as: $f(x) = (a + b) - (c + d) + (e + f) - (g + h)$ , and let the initial population consist of four individuals with the following chromosomes: $x_1 = 6\ 5\ 4\ 1\ 3\ 5\ 3\ 2$ , $x_2 = 8\ 7\ 1\ 2\ 6\ 6\ 0\ 1$ , $x_3 = 2\ 3\ 9\ 2\ 1\ 2\ 8\ 5$ and $x_4 = 4\ 1\ 8\ 5\ 2\ 0\ 9\ 4$	(15)
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	i) Evaluate the fitness of each individual showing all your workings and arrange them in order with fittest first and least fit last. ii) Cross the fittest two individuals using one-point crossover at the middle point. iii) Cross the second and third fittest individuals using a two-point crossover (point's b and f). iv) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover.	
Q.2(b)	Using an example, show why it is important to have a mutation in a genetic algorithm	

The performance of the students in the above question is then summarized as given below in Table PO-11(A).3 using rubrics defined in Table PO-11.1(a).

**Table PO-11(A).3: Students' performance in question targeting 'PO-11(A)'; Course UEE802**

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
1	101254015	Kuldeep Singh Deora	12	5
2	101304001	Aarushi Bajaj	8	3
3	101304002	Abhey Arora	8	3
4	101304003	AbhishekTaksali	8	3
5	101304004	Adhikaansh Tayal	2	1
6	101304005	Aditi Narang	13	5
7	101304006	Aditya	11	4
8	101304007	Akshat	15	5
9	101304008	Akshay Kapoor	13	5
10	101304009	Akshay Kumar	12	5
11	101304010	Akshay Kumar	0	1
12	101304011	Akshay Sharma	11	4
13	101304012	Amandeep Kaur	3	2
14	101304013	Amandeep Singh	7	3
15	101304014	Amaninder Singh	0	1
16	101304015	Angad Kapoor	13	5
17	101304016	Ankita Garg	15	5
18	101304018	Anmol Jawa	13	5
19	101304019	Anmolpreet Singh	13	5
20	101304020	Anyuti Tiwary	5	2
21	101304021	Arpit Sharma	4	2
22	101304022	Arsh Kundal	5	2
23	101304023	Arshbir Kaur	1	1
24	101304024	Arshdeep Singh Bagga	9	4

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
25	101304025	Ashish	6	3
26	101304026	Ashish Rajpal	2	1
27	101304028	Berry Lubana	0	1
28	101304029	Bhanu Duggal	15	5
29	101304030	Bhanu Marwaha	11	4
30	101304031	Chirag Gaba	2	1
31	101304032	DipinGarg	2	1
32	101304033	Dishant Vanvari	0	1
33	101304034	Divyesh Pratap Singh	5	2
34	101304035	Elham Anwar	9	4
35	101304036	Gurseerat Singh Meen	4	2
36	101304037	Gursewak Singh	6	3
37	101304040	Hariansh Sehgal	7	3
38	101304041	Hartejdeep Singh	5	2
39	101304042	Himanshu Goyal	13	5
40	101304044	Jasjit Singh	4	2
41	101304045	Jassimran Singh Julka	4	2
42	101304046	Jessica Dhaliwal	13	5
43	101304047	Kanwarpal Singh	8	3
44	101304048	Karan Kumar	0	1
45	101304049	Karanjot Singh Kochar	13	5
46	101304050	Kashish Aggarwal	11	4
47	101304052	Love Gaba	10	4
48	101304054	Manik Mittal	10	4
49	101304055	Maninderjit Singh	10	4
50	101304056	Mayank Singla	13	5
51	101304057	Mridul Bhutani	13	5
52	101304058	Naman Garg	13	5
53	101304059	Navdeep Singh	10	4
54	101304060	Navdeep Singh	11	4
55	101304062	Nishant Garg	13	5
56	101304094	Satripleen Kaur	13	5
57	101484001	Amandeep Singh	15	5
58	101484002	Amrinder Singh	12	5
59	101484003	Ashmeen Singh	5	2
60	101484004	Azad Singh	2	1
61	101484005	Chandan Garg	0	1

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
62	101484007	Deepak Singla	8	3
63	101484008	Diljeet Singh	4	2
64	101304051	KritikaSingla	7	3
65	101304061	Nazuk Aggarwal	11	4
66	101304063	Nishtha Raheja	5	2
67	101304064	Paras Bawa	10	4
68	101304065	Parth Ahuja	11	4
69	101304066	Parushi	5	2
70	101304067	Pency Goyal	11	4
71	101304068	Piyush Jindal	13	5
72	101304069	Piyush Tripathi	11	4
73	101304070	Prachi Garg	11	4
74	101304071	Prashant Kataria	5	2
75	101304072	Preeti Garg	5	2
76	101304073	Priyank Arora	10	4
77	101304074	Priyanka	7	3
78	101304075	Priyanka Singh	15	5
79	101304076	Priyansh Mahajan	8	3
80	101304077	Rahul Meena	6	3
81	101304078	Rajan	9	4
82	101304079	Rajat Sharma	6	3
83	101304080	Ratul Goyal	3	2
84	101304081	Ravinder Singh	1	1
85	101304082	Rishabh Juneja	4	2
86	101304083	Robin Manktala	13	5
87	101304084	Rohan Ghai	9	4
88	101304085	Rohan Singla	6	3
89	101304086	Rohan Wadhawan	10	4
90	101304087	Rohit Goyal	6	3
91	101304088	Rubina Bamba	5	2
92	101304089	Sagar Pulani	13	5
93	101304090	Sahil Kataria	9	4
94	101304091	Sakshi	5	2
95	101304092	Sandal Singh Sidhu	2	1
96	101304093	Sandeep Kaur	8	3
97	101304095	Saurabh Mohan	8	3
98	101304096	Shagundeepr Singh	3	2

S. No	Roll No.	Name of Student	Marks (15)	Score (1-5)
99	101304097	Shailly Gupta	9	4
100	101304098	Shaina	13	5
101	101304099	Shivika Gupta	5	2
102	101304100	Shresth Rai	0	1
103	101304101	Shubham Goyal	13	5
104	101304102	Shubham Gupta	10	4
105	101304103	Shubham Sharma	6	3
106	101304104	Shubham Sharma	13	5
107	101304105	Shubham Soin	8	3
108	101304106	Siddharth Goyal	7	3
109	101304107	Sidharth Garg	11	4
110	101304108	Simran Kaur	8	3
111	101304109	Simranjit Singh	0	1
112	101304111	Sumit Dhingra	6	3
113	101304112	Sumit Kaushik	13	5
114	101304113	TusharDheer	8	3
115	101304114	Tushar Sharma	6	3
116	101304116	Utsav Chhabra	0	1
117	101304117	Vaibhav Gupta	11	4
118	101304118	Vaishali	5	2
119	101304119	Varun Bansal	11	4
120	101304120	Veni Jindal	15	5
121	101304121	Vishal Arora	7	3
122	101304122	Yugesh Goyal	3	2
123	101484009	Jyoti Kaushal	6	3
124	101484011	Pawan Kumar	12	5
125	101484012	Rajat Singla	1	1
126	101484013	Satveer Kaur	13	5
127	101484014	Saurabh Kumar	13	5
128	101484015	Shweta Sharma	3	2
129	101484016	Sukhjeet Singh	10	4

The performance of students through the course UEE802 for criteria PO-11(A) is summarized in Table PO-11(A).4.

**Table PO-11(A).4: Average score of student performance in the course UEE802 for criteria PO-11(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	

<b>UEE802</b>	<b>24.81</b>	<b>21.71</b>	<b>20.93</b>	<b>18.60</b>	<b>13.95</b>	<b>3.25</b>
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### **UEE791: Project Semester**

The performance of course *UEE791: Project Semester* is used to measure the attainment of outcome ‘PO-11(A)’ through the work carried out using modern techniques and tools during the project semester (Jan-June 2017, 100 marks).

The performance of the students in the above question is then summarized as given below in Table PO-11(A).5 using rubrics defined in Table PO-11.1(b).

**Table PO-11(A).5: Students' performance in question targeting 'PO-11(A)'; Course UEE791**

<b>S. No</b>	<b>Roll No.</b>	<b>Name of Student</b>	<b>Marks (100)</b>	<b>Score (1-5)</b>
1	101304001	Aarushi Bajaj	69	4
2	101304002	Abhey Arora	56	3
3	101304003	Abhishek Taksali	66	4
4	101304004	Adhikaansh Tayal	71	4
5	101304005	Aditi Narang	89	5
6	101304006	Aditya	73	4
7	101304007	Akshat	60	4
8	101304008	Akshay Kapoor	73	4
9	101304009	Akshay Kumar	58	3
10	101304011	Akshay Sharma	68	4
11	101304012	Amandeep Kaur	74	4
12	101304013	Amandeep Singh	70	4
13	101304014	Amaninder Singh Randhawa	57	3
14	101304015	Angad Kapoor	68	4
15	101304016	Ankita Garg	86	5
16	101304018	Anmol Jawa	77	4
17	101304019	Anmolpreet Singh	84	5
18	101304020	Anyuti Tiwary	87	5
19	101304021	Arpit Sharma	79	4
20	101304023	Arshbir Kaur	80	5
21	101304024	Arshdeep Singh Bagga	59	3
22	101304025	Ashish	64	4
23	101304026	Ashish Rajpal	70	4
24	101304028	Berry Lubana	57	3

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
25	101304029	Bhanu Duggal	85	5
26	101304030	Bhanu Marwaha	91	5
27	101304031	Chirag Gaba	64	4
28	101304032	Dipin Garg	72	4
29	101304033	Dishant Vanvari	78	4
30	101304034	Divyesh Pratap Singh	78	4
31	101304035	Elham Anwar	80	5
32	101304036	Gurseerat Singh Meen	70	4
33	101304037	Gursewak Singh	59	3
34	101304040	Hariansh Sehgal	64	4
35	101304041	Hartejdeep Singh	60	4
36	101304042	Himanshu Goyal	74	4
37	101304044	Jasjit Singh	75	4
38	101304045	Jassimran Singh Julka	75	4
39	101304046	Jessica Dhaliwal	78	4
40	101304047	Kanwarpal Singh	54	3
41	101304048	Karan Kumar	80	5
42	101304049	Karanjot Singh Kochar	82	5
43	101304050	Kashish Aggarwal	78	4
44	101304051	Kritika Singla	69	4
45	101304052	Love Gaba	70	4
46	101304054	Manik Mittal	66	4
47	101304055	Maninderjit Singh	55	3
48	101304056	Mayank Singla	66	4
49	101304057	Mridul Bhutani	80	4
50	101304058	Naman Garg	75	4
51	101304059	Navdeep Singh	67	4
52	101304060	Navdeep Singh	78	4
53	101304061	Nazuk Aggarwal	79	4
54	101304062	Nishant Garg	68	4
55	101304063	Nishtha Raheja	73	4
56	101304064	Paras Bawa	76	4
57	101304065	Parth Ahuja	74	4
58	101304066	Parushi	66	4
59	101304067	Pency Goyal	75	4
60	101304068	Piyush Jindal	69	4
61	101304069	Piyush Tripathi	66	4

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
62	101304070	Prachi Garg	72	4
63	101304071	Prashant Kataria	49	3
64	101304072	Preeti Garg	82	5
65	101304073	Priyank Arora	71	4
66	101304074	Priyanka	78	4
67	101304075	Priyanka Singh	77	4
68	101304076	Priyansh Mahajan	63	4
69	101304077	Rahul Meena	62	4
70	101304079	Rajat Sharma	69	4
71	101304080	Ratul Goyal	78	4
72	101304081	Ravinder Singh	52	3
73	101304082	Rishabh Juneja	70	4
74	101304083	Robin Manktala	82	5
75	101304084	Rohan Ghai	74	4
76	101304085	Rohan Singla	57	3
77	101304086	Rohan Wadhawan	67	4
78	101304087	Rohit Goyal	60	4
79	101304088	Rubina Bamba	84	5
80	101304089	Sagar Pulani	74	4
81	101304090	Sahil Kataria	64	4
82	101304091	Sakshi	75	4
83	101304092	Sandal Singh Sidhu	78	4
84	101304093	Sandeep Kaur	67	4
85	101304094	Satripleen Kaur	81	5
86	101304095	Saurabh Mohan	68	4
87	101304097	Shailly Gupta	85	5
88	101304098	Shaina	68	4
89	101304099	Shivika Gupta	74	4
90	101304100	Shresth Rai	72	4
91	101304101	Shubham Goyal	87	5
92	101304102	Shubham Gupta	82	5
93	101304103	Shubham Sharma	80	4
94	101304104	Shubham Sharma	82	5
95	101304105	Shubham Soin	64	4
96	101304106	Siddharth Goyal	62	4
97	101304107	Sidharth Garg	86	5
98	101304108	Simran Kaur	71	4

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
99	101304109	Simranjit Singh	54	3
100	101304111	Sumit Dhingra	71	4
101	101304112	Sumit Kaushik	78	4
102	101304113	Tushar Dheer	76	4
103	101304114	Tushar Sharma	57	3
104	101304116	Utsav Chhabra	66	4
105	101304117	Vaibhav Gupta	72	4
106	101304118	Vaishali	74	4
107	101304119	Varun Bansal	80	5
108	101304120	Veni Jindal	87	5
109	101304121	Vishal Arora	73	4
110	101304122	Yugesh Goyal	79	4
111	101484001	Amandeep Singh	75	4
112	101484002	Amrinder Singh	72	4
113	101484004	Azad Singh	57	3
114	101484005	Chandan Garg	65	4
115	101484007	Deepak Singla	78	4
116	101484008	Diljeet Singh	64	4
117	101484009	Jyoti Kaushal	68	4
118	101484011	Pawan Kumar	66	4
119	101484012	Rajat Singla	62	4
120	101484013	Satveer Kaur	78	4
121	101484014	Saurabh Kumar Wadhawan	75	4
122	101484015	Shweta Sharma	71	4
123	101484016	Sukhjeet Singh	50	3

The performance of students through the course UEE791 for criteria PO-11(A) is summarized in Table PO-11(A).6.

**Table PO-11(A).6: Average score of student performance in the course UEE791 for criteria PO-11(A)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE791</b>	<b>17.07</b>	<b>70.73</b>	<b>12.20</b>	<b>0.00</b>	<b>0.00</b>	<b>4.05</b>

The data from Table PO-11(A).2, Table PO-11(A).4 and Table PO-11(A).6 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-11(A)’, and is summarised in Table PO-11(A).7.

**Table PO-11(A).7: Weighted Average Student class performance (Course Portfolio) for criteria ‘PO-11(A).**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE801	0.78	20.31	23.44	28.91	26.56	<b>2.40</b>
UEE802	24.81	21.71	20.93	18.60	13.95	<b>3.25</b>
UEE791	17.07	70.73	12.20	0.00	0.00	<b>4.05</b>
Student class performance score	<b>14.22</b>	<b>37.58</b>	<b>18.86</b>	<b>15.84</b>	<b>13.50</b>	<b>3.23</b>

### b) Indirect Measures

The indirect measurement of performance criteria ‘PO-11(A)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-11(A).8 and Table PO-11(A).9.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-11(A)’.

UEE801	Conceptualize the basic drive system and analyse it for different types of loads
UEE802	Obtain the optimum solution of well formulated optimization problem using evolutionary approach.
UEE791	Acquire knowledge and experience of software and hardware practices in the area of project.

**Table PO-11(A).8: Weighted average score of performance criterion ‘PO-11(A)’ based on student course surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE801	38.32	26.16	18.69	6.54	10.28	<b>3.75</b>
UEE802	27.34	34.38	31.25	2.34	4.69	<b>3.77</b>
UEE791	30.08	27.64	34.96	4.88	2.44	<b>3.78</b>
Course survey score	<b>31.91</b>	<b>29.39</b>	<b>28.30</b>	<b>4.59</b>	<b>5.80</b>	<b>3.77</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-11’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Alumni Survey	
Employer Survey	Do our students have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice?

**Table PO-11(A).9: Weighted average score of performance criterion ‘PO-11(A)’ based on other surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	32.39	50.70	15.49	1.41	0.00	<b>4.14</b>
<b>Employer survey</b>	40.00	53.33	6.67	0.00	0.00	<b>4.33</b>
<b>Alumni survey</b>	28.02	41.06	24.64	5.31	0.97	<b>3.90</b>
<b>Other surveys score</b>	<b>33.47</b>	<b>48.36</b>	<b>15.6</b>	<b>2.24</b>	<b>0.32</b>	<b>4.12</b>

**c) Overall weighted average score of performance criterion ‘PO-11(A)’**

The overall weighted average score of performance criterion ‘PO-11(A)’ is summarised in Table PO-11(A).10 from the data given in Tables PO-11(A).7, PO-11(A).8 and PO-11(A).9.

**Table PO-11(A).10: Overall weighted average score of performance criterion ‘PO-11(A)’**

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance score</b>	14.22	37.58	18.86	15.84	13.50	<b>3.23</b>	5
<b>Course surveys score</b>	31.91	29.39	28.30	4.59	5.80	<b>3.77</b>	4
<b>Other surveys score</b>	33.47	48.36	15.6	2.24	0.32	<b>4.12</b>	3
<b>Overall weighted score</b>	<b>24.93</b>	<b>37.54</b>	<b>21.19</b>	<b>8.69</b>	<b>7.64</b>	<b>3.63</b>	-

**Assessment of Outcome ‘PO-11’ using performance criterion PO-11(B)**

**PO-11(B): Able to develop systems for engineering applications.**

The performance criteria ‘PO-11(B)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

**a) Direct Measures:**

**(i) Assessment Tool: Students’ performance using Course Portfolio**

Three courses namely *UEE603: Switchgear & Protection*, *UEI501: Control systems and UEE793: Capstone Project* are used to assess performance criteria PO-11(B) as a direct measure. The analysis for each of these courses is provided below:

**UEE603: Switchgear & Protection**

The performance of course *UEE603: Switchgear & Protection* is used to measure the attainment of outcome ‘PO-11(B)’ through the End Semester Examination (Question No. 6, Jan-June 2017, 10 marks).

**Question:**

Q.6	A star-connected, 3-phase, 10 MVA, 6.6 kV alternator is protected by circulating	(10)
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	current protection, the star point being earthed via a resistance $r$ . Estimate the value of earthing resistor if 85% of the stator winding is protected against earth faults. Assume an earth fault setting of 20%. Neglect the impedance of the alternator winding.	
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The performance of the students in the above question is summarized in Table PO-11(B).1 using rubrics defined in Table PO-11.1(a).

**Table PO-11(B).1: Students' performance in question targeting 'PO-11(B)'; Course UEE603**

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
1	101404001	Abhay Mahipal	10	5
2	101404002	Abhijeet Singh Sankhla	10	5
3	101404004	Abhinav Arora	0	1
4	101404006	Abhishek Sharma	10	5
5	101404007	Ajay Singh	0	1
6	101404009	Alka Thakur	10	5
7	101404012	Ankush Goyal	10	5
8	101404013	Anmol Arjun Bharaj	0	1
9	101404014	Anmol Goyat	0	1
10	101404015	Anmol Rattan Kaur	8	5
11	101404017	Anubhav Kumar	2	2
12	101404018	Apeksha Goel	0	1
13	101404019	Arnish Jain	10	5
14	101404020	Arshiya	10	5
15	101404021	Arshjot Kaur	10	5
16	101404023	Ayush Jain	10	5
17	101404024	Bhawani Singh	10	5
18	101404025	Chirag Jain	10	5
19	101404026	Davileen Garg	10	5
20	101404027	Dilpreet Kaur	10	5
21	101404028	Divesh Kamdar	10	5
22	101404029	Divyam Aggarwal	10	5
23	101404031	Divyanshu Siddharth	10	5
24	101404032	Garima	10	5
25	101404033	Garv Chahar	0	1
26	101404035	Gaurav Rathore	0	1
27	101404036	Gurpreet Singh	8	5
28	101404037	Gursagar Singh	10	5
29	101404038	Gurupinder Pal Singh	6	4
30	101404039	Harmanpreet Singh	0	1

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
31	101404041	Harshit Kaushik	10	5
32	101404042	Harshvir Singh	10	5
33	101404043	Harsimarjot Kaur	10	5
34	101404044	Harsimran Singh	8	5
35	101404046	Heema Gupta	10	5
36	101404047	Hitesh Kumar	6	4
37	101404048	Ishita Mahindru	0	1
38	101404049	Jagmeet Singh Bawa	10	5
39	101404050	Jagnoor Kaur	8	5
40	101404051	Jashanpreet Singh	10	5
41	101404052	Jatin Bansal	10	5
42	101404053	Jatin Raheja	10	5
43	101404054	Kanishak Sharma	10	5
44	101404055	Karan Sanjeev Bajaj	10	5
45	101404056	Kirtish Madaan	10	5
46	101404057	Mahitosh Sharma	10	5
47	101404058	Manan Mittal	10	5
48	101404059	Mandeep Singh Panesar	10	5
49	101404060	Manisha Gupta	10	5
50	101404061	Manit Gupta	5	3
51	101404062	Manjosh Singh Dhillon	10	5
52	101404063	Manpreet Singh Brar	10	5
53	101404064	Manvir Kaur	10	5
54	101404065	Mehak Bhatia	10	5
55	101404066	Mithilesh Kumar	10	5
56	101404067	Mohit Goyal	10	5
57	101404068	Mridul Marwaha	10	5
58	101404069	Mudit Arora	10	5
59	101404070	Naveen Parashar	0	1
60	101404072	Nigam Wadhwa	10	5
61	101404073	Nikhil Danodia	0	1
62	101404074	Nishita Kumari	10	5
63	101404075	Nitin Gupta	10	5
64	101404076	Nitish Arora	10	5
65	101404077	Nitish Bhardwaj	0	1
66	101404078	Omandeep Kaur	10	5
67	101404079	Pankaj Garg	10	5

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
68	101404080	Paramjot Singh	10	5
69	101404081	Parmar Adhiraj Singh	10	5
70	101404083	Prabhdeep Kaur	10	5
71	101404084	Prachur Maharwal	8	5
72	101404087	Prashant Khare	4	3
73	101404089	Pulkit Bansal	10	5
74	101404090	Pushpinder Singh	10	5
75	101404091	Rachit Verma	10	5
76	101404092	Rahul Gautam	0	1
77	101404093	Rahul Goyal	10	5
78	101404094	Rajshree Vaidya	10	5
79	101404096	Rishabh Gupta	10	5
80	101404099	Sagar Bansal	10	5
81	101404100	Sahajdeep Kaur	10	5
82	101404102	Sahil Singla	10	5
83	101404103	Samarth Gupta	10	5
84	101404104	Sambhav Jain	10	5
85	101404105	Samrat Kumar Gupta	0	1
86	101404106	Sanamdeep Singh	10	5
87	101404107	Sanket Gupta	4	3
88	101404108	Saurabh Kumar	2	2
89	101404109	Shailesh Verma	10	5
90	101404110	Shaivya Thapliyal	0	1
91	101404111	Sher Mohammed	10	5
92	101404112	Shivam Dochania	10	5
93	101404113	Shivam Gera	10	5
94	101404114	Shivam Kumar Kedia	10	5
95	101404115	Shubham Bhardwaj	3	2
96	101404116	Shubham Chaturvedi	5	3
97	101404117	Shubham Garg	10	5
98	101404118	Shubham Kumar	10	5
99	101404119	Shubham Verma	0	1
100	101404120	Shubhdeep Singh	0	1
101	101404121	Siddharth Singh	10	5
102	101404122	Simran Mehra	0	1
103	101404123	Sukhman	10	5
104	101404124	Swapnil Singla	10	5

S. No	Roll No.	Name of Student	Marks (10)	Score (1-5)
105	101404125	Tanish Gupta	0	1
106	101404126	Taranjot Singh	10	5
107	101404127	Tarun Garg	10	5
108	101404128	Tarun Gupta	0	1
109	101404129	Tarun Kumar	5	3
110	101404130	Tushar Goel	10	5
111	101404132	Utkarsh Atri	0	1
112	101404133	Vandana Gora	10	5
113	101404135	Vasu Mittal	10	5
114	101404136	Yashika Chopra	5	3
115	101404137	Yatin Gudwani	0	1
116	101404138	Yogesh Garg	10	5
117	101454001	Yatendra Agrawal	10	5
118	101454002	Yash Motwani	5	3
119	101454003	Harshwardhan Soni	0	1
120	101454004	Simardeep Kaur	10	5
121	101454005	Tejas Kapila	10	5
122	101454006	Nitish Dewan	0	1
123	101454007	Abhishek Nigam	10	5
124	101454008	Tarun Puri	10	5
125	101454009	Lariza Bansal	8	5
126	101454010	Tanish Goyal	10	5
127	101454011	Aditi	0	1
128	101484003	Ashmeen Singh	0	1
129	101584001	Amanjit Singh	5	3
130	101584002	Chetan Garg	10	5
131	101584003	Devinder Kumar	5	3
132	101584007	Karamjeet Singh	10	5
133	101584008	Lakshay Garg	10	5
134	101584009	Prince Kalia	0	1
135	101584010	Rohit	0	1
136	101584011	Satvir Singh	6	4
137	101584012	Sharandeep Singh	10	5
138	101584013	Shashi Sharma	10	5
139	101584014	Sunnypreet Singh	10	5
140	101584015	Rajat Chandra	10	5
141	101584016	Gursimran Singh	0	1

The performance of students through the course UEE603 for criteria PO-11(B) is summarized in Table PO-11(B).2

**Table PO-11(B).2: Average score of student performance in the course UEE603 for criteria PO-11(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE603	68.79	2.13	6.38	2.13	20.57	3.96

### UEI501: Control systems

The performance of course *UEI501: Control Systems* is used to measure the attainment of outcome ‘PO-11(B)’ through the End Semester Examination (Question No. 4, July-Dec 2016, 20 marks).

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#### Question:

Q.4	<p>Design a lead compensator for a unity feedback system with an open-loop transfer function</p> $G(S) = \frac{K}{S(S + 1)}$ <p>For the specifications of <math>K_v = 10 \text{ s}^{-1}</math> and <math>\phi = 35^\circ</math>.</p>	(20)
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The performance of the students in the above question is summarized in Table PO-11(B).3 using rubrics defined in Table PO-11.1(a).

**Table PO-11(B).3: Students' performance in question targeting ‘PO-11(B)’; Course UEI501**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1.	101404001	Abhay Mahipal	10	3
2.	101404002	Abhijeet Singh Sankhla	10	3
3.	101404004	Abhinav Arora	4	2
4.	101404006	Abhishek Sharma	15	5
5.	101404007	Ajay Singh	5	2
6.	101404009	Alka Thakur	15	5
7.	101404012	Ankush Goyal	8	3
8.	101404013	Anmol Arjun Bharaj	12	4
9.	101404014	Anmol Goyat	2	1
10.	101404015	Anmol Rattan Kaur	8	3
11.	101404017	Anubhav Kumar	0	1
12.	101404018	Apeksha Goel	20	5
13.	101404019	Arnish Jain	15	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
14.	101404020	Arshiya	20	5
15.	101404021	Arshjot Kaur	15	5
16.	101404023	Ayush Jain	19	5
17.	101404024	Bhawani Singh	15	5
18.	101404025	Chirag Jain	18	5
19.	101404026	Davileen Garg	15	5
20.	101404027	Dilpreet Kaur	15	5
21.	101404028	Divesh Kamdar	19	5
22.	101404029	Divyam Aggarwal	10	3
23.	101404031	Divyanshu Siddharth	10	3
24.	101404032	Garima	15	5
25.	101404033	Garv Chahar	15	5
26.	101404035	Gaurav Rathore	2	1
27.	101404036	Gurpreet Singh	18	5
28.	101404037	Gursagar Singh	10	3
29.	101404038	Gurupinder Pal Singh	15	5
30.	101404039	Harmanpreet Singh	9	3
31.	101404041	Harshit Kaushik	2	1
32.	101404042	Harshvir Singh	10	3
33.	101404043	Harsimarjot Kaur	10	3
34.	101404044	Harsimran Singh	10	3
35.	101404045	Hartej Singh Bains	0	1
36.	101404046	Heema Gupta	18	5
37.	101404047	Hitesh Kumar	0	1
38.	101404048	Ishita Mahindru	10	3
39.	101404049	Jagmeet Singh Bawa	2	1
40.	101404050	Jagnoor Kaur	15	5
41.	101404051	Jashanpreet Singh	5	2
42.	101404052	Jatin Bansal	5	2
43.	101404053	Jatin Raheja	15	5
44.	101404054	Kanishak Sharma	20	5
45.	101404055	Karan Sanjeev Bajaj	18	5
46.	101404056	Kirtish Madaan	20	5
47.	101404057	Mahitosh Sharma	17	5
48.	101404058	Manan Mittal	10	3
49.	101404059	Mandeep Singh Panesar	20	5
50.	101404060	Manisha Gupta	5	2

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
51.	101404061	Manit Gupta	0	1
52.	101404121	Siddharth Singh	0	1
53.	101404129	Tarun Kumar	0	1
54.	101404130	Tushar Goel	5	2
55.	101404131	Utkarsh Apoorva	0	1
56.	101404132	Utkarsh Atri	20	5
57.	101404133	Vandana Gora	20	5
58.	101404135	Vasu Mittal	15	5
59.	101404136	Yashika Chopra	15	5
60.	101404137	Yatin Gudwani	5	2
61.	101404138	Yogesh Garg	7	2
62.	101454001	Yatendra Agrawal	20	5
63.	101454002	Yash Motwani	5	2
64.	101584001	Amanjit Singh	18	5
65.	101584002	Chetan Garg	1	1
66.	101584004	Gurpreet Singh	0	1
67.	101584005	Gurpreet Singh	0	1
68.	101584006	Harman Preet Singh	0	1
69.	101584008	Lakshay Garg	10	3
70.	101584010	Rohit	0	1
71.	101584012	Sharandeep Singh	15	5

The performance of students through the course UEI501 for criteria PO-11(B) is summarized in Table PO-11(B).4.

**Table PO-11(B).4: Average score of student performance in the course UEI501 for criteria PO-11(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEI501	43.66	1.41	19.72	12.68	22.54	3.31

### **UEE793: Capstone Project**

The performance of course *UEE793: Capstone Project* is used to measure the attainment of outcome ‘PO-11(B)’ for carrying out the exercises towards the development of prototype systems for engineering applications (July-Dec 2016, 100 marks).

The performance of the students in the above question is summarized in Table PO-11(B).5 using rubrics defined in Table PO-11.1(b).

**Table PO-11(B).5: Students' performance in question targeting 'PO-11(B)'; Course UEE793**

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
1	101304001	Aarushi Bajaj	69	4
2	101304002	Abhey Arora	61.25	4
3	101304003	Abhishek Taksali	61.25	4
4	101304004	Adhikaansh Tayal	63.5	4
5	101304005	Aditi Narang	66.25	4
6	101304006	Aditya	71	4
7	101304007	Akshat	59	3
8	101304008	Akshay Kapoor	68.75	4
9	101304009	Akshay Kumar	66	4
10	101304010	Akshay Kumar Chaudhary	68.5	4
11	101304011	Akshay Sharma	68.25	4
12	101304012	Amandeep Kaur	65	4
13	101304013	Amandeep Singh	75.5	4
14	101304014	Amaninder Singh Randhawa	61.75	4
15	101304015	Angad Kapoor	69.25	4
16	101304016	Ankita Garg	70.75	4
17	101304018	Anmol Jawa	73.5	4
18	101304019	Anmolpreet Singh	69.5	4
19	101304020	Anyuti Tiwary	66.25	4
20	101304021	Arpit Sharma	77	4
21	101304022	Arsh Kundal	64.75	4
22	101304023	Arshbir Kaur	65.75	4
23	101304024	Arshdeep Singh	60	4
24	101304025	Ashish	64	4
25	101304026	Ashish Rajpal	71	4
26	101304028	Berry	62.25	4
27	101304029	Bhanu	88	5
28	101304030	Bhanu	76	4
29	101304031	Chirag Gaba	59.25	3
30	101304032	Dipin	62	4
31	101304033	Dishant	62.25	4
32	101304034	Divyesh Pratap	76.5	4
33	101304035	Elham	59.5	3
34	101304036	Gurseerat	70.75	4

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
35	101304037	Gursewak Singh	59	3
36	101304040	Harvensh	65	4
37	101304041	Hartejdeep Singh	55	3
38	101304042	Himanshu Goyal	71.75	4
39	101304044	Jasjit Singh	62	4
40	101304045	Jassimran Singh	74.25	4
41	101304046	Jessica	79.5	4
42	101304047	Kanwarpal singh	62	4
43	101304048	Karan Kumar	58.5	3
44	101304049	Karamjot Singh	73.75	4
45	101304050	Kashish Agarwal	74.75	4
46	101304051	Kritika	75	4
47	101304052	Love gaba	66	4
48	101304054	Manik Mittal	71.75	4
49	101304055	Maninderjit Singh	57	3
50	101304056	Mayank Singla	67.5	4
51	101304057	Mridul	69	4
52	101304058	Naman Garg	80.5	5
53	101304059	Navdeep Singh	66.5	4
54	101304060	Navdeep Singh	68.75	4
55	101304061	Nazuk Agarwal	68.75	4
56	101304062	Nishant Garg	70.5	4
57	101304063	Nishtha Raheja	74.25	4
58	101304064	Paras Bawa	68.25	4
59	101304065	Parth Ahuja	66.75	4
60	101304066	Parushni	70.25	4
61	101304067	Pency Goyal	69	4
62	101304068	Piyush Jindal	62.25	4
63	101304069	Piyush Tripathi	75	4
64	101304070	Prachi Garg	69.5	4
65	101304071	Prashant Kataria	66.75	4
66	101304072	Preeti Garg	72.25	4
67	101304073	Priyank Arora	71.75	4
68	101304074	Priyanka	77	4
69	101304075	Priyanka Singh	74.5	4
70	101304076	Priyansh Mahajan	68.75	4
71	101304077	Rahul Meena	50.25	3

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
72	101304078	Rajan	63.5	4
73	101304079	Rajat Sharma	67	4
74	101304080	Ratul Goyal	71.75	4
75	101304081	Ravinder Singh	65.25	4
76	101304082	Rishabh Juneja	63.75	4
77	101304083	Robin Manktala	70.5	4
78	101304084	Rohan Ghai	79.25	4
79	101304085	Rohan Singla	74.5	4
80	101304086	Rohan Wadhawan	64	4
81	101304087	Rohit Goyal	71.5	4
82	101304088	Rubina Bamba	66.75	4
83	101304089	Sagar Pulani	73	4
84	101304090	Sahil Kataria	71	4
85	101304091	Sakshi	76.75	4
86	101304092	Sandal Singh Sidhu	63.5	4
87	101304093	Sandeep Kaur	66.75	4
88	101304094	SatRipleen kaur	80.33	5
89	101304095	Saurabh Mohan	76.25	4
90	101304096	Shagundeepraj Singh	69.75	4
91	101304097	Shailesh Gupta	75.25	4
92	101304098	Shaina	75.25	4
93	101304099	Shivika Gupta	65.5	4
94	101304100	Shresth Rai	73.75	4
95	101304101	Shubham Goyal	74.75	4
96	101304102	Shubham Gupta	71.25	4
97	101304103	Shubham Sharma	76.5	4
98	101304104	Shubham Sharma	82	5
99	101304105	Shubham Soin	72.25	4
100	101304106	Siddharth Goyal	70	4
101	101304107	Sidharth Garg	74.5	4
102	101304108	Simran Kaur	77	4
103	101304109	Simranjit Singh	58.25	3
104	101304111	Sumit Dhingra	74.5	4
105	101304112	Sumit Kaushik	71.25	4
106	101304113	Tushar Dheer	65.75	4
107	101304114	Tushar Sharma	69.75	4
108	101304116	Utsav Chhabra	68.75	4

S. No	Roll No.	Name of Student	Marks (100)	Score (1-5)
109	101304117	Vaibhav Gupta	70.75	4
110	101304118	Vaishali	66	4
111	101304119	Varun Bansal	65.5	4
112	101304120	Veni Jindal	77.75	4
113	101304121	Vishal Arora	70.5	4
114	101304122	Yugesh Goyal	70.5	4
115	101484001	Amandeep Singh	66.25	4
116	101484002	Amrinder Singh	68.25	4
117	101484003	Ashmeen Singh	65	4
118	101484004	Azad Singh	58.5	3
119	101484005	Chardan Garg	64.75	4
120	101484007	Deepak	72.25	4
121	101484008	Diljeet Singh	79.75	4
122	101484009	Jyoti Kaushal	71.25	4
123	101484011	Pawan Kumar	75.5	4
124	101484012	Rajat Singla	72.5	4
125	101484013	Satveer Kaur	73.25	4
126	101484014	Saurabh Kumar Wadhawan	64.25	4
127	101484015	Shweta Sharma	76.5	4
128	101484016	Sukhjeet Singh	68.75	4

The performance of students through the course UEE793 for criteria PO-11(B) is summarized in Table PO-11(B).6.

**Table PO-11(B).6: Average score of student performance in the course UEE793 for criteria PO-11(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE793	3.13	89.06	7.81	0.00	0.00	3.95

The data from Table PO-11(B).2, Table PO-11(B).4 and Table PO-11(B).6 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-11(B)’, and is summarised in Table PO-11(B).7.

**Table PO-11(B).7: Weighted Average Student class performance (course portfolio) for criteria PO-11(B)**

Course	% of students in each score					Average Score
	5	4	3	2	1	

<b>UEE603</b>	68.79	2.13	6.38	2.13	20.57	<b>3.96</b>
<b>UEI501</b>	43.66	1.41	19.72	12.68	22.54	<b>3.31</b>
<b>UEE793</b>	3.13	89.06	7.81	0.00	0.00	<b>3.95</b>
<b>Student class performance score</b>	<b>38.53</b>	<b>30.87</b>	<b>11.30</b>	<b>4.93</b>	<b>14.37</b>	<b>3.74</b>

**b) Indirect Measures:**

The indirect measurement of performance criteria ‘PO-11(B)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-11(B).8 and Table PO-11(B).9.

**(i) Assessment Tool:** Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-11(B)’.

<b>UEE603</b>	Design the basic earthing requirement for residential and other purposes.
<b>UEI501</b>	Design the various kinds of compensator.
<b>UEE793</b>	To design an electrical engineering project implementing an integrated design approach applying knowledge accrued in various professional courses.

**Table PO-11(B).8: Weighted average score of performance criterion ‘PO-11(B)’ based on student course surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE603</b>	13.70	41.10	31.51	10.96	2.74	<b>3.52</b>
<b>UEI501</b>	40.7	24.77	20.35	17.69	11.5	<b>3.56</b>
<b>UEE793</b>	35.16	32.03	28.12	3.12	1.56	<b>3.96</b>
<b>Course survey score</b>	<b>29.85</b>	<b>32.63</b>	<b>26.66</b>	<b>10.59</b>	<b>5.27</b>	<b>3.68</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-11’ through indirect measurement using following question in the respective surveys.

Graduating Survey	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Alumni Survey	
Employer Survey	Do our students have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice?

**Table PO-11(B).9: Weighted average score of performance criterion ‘PO-11(B)’ based on other surveys.**

Course	% of students in each score	Average
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	5	4	3	2	1	Score
<b>Graduating student survey</b>	32.39	50.70	15.49	1.41	0.00	<b>4.14</b>
<b>Employer survey</b>	40.00	53.33	6.67	0.00	0.00	<b>4.33</b>
<b>Alumni survey</b>	28.02	41.06	24.64	5.31	0.97	<b>3.90</b>
<b>Weighted average score other surveys</b>	<b>33.47</b>	<b>48.36</b>	<b>15.6</b>	<b>2.24</b>	<b>0.32</b>	<b>4.12</b>

c) Overall weighted average score of performance criterion ‘PO-11(B)’

Finally overall weighted average score of performance criterion ‘PO-11(B)’ is evaluated as given below in Table PO-11(B).10:

Table PO-11(B).10 Overall weighted average score of performance criterion ‘PO-11(B)’

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance score</b>	38.53	30.87	11.30	4.93	14.37	<b>3.74</b>	5
<b>Course surveys score</b>	29.85	32.63	26.66	10.59	5.27	<b>3.68</b>	4
<b>Other surveys score</b>	33.47	48.36	15.6	2.24	0.32	<b>4.12</b>	3
<b>Overall weighted score</b>	<b>34.37</b>	<b>35.83</b>	<b>17.49</b>	<b>6.14</b>	<b>7.82</b>	<b>3.82</b>	-

**Assessment of Outcome ‘PO-11’ using performance criterion PO-11(C)**

**PO-11(C): Able to analyze engineering problems using software tools.**

The performance criteria ‘PO-11(C)’ has been measured through direct assessment using the course portfolio and indirect assessment using course surveys and other surveys (Graduating student survey, Alumni survey and Employer survey).

a) Direct Measures:

(i) Assessment Tool: Students’ performance using Course Portfolio

Two courses namely *UEE405: Network Theory and Design* and *UEE605: Power System Analysis & Stability* are used to assess performance criteria PO-11(C) as a direct measure. The analysis for each of these courses is provided below:

**UEE405: Network Theory and Design**

The performance of course *UEE405: Network Theory and Design* is used to measure the attainment of outcome ‘PO-11(C)’ by giving the laboratory exercises to develop programs for verify various ac network theorems using PSPICE and MultiSim softwares in laboratory (Jan-June 2017, 5 marks).

The performance of the students in the above question is then summarized as given below in Table PO-11(C).1 using rubrics defined in Table PO-11.1(b).

**Table PO-11(C).1: Students' performance in question targeting 'PO-11(C)'; Course UEE405**

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
1	101504071	Mohit Goyal	4.5	5
2	101504074	Neha Singla	4.5	5
3	101504078	Nitin Gupta	4.5	5
4	101504081	Osho	4.5	5
5	101504108	Sahil Virk	4.5	5
6	101504114	Satyam Kumar	4.5	5
7	101504127	Vikram Kumawat	4.5	5
8	101554035	Shishant Airon	4.5	5
9	101684007	Khushdeep Singh	4.5	5
10	101684015	Sahib Singh	4.5	5
11	101684017	Ketan Singla	4.5	5
1	101504046	Gurnoor Kaur	4	5
2	101504054	Himanshu Gupta	4	5
3	101504073	Neha Bhargava	4	5
4	101504075	Nihal Singh	4	5
5	101504076	Nikhil Sharma	4	5
6	101504082	Pankaj Goyal	4	5
7	101504086	Prabhav Pande	4	5
8	101504087	Pragati Sharma	4	5
9	101504088	Pranav Joshi	4	5
10	101504096	Praveen Kumar Yadav	4	5
11	101504100	Ramneet Kaur	4	5
12	101504101	Ravneet Sharma	4	5
13	101504105	Rushil Krishna	4	5
14	101504119	Shubham Gupta	4	5
15	101504120	Stuti Sidhu	4	5
16	101504121	Suhas Mahajan	4	5
17	101504122	Swanav Swaroop	4	5
18	101554006	Bhisham Mittal	4	5
19	101554009	Gayatri Bansal	4	5
20	101554017	Kratika Agarwal	4	5
21	101554027	Rohit Mehta	4	5
22	101554028	Romil Garg	4	5

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
23	101684008	Mandeep Sharma	4	5
24	101684010	Nikhil Dhiman	4	5
25	101684011	Nittin Garg	4	5
26	101684012	Paras Arora	4	5
27	101684014	Simranjeet Singh	4	5
28	101684016	Sukhwinder Singh	4	5
29	101684018	Vaneet Kumar	4	5
30	401504007	Simarpreet Singh	4	5
31	101504067	Malay Chand	3.5	4
32	101504069	Mayank Kumar	3.5	4
33	101504079	Nitish Kumar Soni	3.5	4
34	101504083	Parmeet Singh Sangha	3.5	4
35	101504084	Parth Gupta	3.5	4
36	101504085	Pinak Bhardwaj	3.5	4
37	101504089	Pranav Mathur	3.5	4
38	101504094	Prateek Gupta	3.5	4
39	101504099	Ramandeep Singh	3.5	4
40	101504103	Rohan Malhotra	3.5	4
41	101504104	Rohit Arora	3.5	4
42	101504107	Sahil Bansal	3.5	4
43	101504116	Shaurya Gaba	3.5	4
44	101504124	Utkarsh Verma	3.5	4
45	101504125	Vaibhav Chawla	3.5	4
46	101504130	Vishal Bansal	3.5	4
47	101504131	Vishu Jain	3.5	4
48	101504133	Riya Gupta	3.5	4
49	101554008	Evan Garg	3.5	4
50	101554014	Himanshu Mittal	3.5	4
51	101554015	Ipsita Sahoo	3.5	4
52	101554020	Mannat Batish	3.5	4
53	101554022	Prabhjot Singh Saini	3.5	4
54	101554024	Rajat Dixit	3.5	4
55	101554026	Ritunjay Gupta	3.5	4
56	101554029	Sahil Sharma	3.5	4
57	101554031	Sajan Goyal	3.5	4
58	101554032	Sanchit Sharma	3.5	4
59	101554033	Saransh Sehgal	3.5	4

S. No	Roll No.	Name of Student	Marks (5)	Score (1-5)
60	401554001	Kunal Gupta	3.5	4
61	101504070	Mehul Natu	3	4
62	101504098	Ramandeep Singh	3	4
63	101504109	Sainesh Karamchandani	3	4
64	101504117	Sheikh Mohd Najam Ul Sehar	3	4
65	101504118	Shrey Arora	3	4
66	101504126	Vaibhav Singh	3	4
67	101504128	Viraj Baswana	3	4
68	101554019	Mahima Goel	3	4
69	101554030	Sahil Virk	3	4
70	401504008	Uday Bhandari	3	4
71	101504091	Pranav Singh	2	3
72	101504097	Raghav Kumar Tiwari	2	3
73	101684013	Pratik Bal	2	3
74	101504115	Shanun Randev	0	1

The overall performance of students for the above criterion is summarized in Table PO-11(C).2

**Table PO-11(C).2: Average score of student performance in the course UEE405 for criteria PO-11(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	48.24	47.06	3.53	0.00	1.18	4.41

### **UEE605: Power System Analysis & Stability**

The performance of course *UEE605: Power System Analysis & Stability* is used to measure the attainment of outcome ‘PO-11(C)’ by giving the Laboratory assignments to develop programs for solutions to steady state load flow studies and short circuit studies for power system using MATLAB s/w in laboratory (Jan-June 2017, 20 marks).

The performance of the students in the above question is then summarized as given below in Table PO-11(C).3 using rubrics defined in Table PO-11.1(b).

**Table PO-11(C).3: Students’ performance in question targeting ‘PO-11(C)’; Course UEE605**

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
1	101404001	AbhayMahipal	14.5	4

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
2	101404002	Abhijeet Singh Sankhla	8.5	3
3	101404004	Abhinav Arora	9.75	3
4	101404006	Abhishek Sharma	15	4
5	101404007	Ajay Singh	9.5	3
6	101404009	Alka Thakur	13.5	4
7	101404012	Ankush Goyal	15	4
8	101404013	Anmol Arjun Bharaj	10.5	3
9	101404014	Anmol Goyat	8	3
10	101404015	Anmol Rattan Kaur	14.25	4
11	101404017	Anubhav Kumar	9.5	3
12	101404018	Apeksha Goel	14	4
13	101404019	Arnish Jain	14.25	4
14	101404020	Arshiya	15.75	4
15	101404021	Arshjot Kaur	18	5
16	101404023	Ayush Jain	14	4
17	101404024	Bhawani Singh	9.25	3
18	101404025	Chirag Jain	12	4
19	101404026	Davileen Garg	14.5	4
20	101404027	Dilpreet Kaur	15.25	4
21	101404028	Divesh Kamdar	16.5	5
22	101404029	Divyam Aggarwal	18	5
23	101404031	Divyanshu Siddharth	12	4
24	101404032	Garima	13.75	4
25	101404033	Garv Chahar	5.75	2
26	101404035	Gaurav Rathore	9.25	3
27	101404036	Gurpreet Singh	5.5	2
28	101404037	Gursagar Singh	16	5
29	101404038	Gurupinder Pal Singh	7	2
30	101404039	Harmanpreet Singh	6	2
31	101404041	Harshit Kaushik	10.5	3
32	101404042	Harshvir Singh	14	4
33	101404043	Harsimarjot Kaur	12	4
34	101404044	Harsimran Singh	11	3
35	101404046	Heema Gupta	13	4
36	101404047	Hitesh Kumar	11.5	3
37	101404048	Ishita Mahindru	13	4
38	101404050	Jagnoor Kaur	17.5	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
39	101404051	Jashanpreet Singh	9	3
40	101404052	Jatin Bansal	14	4
41	101404053	Jatin Raheja	10.5	3
42	101404054	Kanishak Sharma	17	5
43	101404055	Karan Sanjeev Bajaj	15	4
44	101404056	Kirtish Madaan	12	4
45	101404057	Mahitosh Sharma	17.5	5
46	101404058	Manan Mittal	17	5
47	101404059	Mandeep Singh Panesar	17.5	5
48	101404060	Manisha Gupta	14	4
49	101404061	Manit Gupta	11	3
50	101404062	Manjosh Singh Dhillon	9	3
51	101404063	Manpreet Singh Brar	11.5	3
52	101404064	Manvir Kaur	12.5	4
53	101404065	Mehak Bhatia	13	4
54	101404066	Mithilesh Kumar	7.5	2
55	101404067	Mohit Goyal	18	5
56	101404068	Mridul Marwaha	15.5	4
57	101404069	Mudit Arora	18.04	5
58	101404070	Naveen Parashar	8.5	3
59	101404072	Nigam Wadhwa	10.5	3
60	101404073	Nikhil Danodia	4	2
61	101404074	Nishita Kumari	12.5	4
62	101404075	Nitin Gupta	17	5
63	101404076	Nitish Arora	16.5	5
64	101404077	Nitish Bhardwaj	6.5	2
65	101404078	Omandeep Kaur	13.5	4
66	101404079	Pankaj Garg	13.5	4
67	101404080	Paramjot Singh	13	4
68	101404081	Parmar Adhiraj Singh	11.5	3
69	101404083	Prabhdeep Kaur	6.5	2
70	101404084	Prachur Maharwal	7.5	2
71	101404087	Prashant Khare	9	3
72	101404089	Pulkit Bansal	18.5	5
73	101404090	Pushpinder Singh	13.5	4
74	101404091	RachitVerma	11	3
75	101404092	Rahul Gautam	8.5	3

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
76	101404093	Rahul Goyal	15	4
77	101404094	Rajshree Vaidya	14.5	4
78	101404096	Rishabh Gupta	9.5	3
79	101404099	Sagar Bansal	19	5
80	101404100	Sahajdeep Kaur	18	5
81	101404102	Sahil Singla	15	4
82	101404103	Samarth Gupta	2	1
83	101404104	Sambhav Jain	10.5	3
84	101404105	Samrat Kumar Gupta	3	1
85	101404106	Sanamdeep Singh	9.5	3
86	101404107	Sanket Gupta	8	3
87	101404108	Saurabh Kumar	3	1
88	101404109	Shailesh Verma	10.5	3
89	101404110	Shaiyya Thapliyal	18	5
90	101404111	Sher Mohammed	11	3
91	101404112	Shivam Dochania	11	3
92	101404113	Shivam Gera	9.5	3
93	101404114	Shivam Kumar Kedia	8	3
94	101404115	Shubham Bhardwaj	10	3
95	101404116	Shubham Chaturvedi	10.5	3
96	101404117	Shubham Garg	13.5	4
97	101404118	Shubham Kumar	14.5	4
98	101404119	Shubham Verma	5.5	2
99	101404120	Shubhdeep Singh	5	2
100	101404121	Siddharth Singh	6.5	2
101	101404122	Simran Mehra	15	4
102	101404123	Sukhman	12	4
103	101404124	Swapnil Singla	9	3
104	101404125	Tanish Gupta	14	4
105	101404126	Tarajot Singh	12.5	4
106	101404127	Tarun Garg	16	5
107	101404128	Tarun Gupta	12.5	4
108	101404129	Tarun Kumar	11.5	3
109	101404130	Tushar Goel	16.5	5
110	101404132	Utkarsh Atri	13.25	4
111	101404133	Vandana Gora	14	4
112	101404135	Vasu Mittal	16	5

S. No	Roll No.	Name of Student	Marks (20)	Score (1-5)
113	101404136	Yashika Chopra	15.25	4
114	101404137	Yatin Gudwani	13.25	4
115	101404138	Yogesh Garg	14.5	4
116	101454001	Yatendra Agrawal	17.5	5
117	101454002	Yash Motwani	2	1
118	101454003	Harshwardhan Soni	12.5	4
119	101454004	Simardeep Kaur	13	4
120	101454005	Tejas Kapila	14.5	4
121	101454006	Nitish Dewan	10	3
122	101454007	Abhishek Nigam	16	5
123	101454008	Tarun Puri	9	3
124	101454009	Lariza Bansal	8	3
125	101454010	Tanish Goyal	12.5	4
126	101454011	Aditi	9	3
127	101584001	Amanjit Singh	14.5	4
128	101584002	Chetan Garg	17.5	5
129	101584003	Devinder Kumar	10	3
130	101584007	Karamjeet Singh	6.5	2
131	101584008	Lakshay Garg	11	3
132	101584009	Prince Kalia	6	2
133	101584010	Rohit	7.5	2
134	101584011	Satvir Singh	5.5	2
135	101584012	Sharandeep Singh	8	3
136	101584013	Shashi Sharma	13	4
137	101584014	Sunnypreet Singh	2	1
138	101584015	Rajat Chandra	11.5	3
139	101584016	Gursimran Singh	2	1

The performance of students through the course UEE605 for criteria PO-11(C) is summarized in Table PO-11(C).4.

**Table PO-11(C).4: Average score of student performance in the course UEE605 for criteria PO-11(C)**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>UEE605</b>	<b>16.55</b>	<b>36.69</b>	<b>30.94</b>	<b>11.51</b>	<b>4.32</b>	<b>3.5</b>

The data from Table PO-11(C).2 and Table PO-11(C).4 is used to evaluate weighted average of direct measure through course portfolio for criteria ‘PO-11(C)’, and is summarised in Table PO-11(C).5.

**Table PO-11(C).5: Weighted Average Student class performance (course portfolio) for criteria PO-11(C)**

Courses	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	48.24	47.06	3.53	0.00	1.18	<b>4.41</b>
UEE605	16.55	36.69	30.94	11.51	4.32	<b>3.50</b>
<b>Student class performance score</b>	<b>32.39</b>	<b>41.87</b>	<b>17.24</b>	<b>5.75</b>	<b>2.75</b>	<b>3.96</b>

### b) Indirect Measures:

The indirect measurement of performance criteria ‘PO-11(C)’ has been assessed through Student Course Surveys and other surveys (Graduating Student Survey, Alumni Survey and Employer Survey). The weighted average score in respective surveys is summarised in Table PO-11(C).6 and Table PO-11(C).7.

#### (i) Assessment Tool: Student Course Surveys

The Course Learning Outcome (CLO) as described below has been used for the measurement of attainment of ‘PO-11(C)’.

<b>UEE405</b>	<ul style="list-style-type: none"> <li>Apply the various laws and theorems related to electric networks</li> <li>Explain the concept of two port networks</li> </ul>
<b>UEE605</b>	<ul style="list-style-type: none"> <li>Develop an appropriate mathematical model of power system</li> <li>Carry out power flow analysis of practical power system for balanced system.</li> <li>Conduct studies during balanced faults to decide the fault levels and circuit breaker ratings.</li> <li>Conduct studies during unbalanced faults to decide the fault levels and circuit breaker ratings.</li> </ul>

**Table PO-11(C).6: Weighted average score of performance criterion ‘PO-11(C)’ based on student course surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
UEE405	36.54	28.85	13.46	15.38	5.77	<b>3.75</b>
UEE605	49.75	10.12	6.69	5.09	28.32	<b>3.48</b>
<b>Course surveys score</b>	<b>43.14</b>	<b>19.49</b>	<b>10.07</b>	<b>10.24</b>	<b>17.04</b>	<b>3.62</b>

**(ii) Assessment Tool:** Graduating Student Survey, Alumni Survey and Employer Survey (Other surveys) are used to assess the attainment of program outcome ‘PO-11’ through indirect measurement using following question in the respective surveys.

**Table PO-11(C).7: Weighted average score of performance criterion ‘PO-11(C)’ based on other surveys.**

Course	% of students in each score					Average Score
	5	4	3	2	1	
<b>Graduating student survey</b>	32.39	50.70	15.49	1.41	0.00	<b>4.14</b>
<b>Employer survey</b>	40.00	53.33	6.67	0.00	0.00	<b>4.33</b>
<b>Alumni survey</b>	28.02	41.06	24.64	5.31	0.97	<b>3.90</b>
<b>Other surveys score</b>	<b>33.47</b>	<b>48.36</b>	<b>15.6</b>	<b>2.24</b>	<b>0.32</b>	<b>4.12</b>

**c) Overall weighted average score of performance criterion ‘PO-11(C)’**

Finally overall weighted average score of performance criterion ‘PO-11(C)’ is evaluated as given below in Table PO-11(C).8:

**Table PO-11(C).8: Overall weighted average score of performance criterion ‘PO-11(C)’**

Course	% of students in each score					Average Score	Assessment Tool Weight
	5	4	3	2	1		
<b>Student class performance score</b>	32.39	41.87	17.24	5.75	2.75	<b>3.96</b>	5
<b>Course surveys score</b>	43.14	19.49	10.07	10.24	17.04	<b>3.62</b>	4
<b>Other surveys score</b>	33.47	48.36	15.6	2.24	0.32	<b>4.12</b>	3
<b>Overall weighted score</b>	<b>36.24</b>	<b>36.03</b>	<b>14.44</b>	<b>6.37</b>	<b>6.91</b>	<b>3.89</b>	-

**Overall assessment of program outcome PO-11 using scores of PO-11(A), PO-11(B) and PO-11(C)**

In the previous sections, each of the individual performance criteria PO-11(A), PO-11(B) and PO-11(C) have been assessed. The performance for attainment of outcome PO-11 has been completed using the attainment values for PO-11(A), PO-11(B) and PO-11(C) are given below:

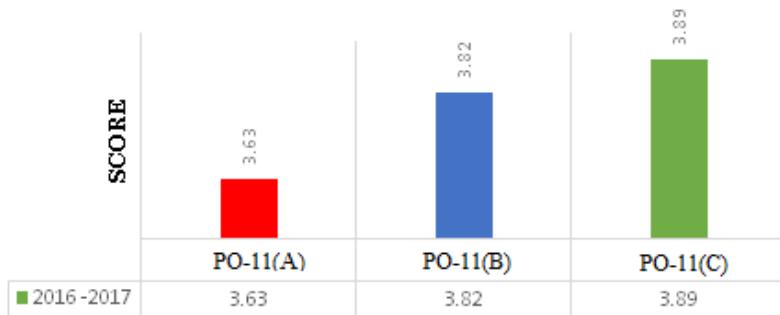
Table PO-11.2 summarizes the scores of each of the three performance criteria and these scores have been used to assess an overall score for outcome PO-11.

**Table PO11.2: Overall score for outcome PO-11 at the program level**

Performance criteria	% of students in each score					Overall weighted average score	Criteria weight
	5	4	3	2	1		
PO-11(A)	24.93	37.54	21.19	8.69	7.64	<b>3.63</b>	5
PO-11(B)	34.37	35.83	17.49	6.14	7.82	<b>3.82</b>	5
PO-11(C)	36.24	36.03	14.44	6.37	6.91	<b>3.89</b>	5
<b>Overall score</b>	<b>31.85</b>	<b>36.47</b>	<b>17.71</b>	<b>7.02</b>	<b>7.47</b>	<b>3.78</b>	

The performance criterion wise assessment score distribution of outcome PO-11 is shown in Figure PO-11.2.

**Attainment of Performance Criteria  
for Program Outcome PO-11 in 2016-1017**



**Figure PO-11.2: Performance criteria-wise assessment scores distribution of outcome ‘PO-11’ for AY 2016-17**

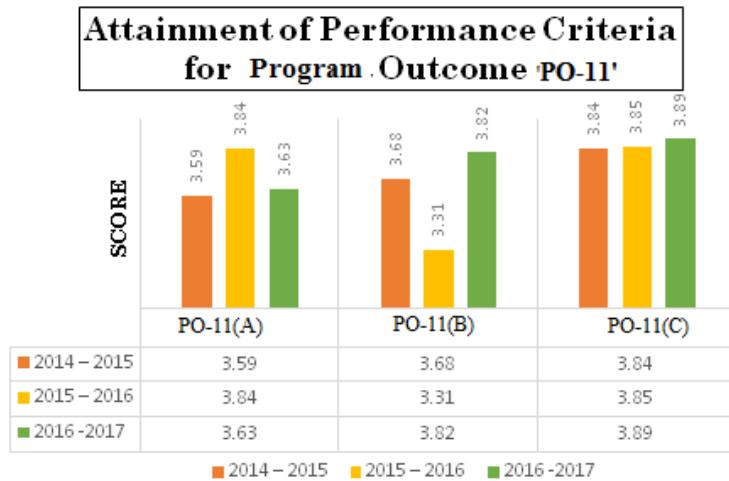
**Track Record and assessment of attainment of program outcomes over the last three academic years**

The performance criteria-wise assessment scores distribution and overall weighted score for outcome ‘PO-11’ for last three years, i.e. 2014-2015, 2015-2016, and 2016-2017 are presented in this section. The Table PO-11.3 presents the performance criteria-wise assessment score distribution for outcome ‘PO-11’.

**Table PO-11.3 Performance criteria-wise assessment scores distribution for each outcome ‘PO-11’.**

Program outcome and performance criteria	Academic year			Weight
		2014 – 2015	2015 – 2016	
PO-11	PO-11(A)	3.59	3.84	3.63
	PO-11(B)	3.68	3.31	3.82
	PO-11(C)	3.84	3.85	3.89
<b>Overall weighted score of outcome PO-11</b>		<b>3.70</b>	<b>3.67</b>	<b>3.78</b>

The above data has been plotted to visualize performance criteria-wise assessment score distribution for outcome ‘PO-11’ over a period of last three years and is shown in Fig. PO-11.3.



**Figure PO-11.3: Performance criteria-wise assessment score distribution of outcome ‘PO-11’**

#### **Level of attainment of program outcome over the last three academic years**

Level of attainment for each outcome is categorized into three categories as given below:

- Excellent:** Overall weighted score for the outcome is  $\geq 4.5$  on a scale of 1 to 5.
- Good:** Overall weighted score for the outcome is between 3.5 and 4.5 on a scale of 1 to 5.
- Satisfactory:** Overall weighted score for the outcome is between 3.0 and 3.5 on a scale of 1 to 5.
- Unsatisfactory:** Overall weighted score for the outcome is  $\leq 3.0$  on a scale of 1 to 5.

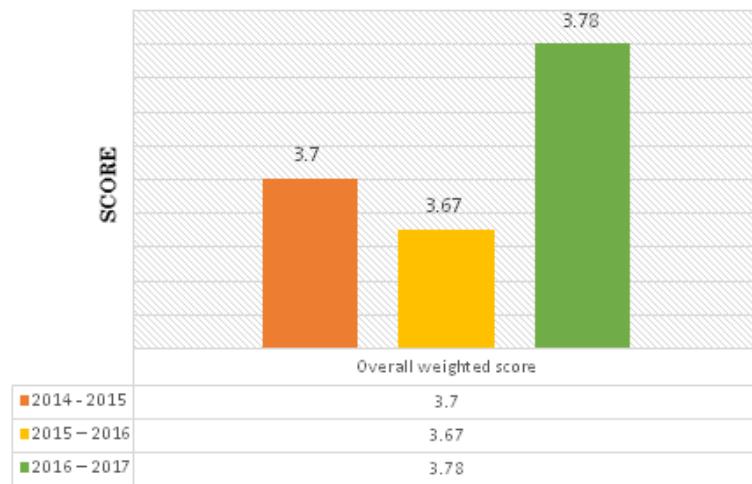
The Table PO-11.4 presents the overall weighted score of outcome ‘PO-11’ over the last three academic years.

**Table PO-11.4: Overall weighted score of the outcome ‘PO-11’ over a period of last three academic years.**

Academic year	Overall Weighted Score	Level of Attainment
2014 - 2015	3.70	Good
2015 – 2016	3.67	Good
2016 – 2017	3.78	Good

Figure PO-11.4 shows the overall weighted score of outcome ‘PO-11’ over a period of last three academic years.

### Attainment of Program Outcome PO-11



**Figure PO-11.4:** Overall weighted score of outcome ‘PO-11’ over a period of last three academic years.