

**Assessment of Attainment of Program Outcomes (POs)
(Year 2016)**

for the

***Bachelor of Engineering
in
Mechanical Engineering***



**Thapar University
Patiala (Punjab) - 147004
INDIA**

**Assessment of Attainment of Program Outcome
'A'
(Year 2016)**

for the

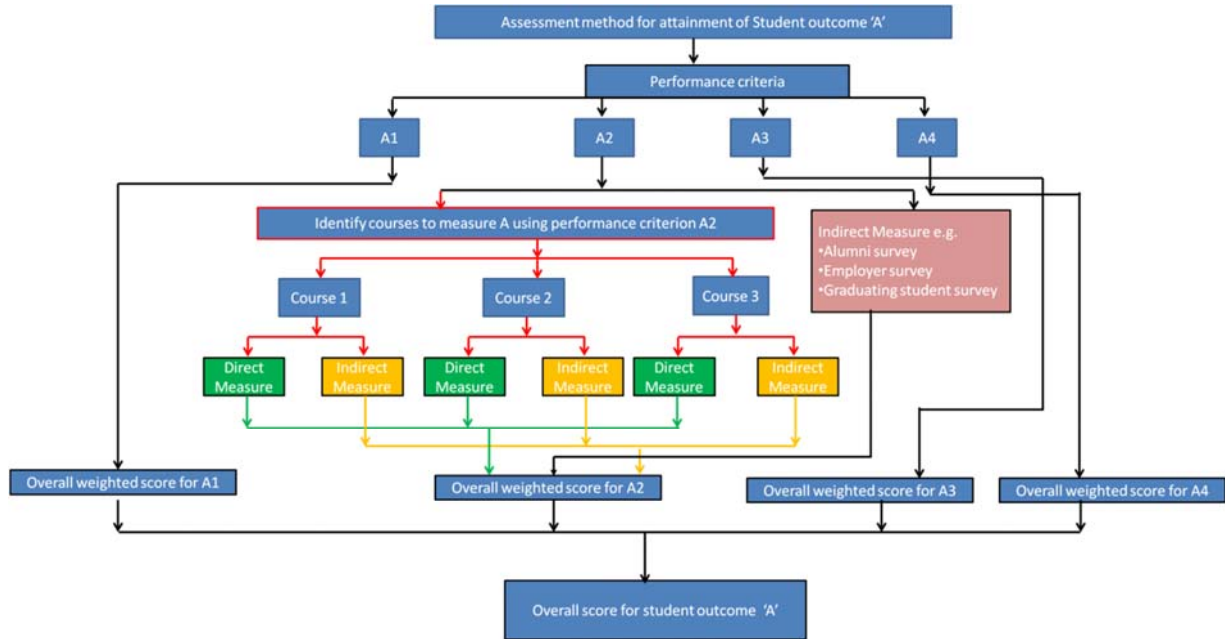
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome A

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'A'

Courses:

1. Mechanics (UES009),
2. Mechanics of Deformable Bodies (UME404),
3. Operations Management (UME836),

Outcome A has been assessed by four performance criteria A1, A2, A3 and A4. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these four performance criteria has been used to measure the overall measure of outcome A.

1) Assessment of Outcome ‘A’ using performance criterion A1

Performance criteria ‘A1’: Applying mathematics (multivariate calculus, differential equations, linear algebra etc.) to obtain analytical and numerical solutions.

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: Two courses namely Mechanics (UES009) and Mechanics of Deformable Bodies (UME404) were used to assess performance criteria A1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Mechanics (UES009)

The above performance criteria is used to measure the attainment of outcome ‘A1’ by giving the following question (Question No. 1a: during EST in May 2016, weightage 10 marks) to the students.

Question: Two beams AB and DE are arranged and supported as shown in Figure 1. Find the magnitude of the reaction R_E at E due to the force $P = 890\text{ N}$ applied at B as shown. The supports at points A and D are hinged.

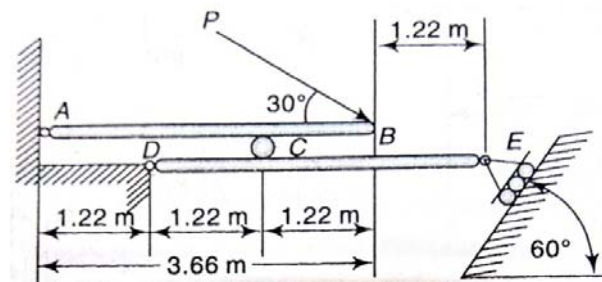


Figure 1

Student’s performance in the above question is given below:

Table A4.1: Student’s performance in question targeting ‘A1’; course: UES009

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|------------------|----------------|----------------------|
| 1 | 101508062 | Kunal Swami | 10 | 5 |
| 2 | 101508063 | Lakshya Jain | 8 | 5 |
| 3 | 101508064 | Lakshya Khanduja | 0 | 1 |
| 4 | 101508065 | Lovepreet Singh | 10 | 5 |
| 5 | 101508066 | Mahesh Chugh | 10 | 5 |
| 6 | 101508067 | Manmohit Chugh | 5 | 3 |
| 7 | 101508068 | Mannan Jain | 6 | 4 |
| 8 | 101508069 | Manu Rawal | 10 | 5 |
| 9 | 101508070 | Mayank Singh | 8 | 5 |
| 10 | 101508071 | Mehar Satsangi | 10 | 5 |
| 11 | 101508072 | Mehardeep Singh | 8 | 5 |

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|--------------------------|----------------|----------------------|
| 12 | 101508073 | Mehkant Singh Mittal | 10 | 5 |
| 13 | 101508074 | Mehul Satyajit | 10 | 5 |
| 14 | 101508075 | Mohit Sorout | 10 | 5 |
| 15 | 101508076 | Navjot Wadhwa | 8 | 5 |
| 16 | 101508077 | Navkaran Singh Mroque | 10 | 5 |
| 17 | 101508078 | Navnoor Singh Sidhu | 8 | 5 |
| 18 | 101508079 | Nikhil Jain | 10 | 5 |
| 19 | 101508080 | Nikhil Joshi | 10 | 5 |
| 20 | 101508081 | Nimrat Singh Brar | 9.5 | 5 |
| 23 | 101508084 | Parth Ahuja | 10 | 5 |
| 24 | 101508085 | Parth Mahajan | 10 | 5 |
| 25 | 101508086 | Prabhsimran Singh Bakshi | 10 | 5 |
| 26 | 101508087 | Pranshu Kansal | 3 | 2 |
| 27 | 101508088 | Prasu Shome | 2 | 1 |
| 28 | 101508090 | Prateek Choudhary | 5 | 3 |
| 29 | 101508091 | Prateek Prasad | 5 | 3 |
| 30 | 101508092 | Preetam Singh Manku | 10 | 5 |
| 31 | 101508093 | Prince Nirwal | 4 | 2 |
| 32 | 101508094 | Raghav Gupta | 10 | 5 |
| 33 | 101508095 | Ragjot Kiran Chhibber | 10 | 5 |
| 34 | 101508096 | Rahul Choudhary | 3 | 2 |
| 35 | 101508097 | Rahul Kumar Yadav | 4 | 2 |
| 36 | 101508098 | Rajnish Bharti | 10 | 5 |
| 37 | 101508099 | Rakshit Ahuja | 1.5 | 1 |
| 38 | 101508100 | Ramneek Devgan | 4 | 2 |
| 39 | 101508101 | Ravneesh Munjal | 10 | 5 |
| 40 | 101508102 | Rohit Kumar | 0 | 1 |
| 41 | 101508103 | Sharanpreet Singh | 10 | 5 |
| 42 | 101508104 | Sahil Chhabra | 10 | 5 |
| 43 | 101508105 | Sahil Garg | 10 | 5 |
| 44 | 101508106 | Saksham | 10 | 5 |
| 45 | 101508107 | Saravpreet Singh | 6 | 4 |
| 46 | 101508108 | Sarthak Bathla | 6 | 4 |
| 47 | 101508109 | Satyam Gupta | 1 | 1 |

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|---------------------|----------------|----------------------|
| 48 | 101508110 | Saurabh Garg | 10 | 5 |
| 49 | 101508111 | Sehaj Aggarwal | 10 | 5 |
| 50 | 101508112 | Shailendra Rai | 0 | 1 |
| 51 | 101508113 | Shashwat Jain | 10 | 5 |
| 52 | 101508114 | Shivam Mittal | 10 | 5 |
| 53 | 101508115 | Shreshth | 7 | 4 |
| 54 | 101508116 | Shubhang Gupta | 8 | 5 |
| 55 | 101508117 | Shubhang Prasad | 10 | 5 |
| 56 | 101508118 | Siddarth | 10 | 5 |
| 57 | 101508119 | Siddharth Nagpal | 4 | 2 |
| 58 | 101508121 | Sourav Deep Singh | 10 | 5 |
| 59 | 101508122 | Sumanyu Aggarwal | 10 | 5 |
| 60 | 101508123 | Supandeep Singh | 10 | 5 |
| 61 | 101508124 | Tushar Bansal | 10 | 5 |
| 62 | 101508125 | Utkarsh Mishra | 8 | 5 |
| 63 | 101508126 | Vaibhav Chobisa | 10 | 5 |
| 64 | 101508127 | Vaibhav Dogra | 0 | 1 |
| 65 | 101508128 | Vaidant Bakshi | 10 | 5 |
| 66 | 101508129 | Vikas Singh Chauhan | 5 | 3 |
| 67 | 101508130 | Vikram Singh | 0 | 1 |
| 68 | 101508131 | Yash Parmar | 10 | 5 |
| 69 | 101508133 | Yatin Singla | 10 | 5 |
| 70 | 101508134 | Deepankar Kumar | 10 | 5 |

The overall performance of students in the above question is then summarized as given below

TableA4.2: Average score of student performance in the course UES009for criteria A1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-----|-----|-----|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UES009 | 67.6 | 5.9 | 5.9 | 8.8 | 11.8 | 4.09 |

(ii) Course: Mechanics of Deformable Bodies (UME404)

The above performance criteria is used to measure the attainment of outcome 'A1' by giving the following question (Question No. 3: during EST in May 2016, weightage 10 marks)to the students.

Question: For the beam loaded at the midspan, determine the slope at end A. Assume E the young modulus and I be the second moment of area.

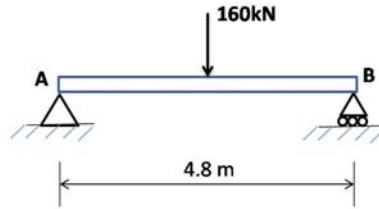


Figure 1

Student's performance in the above question is given below:

TableA4.3: Student's performance in question targeting 'A1'; course: UME404

| S.No. | Roll no. | Name | EST Q3 (10) | SCORE (1-5) |
|-------|-----------|-------------------------|-------------|-------------|
| 1 | 101408001 | Aashish Kumar | 6.5 | 5 |
| 2 | 101408002 | Aayush Khera | 0.5 | 1 |
| 3 | 101408003 | Abhishek Baruah | 5 | 4 |
| 4 | 101408004 | Abhishek Pandey | 2 | 2 |
| 5 | 101408005 | Abhishek Sharma | 2 | 2 |
| 6 | 101408006 | Abhishek Singh Nathawat | 4 | 4 |
| 7 | 101408007 | Abhishesh Aggarwal | 1 | 2 |
| 8 | 101408008 | Adit Goel | 2.5 | 3 |
| 9 | 101408009 | Aditya Shubham | 3 | 3 |
| 10 | 101408010 | Aerk Dimri | 4.5 | 4 |
| 11 | 101408011 | Ajitesh Bindal | 4 | 4 |
| 12 | 101408012 | Akhilesh Sharma | 4 | 4 |
| 13 | 101408013 | Akin | 2.5 | 3 |
| 14 | 101408014 | Akshansh Jain | 2.5 | 3 |
| 15 | 101408015 | Akshay Bajaj | 1.5 | 2 |
| 16 | 101408016 | Aman Singla | -1 | 0 |
| 17 | 101408017 | Amar Raj Singh | 7 | 5 |
| 18 | 101408019 | Anand Vardhan | 6 | 5 |
| 19 | 101408020 | Anil Barwar | 2.5 | 3 |
| 20 | 101408021 | Ankit Kumar | -1 | 0 |
| 21 | 101408022 | Ankit Verma | 6.5 | 5 |
| 22 | 101408023 | Ankush Narula | 3 | 3 |
| 23 | 101408024 | Anurag Kumar | -1 | 0 |
| 24 | 101408025 | Anurag Verma | 2 | 2 |
| 25 | 101408026 | Arjun Raina | 8.5 | 5 |
| 26 | 101408028 | Arpit Kandhari | 3 | 3 |
| 27 | 101408029 | Ashish Goyal | 3 | 3 |

Attainment of Outcome A

| | | | | |
|----|-----------|----------------------------|-----|---|
| 28 | 101408030 | Ashok Ranwa | 2.5 | 3 |
| 29 | 101408031 | Ashwinder Singh | 6 | 5 |
| 30 | 101408032 | Atul | -1 | 0 |
| 31 | 101408033 | Avanshu Shrivastav | 3 | 3 |
| 32 | 101408034 | Ayush Pandey | 8.5 | 5 |
| 33 | 101408035 | Ayush Rai | 2 | 2 |
| 34 | 101408036 | Channdeeep | 3 | 3 |
| 35 | 101408037 | Chetan Katyal | 2.5 | 3 |
| 36 | 101408038 | Daksh Garg | 6.5 | 5 |
| 37 | 101408039 | Deepanshu Mohan | 6.5 | 5 |
| 38 | 101408040 | Devjot Singh Sewak | 3 | 3 |
| 39 | 101408041 | Dheerendra Kumar Chaudhary | 6 | 5 |
| 40 | 101408042 | Dhruv Sharma | 6.5 | 5 |
| 41 | 101408043 | Divyesh Gupta | -1 | 0 |
| 42 | 101408044 | Ekamjot Singh | 4 | 4 |
| 43 | 101408045 | Gaurav Gupta | 10 | 5 |
| 44 | 101408046 | Gurasees Singh | 2.5 | 3 |
| 45 | 101408047 | Gurbaksh Singh | -1 | 0 |
| 46 | 101408048 | Gurneet Singh Aujla | 3 | 3 |
| 47 | 101408049 | Hardik Vashishtha | 2.5 | 3 |
| 48 | 101408050 | Harish Jala | 6.5 | 5 |
| 49 | 101408051 | Harjot Singh | 1 | 2 |
| 50 | 101408052 | Harmandeep Singh | 0 | 1 |
| 51 | 101408055 | Harnoor Singh | 2.5 | 3 |
| 52 | 101408056 | Harpreet Singh | 9 | 5 |
| 53 | 101408057 | Himalaya Nath Chinoriya | 1 | 2 |
| 54 | 101408058 | Himanshu Raj | 2 | 2 |
| 55 | 101408059 | Ishaan Mangla | 5 | 4 |
| 56 | 101408060 | Ishjot Singh Jaggi | 5.5 | 4 |
| 57 | 101408061 | Jagdeep Singh | 0 | 1 |
| 58 | 101408062 | Jaskaran Singh | 2.5 | 3 |
| 59 | 101408063 | Jaskirat Singh | 2 | 2 |
| 60 | 101408064 | Jaspreet Singh Bhalla | 3 | 3 |
| 61 | 101408065 | Jaswinder Singh | 1.5 | 2 |
| 62 | 101408066 | Jatin Sharma | 2 | 2 |
| 63 | 101408067 | Kamal Jindal | 2.5 | 3 |
| 64 | 101408068 | Kanwarpal Singh Sohi | 0 | 1 |

| | | | | |
|----|-----------|------------------------|-----|---|
| 65 | 101408069 | Karamjeet Dhiman | 2.5 | 3 |
| 66 | 101408070 | Karan Bains | 2.5 | 3 |
| 67 | 101408071 | Karan Goyal | 2.5 | 3 |
| 68 | 101408073 | Kchaustubh Sharma | 2 | 2 |
| 69 | 101408074 | Kshitiz Raturi | 1.5 | 2 |
| 70 | 101408075 | Kumar Akshaan | 0 | 1 |
| 71 | 101408076 | Kunal Garg | 4.5 | 4 |
| 72 | 101408077 | Lokesh Bansal | -1 | 0 |
| 73 | 101408078 | Lovedeep Sharma | -1 | 0 |
| 74 | 101408079 | Lucky Ahuja | 5.5 | 4 |
| 75 | 101408080 | Mangal Singh | -1 | 0 |
| 76 | 101588001 | Arpanjot Singh | 4 | 4 |
| 77 | 101588002 | Govind Abhimanyu Dhonk | 4.5 | 4 |
| 78 | 101588004 | Hardik Bedi | 5 | 4 |
| 79 | 101588005 | Harshit Kashyap | 4.5 | 4 |
| 80 | 101588006 | Jashandeep Singh | 5.5 | 4 |
| 81 | 101588010 | Rachit Joshi | 5 | 4 |
| 82 | 101588011 | Rajinder Singh Sidhu | 1 | 2 |
| 83 | 101588012 | Rajit Devgan | 3 | 3 |
| 84 | 101588013 | Shubham Sharma | 1.5 | 2 |
| 85 | 101588015 | Tejinder Singh | 4.5 | 4 |
| 86 | 101308070 | Kshitij sharma | 5 | 4 |
| 87 | 101308015 | Ankit sehgal | 1 | 2 |

The overall performance of students in the above question is then summarized as given below

TableA4.4: Average score of student performance in the course UME404for criteria A1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME404 | 17.9 | 23.1 | 30.8 | 21.8 | 6.4 | 3.24 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria A1 as given below in Table A4.5:

Table A4.5: Weighted Average Student class performance (course portfolio) for criteria A1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 67.6 | 5.9 | 5.9 | 8.8 | 11.8 | 4.09 | 4 |
| UME404 | 17.9 | 23.1 | 30.8 | 21.8 | 6.4 | 3.24 | 5 |
| Weighted average score | 39.99 | 15.46 | 19.73 | 16.02 | 8.80 | 3.62 | 9 |

b) Indirect measures for Performance criteria A1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table A4.6: Average score of student course survey for criteria A1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 56.34 | 42.68 | 1 | 0 | 0 | 4.55 | 4 |
| UME404 | 34.67 | 28.78 | 24.11 | 11.2 | 1.23 | 3.84 | 5 |
| Weighted average score | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 9 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table A4.7: Assessment for criteria A1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0 | 0 | 4.10 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0 | 0 | 4.22 |
| Employer Survey | 72.22 | 27.78 | 0.00 | 0 | 0 | 4.72 |

c) Overall weighted average score of performance criterion 'A1'

Finally overall weighted average score of performance criterion 'A1' is evaluated as given below in Table A4.8:

Table A4.8: Overall weighted average score of performance criterion 'A1'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|-------|-------|-------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 39.99 | 15.46 | 19.73 | 16.02 | 8.80 | 3.62 | 5.00 |
| Weighted average student course survey | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 4.00 |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0.00 | 0.00 | 4.10 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 72.22 | 27.78 | 0.00 | 0.00 | 0.00 | 4.72 | 3.00 |
| Overall weighted score | 44.38 | 32.56 | 14.63 | 5.83 | 2.60 | 4.10 | 18.00 |

Assessment of Outcome 'A' using performance criterion A2

Performance criteria 'A2': Demonstrate knowledge of fundamentals, scientific and/or engineering principles.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Mechanics (UES009) and Mechanics of Deformable Bodies (UME404) were used to assess performance criteria A2 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Mechanics (UES009)

The above performance criteria is used to measure the attainment of outcome 'A2' by giving the following question (Question No. 3: during EST in May 2016, weightage 10marks) to the students.

Question: A block of weight $W = 200$ N is resting on a table as shown in Fig. 2. The coefficient of friction between the table and the load W is 0.25. The weight W is connected to the weights $W_1 = 500$ N and $W_2 = 300$ N by inextensible strings as shown in Fig. 2. Find the acceleration of the system and tension in both strings using the D'Alembert's principle

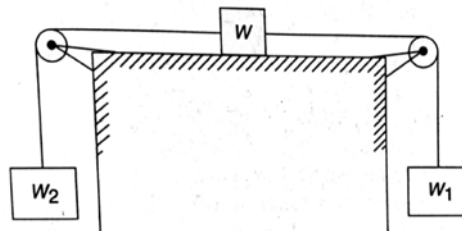


Figure 2

Student's performance in the above question is given below:

TableA4.9: Student's performance in question targeting 'A2'; course: UES009

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|--------------------------|----------------|----------------------|
| 1 | 101508062 | Kunal Swami | 8 | 4 |
| 2 | 101508063 | Lakshya Jain | 10 | 5 |
| 3 | 101508064 | Lakshya Khanduja | 3 | 2 |
| 4 | 101508065 | Lovepreet Singh | 4 | 3 |
| 5 | 101508066 | Mahesh Chugh | 10 | 5 |
| 6 | 101508067 | Manmohit Chugh | 10 | 5 |
| 7 | 101508068 | Mannan Jain | 2 | 2 |
| 8 | 101508069 | Manu Rawal | 10 | 5 |
| 9 | 101508070 | Mayank Singh | 10 | 5 |
| 10 | 101508071 | Mehar Satsangi | 10 | 5 |
| 11 | 101508072 | Mehardeep Singh | 10 | 5 |
| 12 | 101508073 | Mehkant Singh Mittal | 4 | 3 |
| 13 | 101508074 | Mehul Satyajit | 10 | 5 |
| 14 | 101508075 | Mohit Sorout | 5 | 3 |
| 15 | 101508076 | Navjot Wadhwa | 10 | 5 |
| 16 | 101508077 | Navkaran Singh Mroque | 6 | 4 |
| 17 | 101508078 | Navnoor Singh Sidhu | 10 | 5 |
| 18 | 101508079 | Nikhil Jain | 10 | 5 |
| 19 | 101508080 | Nikhil Joshi | 10 | 5 |
| 20 | 101508081 | Nimrat Singh Brar | 10 | 5 |
| 23 | 101508084 | Parth Ahuja | 10 | 5 |
| 24 | 101508085 | Parth Mahajan | 10 | 5 |
| 25 | 101508086 | Prabhsimran Singh Bakshi | 5 | 3 |
| 26 | 101508087 | Pranshu Kansal | 6 | 4 |
| 27 | 101508088 | Prasu Shome | 1 | 1 |
| 28 | 101508090 | Prateek Choudhary | 10 | 5 |
| 29 | 101508091 | Prateek Prasad | 1 | 1 |
| 30 | 101508092 | Preetam Singh Manku | 8 | 4 |
| 31 | 101508093 | Prince Nirwal | 4 | 3 |
| 32 | 101508094 | Raghav Gupta | 10 | 5 |
| 33 | 101508095 | Ragjot Kiran Chhibber | 9 | 5 |

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|---------------------|----------------|----------------------|
| 34 | 101508096 | Rahul Choudhary | 6 | 4 |
| 35 | 101508097 | Rahul Kumar Yadav | 10 | 5 |
| 36 | 101508098 | Rajnish Bharti | 8 | 4 |
| 37 | 101508099 | Rakshit Ahuja | 2 | 2 |
| 38 | 101508100 | Ramneek Devgan | 7 | 4 |
| 39 | 101508101 | Ravneesh Munjal | 5 | 3 |
| 40 | 101508102 | Rohit Kumar | 8 | 4 |
| 41 | 101508103 | Sharanpreet Singh | 10 | 5 |
| 42 | 101508104 | Sahil Chhabra | 7 | 4 |
| 43 | 101508105 | Sahil Garg | 3 | 2 |
| 44 | 101508106 | Saksham | 10 | 5 |
| 45 | 101508107 | Saravpreet Singh | 5 | 3 |
| 46 | 101508108 | Sarthak Bathla | 6 | 4 |
| 47 | 101508109 | Satyam Gupta | 0 | 1 |
| 48 | 101508110 | Saurabh Garg | 2 | 2 |
| 49 | 101508111 | Sehaj Aggarwal | 10 | 5 |
| 50 | 101508112 | Shailendra Rai | 2 | 2 |
| 51 | 101508113 | Shashwat Jain | 10 | 5 |
| 52 | 101508114 | Shivam Mittal | 10 | 5 |
| 53 | 101508115 | Shreshth | 0 | 1 |
| 54 | 101508116 | Shubhang Gupta | 10 | 5 |
| 55 | 101508117 | Shubhang Prasad | 10 | 5 |
| 56 | 101508118 | Siddarth | 6 | 4 |
| 57 | 101508119 | Siddharth Nagpal | 2 | 2 |
| 58 | 101508121 | Sourav Deep Singh | 10 | 5 |
| 59 | 101508122 | Sumanyu Aggarwal | 10 | 5 |
| 60 | 101508123 | Supandeep Singh | 5 | 3 |
| 61 | 101508124 | Tushar Bansal | 10 | 5 |
| 62 | 101508125 | Utkarsh Mishra | 10 | 5 |
| 63 | 101508126 | Vaibhav Chobisa | 10 | 5 |
| 64 | 101508127 | Vaibhav Dogra | 10 | 5 |
| 65 | 101508128 | Vaidant Bakshi | 10 | 5 |
| 66 | 101508129 | Vikas Singh Chauhan | 5 | 3 |
| 67 | 101508130 | Vikram Singh | 2 | 2 |

| S. No. | Roll No. | Name | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-----------------|----------------|----------------------|
| 68 | 101508131 | Yash Parmar | 10 | 5 |
| 69 | 101508133 | Yatin Singla | 10 | 5 |
| 70 | 101508134 | Deepankar Kumar | 10 | 5 |

The overall performance of students in the above question is then summarized as given below

TableA4.10: Average score of student performance in the course UES009 for criteria A2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UES009 | 52.9 | 16.2 | 13.2 | 11.8 | 5.9 | 3.99 |

(ii) Course: Mechanics of Deformable Bodies (UME404)

The above performance criteria is used to measure the attainment of outcome 'A2' by giving the following question (Question No. 4: during EST in May 2016, weightage 20marks) to the students.

Question:

State four assumptions specific to Euler's theory of buckling. A long column of length L with one end fixed and other end free is subjected to an axial compressive load. Derive the expression for Euler's buckling load. Consider EI as flexural rigidity of column. Also, state the value of second buckling load in terms of first buckling load. **(2+6+1)**

A pipe whose internal diameter is 400 mm and thickness is 100 mm contains a fluid at a pressure of 8 N/mm^2 .

- Determine the maximum and minimum radial stress and specify their locations.
- Determine the maximum and minimum circumferential stress and specify their locations.
- Draw radial stress distribution and circumferential stress distribution across the thickness of the cylinder. **(3+6+2)**

Student's performance in the above questions is given below:

Table A4.11: Student's performance in question targeting 'A2'; course: UME404

| S.No. | Roll No. | Name | ESE Q4 (20) | SCORE (1-5) |
|-------|-----------|-------------------------|-------------|-------------|
| 1 | 101408001 | Aashish Kumar | 11 | 4 |
| 2 | 101408002 | Aayush Khera | 5 | 2 |
| 3 | 101408003 | Abhishek Baruah | 2.5 | 1 |
| 4 | 101408004 | Abhishek Pandey | 4.5 | 2 |
| 5 | 101408005 | Abhishek Sharma | 16 | 5 |
| 6 | 101408006 | Abhishek Singh Nathawat | 11 | 4 |
| 7 | 101408007 | Abhishesh Aggarwal | 10.5 | 4 |
| 8 | 101408008 | Adit Goel | 3 | 1 |

| | | | | |
|----|-----------|----------------------------|------|---|
| 9 | 101408009 | Aditya Shubham | 2 | 1 |
| 10 | 101408010 | Aerk Dimri | 11 | 4 |
| 11 | 101408011 | Ajitesh Bindal | 5 | 2 |
| 12 | 101408012 | Akhilesh Sharma | 7.5 | 3 |
| 13 | 101408013 | Akin | 0 | 0 |
| 14 | 101408014 | Akshansh Jain | 3 | 1 |
| 15 | 101408015 | Akshay Bajaj | 6.5 | 2 |
| 16 | 101408016 | Aman Singla | -1 | 0 |
| 17 | 101408017 | Amar Raj Singh | 11 | 4 |
| 18 | 101408019 | Anand Vardhan | 20 | 5 |
| 19 | 101408020 | Anil Barwar | 8.5 | 3 |
| 20 | 101408021 | Ankit Kumar | -1 | 0 |
| 21 | 101408022 | Ankit Verma | 2 | 1 |
| 22 | 101408023 | Ankush Narula | 18 | 5 |
| 23 | 101408024 | Anurag Kumar | -1 | 0 |
| 24 | 101408025 | Anurag Verma | 5 | 2 |
| 25 | 101408026 | Arjun Raina | 12.5 | 4 |
| 26 | 101408028 | Arpit Kandhari | 12.5 | 4 |
| 27 | 101408029 | Ashish Goyal | 15.5 | 5 |
| 28 | 101408030 | Ashok Ranwa | 9 | 4 |
| 29 | 101408031 | Ashwinder Singh | 13.5 | 4 |
| 30 | 101408032 | Atul | -1 | 0 |
| 31 | 101408033 | Avanshu Shrivastav | 12.5 | 4 |
| 32 | 101408034 | Ayush Pandey | 14.5 | 5 |
| 33 | 101408035 | Ayush Rai | 10.5 | 4 |
| 34 | 101408036 | Channdeeep | 10.5 | 4 |
| 35 | 101408037 | Chetan Katyal | 13.5 | 4 |
| 36 | 101408038 | Daksh Garg | 12 | 4 |
| 37 | 101408039 | Deepanshu Mohan | 17 | 5 |
| 38 | 101408040 | Devjot Singh Sewak | 13 | 4 |
| 39 | 101408041 | Dheerendra Kumar Chaudhary | 7.5 | 3 |
| 40 | 101408042 | Dhruv Sharma | 13.5 | 4 |
| 41 | 101408043 | Divyesh Gupta | -1 | 0 |
| 42 | 101408044 | Ekamjot Singh | 16 | 5 |
| 43 | 101408045 | Gaurav Gupta | 16 | 5 |
| 44 | 101408046 | Gurasees Singh | 9 | 4 |
| 45 | 101408047 | Gurbaksh Singh | -1 | 0 |

| | | | | |
|----|-----------|-------------------------|------|---|
| 46 | 101408048 | Gurneet Singh Aujla | 6.5 | 2 |
| 47 | 101408049 | Hardik Vashishtha | 7.5 | 3 |
| 48 | 101408050 | Harish Jala | 13.5 | 4 |
| 49 | 101408051 | Harjot Singh | 5 | 2 |
| 50 | 101408052 | Harmandeep Singh | 8 | 3 |
| 51 | 101408055 | Harnoor Singh | 12 | 4 |
| 52 | 101408056 | Harpreet Singh | 11.5 | 4 |
| 53 | 101408057 | Himalaya Nath Chinoriya | 0 | 0 |
| 54 | 101408058 | Himanshu Raj | 4 | 2 |
| 55 | 101408059 | Ishaan Mangla | 10 | 4 |
| 56 | 101408060 | Ishjot Singh Jaggi | 11 | 4 |
| 57 | 101408061 | Jagdeep Singh | 0 | 0 |
| 58 | 101408062 | Jaskaran Singh | 8.5 | 3 |
| 59 | 101408063 | Jaskirat Singh | 1.5 | 1 |
| 60 | 101408064 | Jaspreet Singh Bhalla | 13 | 4 |
| 61 | 101408065 | Jaswinder Singh | 9 | 4 |
| 62 | 101408066 | Jatin Sharma | 13 | 4 |
| 63 | 101408067 | Kamal Jindal | 15 | 5 |
| 64 | 101408068 | Kanwarpal Singh Sohi | 8.5 | 3 |
| 65 | 101408069 | Karamjeet Dhiman | 5 | 2 |
| 66 | 101408070 | Karan Bains | 8.5 | 3 |
| 67 | 101408071 | Karan Goyal | 17 | 5 |
| 68 | 101408073 | Kchaustubh Sharma | 11 | 4 |
| 69 | 101408074 | Kshitiz Raturi | 2 | 1 |
| 70 | 101408075 | Kumar Akshaan | 0 | 0 |
| 71 | 101408076 | Kunal Garg | 15 | 5 |
| 72 | 101408077 | Lokesh Bansal | -1 | 0 |
| 73 | 101408078 | Lovedeep Sharma | -1 | 0 |
| 74 | 101408079 | Lucky Ahuja | 17 | 5 |
| 75 | 101408080 | Mangal Singh | -1 | 0 |
| 76 | 101588001 | Arpanjot Singh | 19 | 5 |
| 77 | 101588002 | Govind Abhimanyu Dhonk | 4 | 2 |
| 78 | 101588004 | Hardik Bedi | 8.5 | 3 |
| 79 | 101588005 | Harshit Kashyap | 17 | 5 |
| 80 | 101588006 | Jashandeep Singh | 17.5 | 5 |
| 81 | 101588010 | Rachit Joshi | 19 | 5 |
| 82 | 101588011 | Rajinder Singh Sidhu | 17.5 | 5 |

| | | | | |
|----|-----------|----------------|-----|---|
| 83 | 101588012 | Rajit Devgan | 17 | 5 |
| 84 | 101588013 | Shubham Sharma | 18 | 5 |
| 85 | 101588015 | Tejinder Singh | 18 | 5 |
| 86 | 101308070 | Kshitij sharma | 8 | 3 |
| 87 | 101308015 | Ankit sehgal | 0.5 | 0 |

The overall performance of students in the above question is then summarized as given below

Table A4.12: Average score of student performance in the course UME404 for criteria A2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME404 | 27.4 | 35.6 | 13.7 | 13.7 | 9.6 | 3.58 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria A2 as given below in Table A4.13:

Table A4.13: Weighted Average Student class performance (course portfolio) for criteria A2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 52.9 | 16.2 | 13.2 | 11.8 | 5.9 | 3.98 | 4 |
| UME404 | 27.4 | 35.6 | 13.7 | 13.7 | 9.6 | 3.58 | 5 |
| Weighted average score | 38.73 | 26.98 | 13.48 | 12.86 | 7.96 | 3.76 | 9 |

b.) Assessment Tool: Student Course Survey

Table A4.14: Average score of student course survey for criteria A2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 56.34 | 42.68 | 1 | 0 | 0 | 4.55 | 4 |
| UME404 | 34.67 | 28.78 | 24.11 | 11.2 | 1.23 | 3.84 | 5 |
| Weighted average score | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 9 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table A4.15: Assessment for criteria A2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0 | 0 | 4.10 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0 | 0 | 4.22 |
| Employer Survey | 72.22 | 27.78 | 0.00 | 0 | 0 | 4.72 |

Finally overall weighted average score of performance criterion 'A2' is evaluated as given below in Table A4.16:

Table A4.16.: Overall weighted average score of performance criterion 'A2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|-------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 38.73 | 26.98 | 13.48 | 12.86 | 7.96 | 3.76 | 5.00 |
| Weighted average student course survey | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 4.00 |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0.00 | 0.00 | 4.10 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 72.22 | 27.78 | 0.00 | 0.00 | 0.00 | 4.72 | 3.00 |
| Overall weighted score | 44.03 | 35.76 | 12.89 | 4.95 | 2.36 | 4.14 | 18.00 |

Assessment of Outcome 'A' using performance criterion A3

Performance criteria 'A3': Applying scientific and/or engineering principles towards solving engineering problems.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Mechanics (UES009) and Mechanics of Deformable Bodies (UME404) were used to assess performance criteria A3 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Mechanics (UES009)

The above performance criteria is used to measure the attainment of outcome 'A3' by giving the following question (Question No. 3: during EST in May 2016, weightage 15 marks) to the students.

Question: In the pin-jointed plane truss, loaded and supported as shown in Fig. 3, determine
a) The reactions at the two supports B and A, wherein, B is hinge support and A is a roller support.

b) Forces in the members BD, BE, HE and EF.

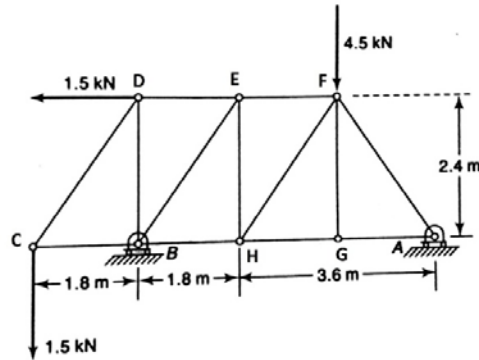


Figure 3

Student’s performance in the above question is given below:

Table A4.17: Student’s performance in question targeting ‘A3’; course: UES 009

| S. No. | Roll No. | Name | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|-----------------------|----------------|----------------------|
| 1 | 101508062 | Kunal Swami | 3 | 2 |
| 2 | 101508063 | Lakshya Jain | 7 | 3 |
| 3 | 101508064 | Lakshya Khanduja | 6 | 2 |
| 4 | 101508065 | Lovepreet Singh | 7 | 3 |
| 5 | 101508066 | Mahesh Chugh | 12 | 4 |
| 6 | 101508067 | Manmohit Chugh | 10 | 4 |
| 7 | 101508068 | Mannan Jain | 7.5 | 3 |
| 8 | 101508069 | Manu Rawal | 14 | 5 |
| 9 | 101508070 | Mayank Singh | 3.5 | 2 |
| 10 | 101508071 | Mehar Satsangi | 15 | 5 |
| 11 | 101508072 | Mehardeep Singh | 15 | 5 |
| 12 | 101508073 | Mehkant Singh Mittal | 11 | 4 |
| 13 | 101508074 | Mehul Satyajit | 13 | 5 |
| 14 | 101508075 | Mohit Sorout | 13 | 5 |
| 15 | 101508076 | Navjot Wadhwa | 11 | 4 |
| 16 | 101508077 | Navkaran Singh Mroque | 15 | 5 |
| 17 | 101508078 | Navnoor Singh Sidhu | 8 | 3 |
| 18 | 101508079 | Nikhil Jain | 15 | 5 |
| 19 | 101508080 | Nikhil Joshi | 8 | 3 |
| 20 | 101508081 | Nimrat Singh Brar | 9 | 3 |
| 23 | 101508084 | Parth Ahuja | 6 | 2 |

| S. No. | Roll No. | Name | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|--------------------------|----------------|----------------------|
| 24 | 101508085 | Parth Mahajan | 7 | 3 |
| 25 | 101508086 | Prabhsimran Singh Bakshi | 9 | 3 |
| 26 | 101508087 | Pranshu Kansal | 10 | 4 |
| 27 | 101508088 | Prasu Shome | 1 | 1 |
| 28 | 101508090 | Prateek Choudhary | 6 | 2 |
| 29 | 101508091 | Prateek Prasad | 5 | 2 |
| 30 | 101508092 | Preetam Singh Manku | 7 | 3 |
| 31 | 101508093 | Prince Nirwal | 15 | 5 |
| 32 | 101508094 | Raghav Gupta | 13.5 | 5 |
| 33 | 101508095 | Ragjot Kiran Chhibber | 7.5 | 3 |
| 34 | 101508096 | Rahul Choudhary | 3 | 2 |
| 35 | 101508097 | Rahul Kumar Yadav | 7 | 3 |
| 36 | 101508098 | Rajnish Bharti | 15 | 5 |
| 37 | 101508099 | Rakshit Ahuja | 3 | 2 |
| 38 | 101508100 | Ramneek Devgan | 3 | 2 |
| 39 | 101508101 | Ravneesh Munjal | 8 | 3 |
| 40 | 101508102 | Rohit Kumar | 7 | 3 |
| 41 | 101508103 | Sharanpreet Singh | 15 | 5 |
| 42 | 101508104 | Sahil Chhabra | 9 | 3 |
| 43 | 101508105 | Sahil Garg | 9 | 3 |
| 44 | 101508106 | Saksham | 13 | 5 |
| 45 | 101508107 | Saravpreet Singh | 15 | 5 |
| 46 | 101508108 | Sarthak Bathla | 14 | 5 |
| 47 | 101508109 | Satyam Gupta | 1 | 1 |
| 48 | 101508110 | Saurabh Garg | 7.5 | 3 |
| 49 | 101508111 | Sehaj Aggarwal | 9 | 3 |
| 50 | 101508112 | Shailendra Rai | 4 | 2 |
| 51 | 101508113 | Shashwat Jain | 7 | 3 |
| 52 | 101508114 | Shivam Mittal | 12 | 4 |
| 53 | 101508115 | Shreshth | 4 | 2 |
| 54 | 101508116 | Shubhang Gupta | 11 | 4 |
| 55 | 101508117 | Shubhang Prasad | 15 | 5 |
| 56 | 101508118 | Siddarth | 14 | 5 |
| 57 | 101508119 | Siddharth Nagpal | 3 | 2 |

| S. No. | Roll No. | Name | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|---------------------|----------------|----------------------|
| 58 | 101508121 | Sourav Deep Singh | 4 | 2 |
| 59 | 101508122 | Sumanyu Aggarwal | 7 | 3 |
| 60 | 101508123 | Supandeep Singh | 6.5 | 3 |
| 61 | 101508124 | Tushar Bansal | 9 | 3 |
| 62 | 101508125 | Utkarsh Mishra | 13 | 5 |
| 63 | 101508126 | Vaibhav Chobisa | 7 | 3 |
| 64 | 101508127 | Vaibhav Dogra | 14.5 | 5 |
| 65 | 101508128 | Vaidant Bakshi | 7 | 3 |
| 66 | 101508129 | Vikas Singh Chauhan | 7 | 3 |
| 67 | 101508130 | Vikram Singh | 0 | 1 |
| 68 | 101508131 | Yash Parmar | 12 | 4 |
| 69 | 101508133 | Yatin Singla | 13 | 5 |
| 70 | 101508134 | Deepankar Kumar | 15 | 5 |

The overall performance of students in the above question is then summarized as given below

Table A4.18: Average score of student performance in the course UES009 for criteria A3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UES009 | 29.4 | 11.8 | 35.3 | 19.1 | 4.4 | 3.43 |

(ii) Course: Mechanics of Deformable Bodies (UME404)

The above performance criteria is used to measure the attainment of outcome 'A3' by giving the following question (Question No. 6: during EST in May 2015, weightage 20 marks) to the students.

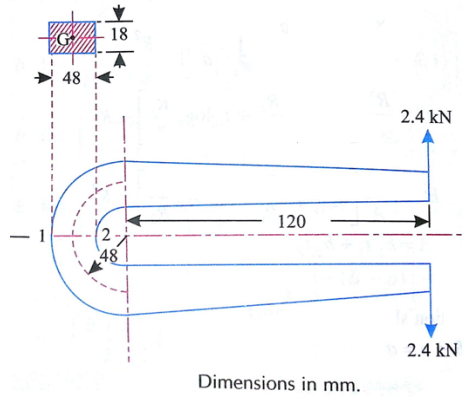
Question:

A torque T is acting on a body whose polar moment of inertia is I_p . This torque tends to rotate the element. The material has the shear modulus as G . Derive an expression for the strain energy stored due to the applied torque, T . (6)

A curved member shown in the figure below has a rectangular cross section and subjected to a load of 2.4 kN as shown. Determine:

- (i) the direct stresses at point 1 and 2.
- (ii) the bending stresses at point 1 and 2.
- (iii) the resultant stresses at point 1 and 2.
- (iv) the location of the neutral axis.

(2+7+2+3)



Student's performance in the above question is given below:

Table A4.19: Student's performance in question targeting 'A3'; course: UME404

| S.No. | Roll no. | Name | ESE Q6 (20) | SCORE (1-5) |
|-------|-----------|-------------------------|-------------|-------------|
| 1 | 101408001 | Aashish Kumar | 11.5 | 4 |
| 2 | 101408002 | Aayush Khera | 3 | 2 |
| 3 | 101408003 | Abhishek Baruah | 7 | 3 |
| 4 | 101408004 | Abhishek Pandey | 9.5 | 4 |
| 5 | 101408005 | Abhishek Sharma | 13.5 | 5 |
| 6 | 101408006 | Abhishek Singh Nathawat | 15 | 5 |
| 7 | 101408007 | Abhishesh Aggarwal | 11.5 | 4 |
| 8 | 101408008 | Adit Goel | 7.5 | 3 |
| 9 | 101408009 | Aditya Shubham | 11.5 | 4 |
| 10 | 101408010 | Aerk Dimri | 12 | 5 |
| 11 | 101408011 | Ajitesh Bindal | 9.5 | 4 |
| 12 | 101408012 | Akhilesh Sharma | 0 | 1 |
| 13 | 101408013 | Akin | 0 | 1 |
| 14 | 101408014 | Akshansh Jain | 2.5 | 1 |
| 15 | 101408015 | Akshay Bajaj | 4 | 2 |
| 16 | 101408016 | Aman Singla | NA | 5 |
| 17 | 101408017 | Amar Raj Singh | 9.5 | 4 |
| 18 | 101408019 | Anand Vardhan | 17 | 5 |
| 19 | 101408020 | Anil Barwar | 14 | 5 |
| 20 | 101408021 | Ankit Kumar | NA | 5 |
| 21 | 101408022 | Ankit Verma | 0 | 1 |
| 22 | 101408023 | Ankush Narula | 18 | 5 |
| 23 | 101408024 | Anurag Kumar | NA | 5 |

| | | | | |
|----|-----------|----------------------------|------|---|
| 24 | 101408025 | Anurag Verma | 12 | 5 |
| 25 | 101408026 | Arjun Raina | 7.5 | 3 |
| 26 | 101408028 | Arpit Kandhari | 8.5 | 4 |
| 27 | 101408029 | Ashish Goyal | 12 | 5 |
| 28 | 101408030 | Ashok Ranwa | 13.5 | 5 |
| 29 | 101408031 | Ashwinder Singh | 13.5 | 5 |
| 30 | 101408032 | Atul | NA | 5 |
| 31 | 101408033 | Avanshu Shrivastav | 6 | 3 |
| 32 | 101408034 | Ayush Pandey | 9 | 4 |
| 33 | 101408035 | Ayush Rai | 8.5 | 4 |
| 34 | 101408036 | Channddeep | 7 | 3 |
| 35 | 101408037 | Chetan Katyal | 14.5 | 5 |
| 36 | 101408038 | Daksh Garg | 19 | 5 |
| 37 | 101408039 | Deepanshu Mohan | 13 | 5 |
| 38 | 101408040 | Devjot Singh Sewak | 3 | 2 |
| 39 | 101408041 | Dheerendra Kumar Chaudhary | 15 | 5 |
| 40 | 101408042 | Dhruv Sharma | 18 | 5 |
| 41 | 101408043 | Divyesh Gupta | NA | 5 |
| 42 | 101408044 | Ekamjot Singh | 8.5 | 4 |
| 43 | 101408045 | Gaurav Gupta | 18.5 | 5 |
| 44 | 101408046 | Gurasees Singh | 8 | 4 |
| 45 | 101408047 | Gurbaksh Singh | NA | 5 |
| 46 | 101408048 | Gurneet Singh Aujla | 1 | 1 |
| 47 | 101408049 | Hardik Vashishtha | 2 | 1 |
| 48 | 101408050 | Harish Jala | 12.5 | 5 |
| 49 | 101408051 | Harjot Singh | 6 | 3 |
| 50 | 101408052 | Harmandeep Singh | 2 | 1 |
| 51 | 101408055 | Harnoor Singh | 8.5 | 4 |
| 52 | 101408056 | Harpreet Singh | 9.5 | 4 |
| 53 | 101408057 | Himalaya Nath Chinoriya | 5.5 | 3 |
| 54 | 101408058 | Himanshu Raj | 2 | 1 |
| 55 | 101408059 | Ishaan Mangla | 8.5 | 4 |
| 56 | 101408060 | Ishjot Singh Jaggi | 1.5 | 1 |
| 57 | 101408061 | Jagdeep Singh | 1 | 1 |
| 58 | 101408062 | Jaskaran Singh | 0 | 1 |
| 59 | 101408063 | Jaskirat Singh | 1 | 1 |
| 60 | 101408064 | Jaspreet Singh Bhalla | 13 | 5 |

| | | | | |
|----|-----------|------------------------|------|---|
| 61 | 101408065 | Jaswinder Singh | 8 | 4 |
| 62 | 101408066 | Jatin Sharma | 2 | 1 |
| 63 | 101408067 | Kamal Jindal | 4 | 2 |
| 64 | 101408068 | Kanwarpal Singh Sohi | 1.5 | 1 |
| 65 | 101408069 | Karamjeet Dhiman | 6 | 3 |
| 66 | 101408070 | Karan Bains | 3 | 2 |
| 67 | 101408071 | Karan Goyal | 8 | 4 |
| 68 | 101408073 | Kchaustubh Sharma | 10.5 | 4 |
| 69 | 101408074 | Kshitiz Raturi | 1 | 1 |
| 70 | 101408075 | Kumar Akshaan | 0 | 1 |
| 71 | 101408076 | Kunal Garg | 3 | 2 |
| 72 | 101408077 | Lokesh Bansal | NA | 5 |
| 73 | 101408078 | Lovedeep Sharma | NA | 5 |
| 74 | 101408079 | Lucky Ahuja | 14.5 | 5 |
| 75 | 101408080 | Mangal Singh | NA | 5 |
| 76 | 101588001 | Arpanjot Singh | 19 | 5 |
| 77 | 101588002 | Govind Abhimanyu Dhonk | 9 | 4 |
| 78 | 101588004 | Hardik Bedi | 1 | 1 |
| 79 | 101588005 | Harshit Kashyap | 6.5 | 3 |
| 80 | 101588006 | Jashandeep Singh | 13.5 | 5 |
| 81 | 101588010 | Rachit Joshi | 12 | 5 |
| 82 | 101588011 | Rajinder Singh Sidhu | 9 | 4 |
| 83 | 101588012 | Rajit Devgan | 6.5 | 3 |
| 84 | 101588013 | Shubham Sharma | 15 | 5 |
| 85 | 101588015 | Tejinder Singh | 19 | 5 |
| 86 | 101308070 | Kshitij sharma | 2.5 | 1 |
| 87 | 101308015 | Ankit sehgal | 8 | 4 |

The overall performance of students in the above question is then summarized as given below

Table A4.20: Average score of student performance in the course UME404 for criteria A3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|----|------|-----|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME404 | 37.9 | 23 | 11.5 | 6.9 | 20.7 | 3.51 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria A3 as given below in Table A4.21:

Table A4.21: Weighted Average Student class performance (course portfolio) for criteria A3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 29.4 | 11.8 | 35.3 | 19.1 | 4.4 | 3.43 | 4 |
| UME404 | 37.9 | 23 | 11.5 | 6.9 | 20.7 | 3.51 | 5 |
| Weighted average score | 34.12 | 18.02 | 22.08 | 12.32 | 13.46 | 3.47 | 9 |

b.) Assessment Tool: Student Course Survey

Table A4.22: Average score of student course survey for criteria A3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UES009 | 56.34 | 42.68 | 1 | 0 | 0 | 4.55 | 4 |
| UME404 | 34.67 | 28.78 | 24.11 | 11.2 | 1.23 | 3.84 | 5 |
| Weighted average score | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 9 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table A4.23: Assessment for criteria A3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0 | 0 | 4.10 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0 | 0 | 4.22 |
| Employer Survey | 72.22 | 27.78 | 0.00 | 0 | 0 | 4.72 |

Finally overall weighted average score of performance criterion ‘A3’ is evaluated as given below in Table A4.24:

Table A4.24: Overall weighted average score of performance criterion ‘A3’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|--------------|--------------|-------------|-------------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 34.12 | 18.02 | 22.08 | 12.32 | 13.46 | 3.47 | 5.00 |
| Weighted average student course survey | 44.30 | 34.96 | 13.84 | 6.22 | 0.68 | 4.16 | 4.00 |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0.00 | 0.00 | 4.10 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 72.22 | 27.78 | 0.00 | 0.00 | 0.00 | 4.72 | 3.00 |
| Overall weighted score | 42.75 | 33.27 | 15.28 | 4.81 | 3.89 | 4.06 | 18.00 |

Assessment of Outcome ‘A’ using performance criterion A4

Performance criteria ‘A4’: Applying statistical methods in analyzing data.

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: One course namely Operations Management (UME836) was used to assess performance criteria A4 as a direct measure. The analysis for each of these courses is provided below:

(I) Course: Operations Management (UME836)

The above performance criteria is used to measure the attainment of outcome ‘A1’ by giving the following question (Question No. 3: during EST in May 2015, weightage 20 marks) to the students. *(You may find suitable question for this assessment from the measurement of CLOs submitted with the course file.)*

Question: What are the MRP inputs and outputs. Complete the MRP format shown below. How many units are on hand at the end of the period?

| | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|
| Order Quantity=500 Lead time= 4 weeks | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Projected requirements | 150 | 150 | 150 | 150 | 200 | 200 | 180 | 320 |
| Receipts | | | | | | | | |
| On hand at the end of period (300) | | | | | | | | |
| Planned order release | | | | | | | | |

| | | | | | | | | |
|------------------------------------|---|---|---|---|---|---|---|---|
| Order Quantity=200 Lead time= 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------------------|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|------------------------------------|----|----|----|----|-----|-----|----|-----|
| weeks | | | | | | | | |
| Projected requirements | 40 | 85 | 10 | 60 | 130 | 110 | 50 | 170 |
| Receipts | | | | | | | | |
| On hand at the end of period (140) | | | | | | | | |
| Planned order release | | | | | | | | |

Student's performance in the above question given below:

Table A4.25: Student's performance in question targeting 'A4'; course: UME836

| S. No. | Roll No. | Name | Marks (MM: 13) |
|--------|-----------|--------------------------|----------------|
| 1 | 101208002 | Aditya Anand | 12 |
| 2 | 101208003 | Ajaywinder Singh | 15 |
| 3 | 101208004 | Akanksh Vashistha | 10 |
| 4 | 101208011 | Patel Amit Singh Jagdish | 18 |
| 5 | 101208020 | Anurag Panthey | 9 |
| 6 | 101208031 | Brinderjeet Singh Dhanoa | 9 |
| 7 | 101208042 | Gaurav Kakkar | 17 |
| 8 | 101208045 | Gurleen Singh | 14 |
| 9 | 101208048 | Harish Garg | 15 |
| 10 | 101208049 | Harsh Raheja | 18 |
| 11 | 101208053 | Ishpuneet Singh Chawla | 18 |
| 12 | 101208058 | Kamal Preet Singh | 8 |
| 13 | 101208063 | Kartik Singla | 15 |
| 14 | 101208078 | Nishant Bansal | 7 |
| 15 | 101208117 | Shubham Saha | 16 |
| 16 | 101208132 | Vikas Kumar Singh | 18 |
| 17 | 101208134 | Vinesh Garg | 18 |
| 18 | 101208138 | Yash Khemka | 14 |
| 19 | 101388003 | Jaswant Singh | 18 |
| 20 | 101388004 | Pawan Kumar | 0 |

The overall performance of students in the above question is then summarized as given below

Table A4.26: Average score of student performance in the course UME836 for criteria A4

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|----|----|----|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME836 | 35 | 30 | 20 | 10 | 5 | 3.8 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria A4 as given below in Table A4.27:

Table A4.27: Weighted Average Student class performance (course portfolio) for criteria A4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME836 | 35 | 30 | 20 | 10 | 5 | 3.80 | 5 |
| Weighted average score | 35.00 | 30.00 | 20.00 | 10.00 | 5.00 | 3.80 | 5 |

b.) Assessment Tool: Student Course Survey

Table A4.28: Average score of student course survey for criteria A4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME836 | 23.12 | 33.25 | 27.1 | 11.99 | 4.51 | 3.58 | 5 |
| Weighted average score | 23.12 | 33.25 | 27.10 | 11.99 | 4.51 | 3.58 | 5 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table A4.29.: Assessment for criteria A4 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0 | 0 | 4.10 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0 | 0 | 4.22 |
| Employer Survey | 72.22 | 27.78 | 0.00 | 0 | 0 | 4.72 |

Finally overall weighted average score of performance criterion ‘A4’ is evaluated as given below in Table A4.30:

Table A4.30: Overall weighted average score of performance criterion ‘A4’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|-------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 35.00 | 30.00 | 20.00 | 10.00 | 5.00 | 3.80 | 5.00 |
| Weighted average student course survey | 23.12 | 33.25 | 27.10 | 11.99 | 4.51 | 3.58 | 4.00 |
| Graduating student survey | 38.71 | 32.26 | 29.03 | 0.00 | 0.00 | 4.10 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 72.22 | 27.78 | 0.00 | 0.00 | 0.00 | 4.72 | 3.00 |
| Overall weighted score | 38.29 | 36.22 | 17.65 | 5.44 | 2.39 | 4.03 | 18 |

Overall assessment of program outcome A using scores of A1, A2, A3 and A4

In the above sections, each of the individual performance criteria A1, A2, A3 and A4 have been assessed. The performance for attainment of outcome A has been completed using the attainment values for A1, A2, A3 and A4 and is provided below:

Table A4.31 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome A.

Table A4.31: Overall score for outcome A at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| A1 | 44.38 | 32.56 | 14.63 | 5.83 | 2.60 | 4.10 | 5 |
| A2 | 44.03 | 35.76 | 12.89 | 4.95 | 2.36 | 4.14 | 5 |
| A3 | 42.75 | 33.27 | 15.28 | 4.81 | 3.89 | 4.06 | 4 |
| A4 | 38.29 | 36.22 | 17.65 | 5.44 | 2.39 | 4.03 | 3 |
| Overall score | 42.82 | 34.32 | 14.81 | 5.26 | 2.96 | 4.09 | 17 |

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

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

The following table A4.32 presents the performance criteria-wise assessment score distribution for outcome ‘A’

Table A4.32: Performance criteria-wise assessment score distribution of outcome A

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| A | A1 | 3.78 | 3.94 | 4.10 |
| | A2 | 3.82 | 3.83 | 4.14 |
| | A3 | 3.93 | 3.74 | 4.06 |
| | A4 | -- | 3.90 | 4.03 |

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

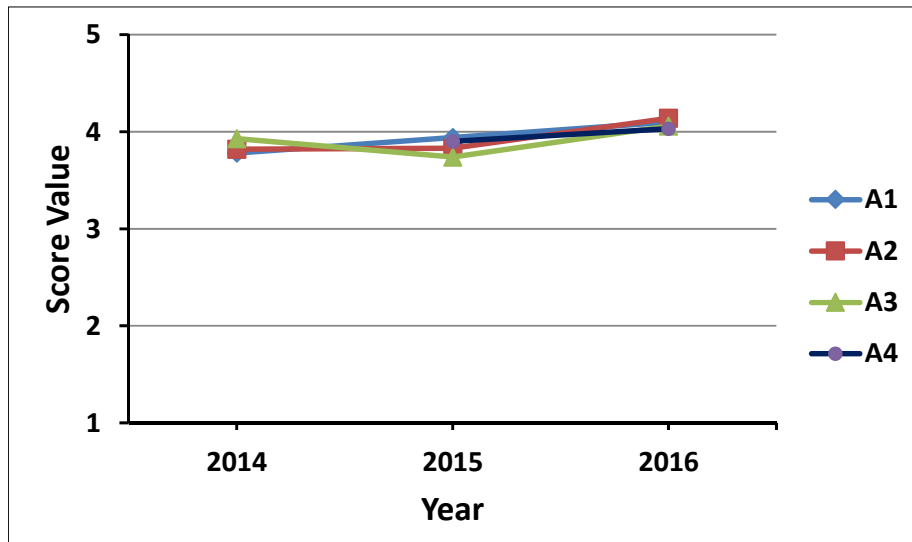


Figure A4.2: Performance criteria-wise assessment score distribution of outcome A

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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table A4.33 presents the overall weighted score of outcome 'A' over the last three academic years

Table A4.33: Overall weighted score of outcome 'A' over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 3.84 | good |
| 2015 | 3.85 | good |
| 2016 | 4.09 | good |

The above data has been plotted to visualize the overall weighted score of outcome 'A' over a period of last three years.

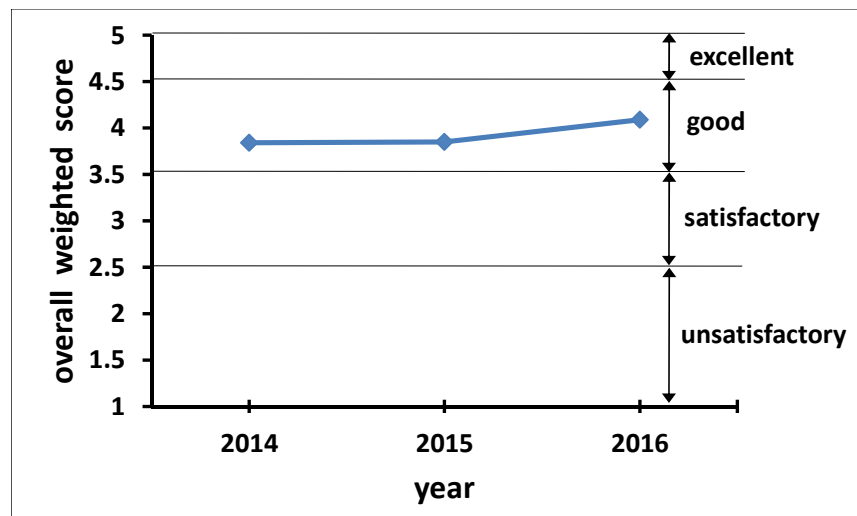


Figure A4.3: Overall weighted score of outcome 'A' over a period of last three years

The following actions have been taken based on the analysis of Outcome A

| Weighted Score for Outcome A | Recommendation | Reason | Implemented from |
|------------------------------|---|-----------------------------|-------------------------|
| 3.85 | <ul style="list-style-type: none"> • Addition of subject, 'Inspection and Quality Control' • Addition of electives on Mechanics of Composite Materials, Dynamics of Rigid Bodies, Rapid Prototyping, Processing of Polymers and Composites, Micro and Nano Manufacturing • Credits of Capstone project increased | To improve domain knowledge | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'B'
(Year 2016)**

for the

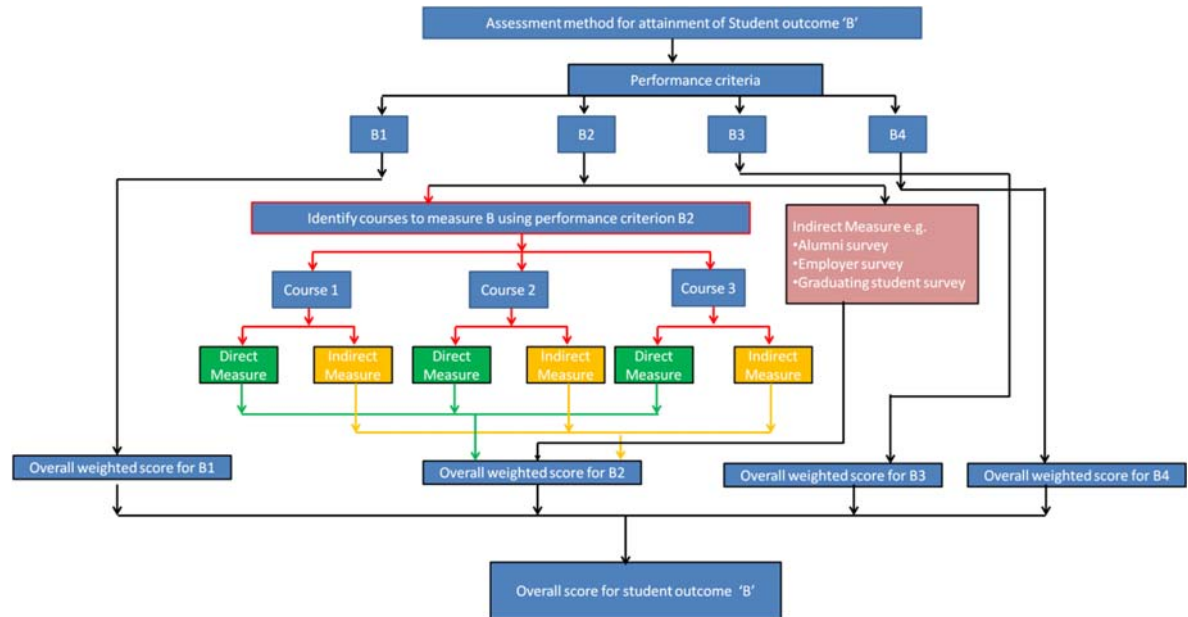
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome B

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'B'

Courses:

1. Manufacturing Technology (UME509)
2. Computer Aided Manufacturing (UME702)

Outcome B has been assessed by four performance criteria B1, B2, B3 and B4. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these four performance criteria has been used to measure the overall measure of outcome B.

1) Assessment of Outcome 'B' using performance criterion B1

Performance criteria 'B1': Identifying the constraints, assumptions and models for the experiments.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Manufacturing Technology (UME509) and Computer Aided Manufacturing (UME702) were used to assess performance criteria B1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Manufacturing Technology (UME509)

The above performance criteria is used to measure the attainment of outcome 'B1' by giving the following question (During Lab in July-Dec2016, weightage 5 marks) to the students.

Question 1: To fabricate rail with wheels using shield metal arc welding using mild steel work piece.

Table B4.1: Student's performance in question targeting 'B1'; course: UME509

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 1 | 101408001 | 3 | 3 |
| 2 | 101408002 | 4 | 4 |
| 3 | 101408003 | 4 | 4 |
| 4 | 101408004 | 3.5 | 4 |
| 5 | 101408005 | 4 | 4 |
| 6 | 101408006 | 4 | 4 |
| 7 | 101408007 | 3.5 | 4 |
| 8 | 101408008 | 0 | 0 |
| 9 | 101408009 | 3.5 | 4 |
| 10 | 101408010 | 4 | 4 |
| 11 | 101408011 | 4 | 4 |
| 12 | 101408012 | 3 | 3 |
| 13 | 101408013 | 4 | 4 |
| 14 | 101408014 | 0 | 0 |
| 15 | 101408015 | 3 | 3 |
| 16 | 101408016 | 4 | 4 |
| 17 | 101408017 | 4 | 4 |
| 18 | 101408019 | 4 | 4 |
| 19 | 101408020 | 4 | 4 |
| 20 | 101408022 | 4 | 4 |
| 21 | 101408023 | 3 | 3 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 22 | 101408024 | 3 | 3 |
| 23 | 101408025 | 4 | 4 |
| 24 | 101408026 | 3 | 3 |
| 25 | 101408028 | 3 | 3 |
| 26 | 101408029 | 4 | 4 |
| 27 | 101408030 | 3 | 3 |
| 28 | 101408031 | 4 | 4 |
| 29 | 101408032 | 3 | 3 |
| 30 | 101408033 | 3 | 3 |
| 31 | 101408034 | 4 | 4 |
| 32 | 101408035 | 4 | 4 |
| 33 | 101408036 | 4 | 4 |
| 34 | 101408037 | 4 | 4 |
| 35 | 101408038 | 3 | 3 |
| 36 | 101408039 | 3.5 | 4 |
| 37 | 101408040 | 0 | 0 |
| 38 | 101408041 | 4 | 4 |
| 39 | 101408042 | 4 | 4 |
| 40 | 101408043 | 4 | 4 |
| 41 | 101408044 | 3.5 | 4 |
| 42 | 101408045 | 4 | 4 |
| 43 | 101408047 | 3.5 | 4 |
| 44 | 101408048 | 3.5 | 4 |
| 45 | 101408049 | 3.5 | 4 |
| 46 | 101408050 | 4 | 4 |
| 47 | 101408051 | 4 | 4 |
| 48 | 101408052 | 3.5 | 4 |
| 49 | 101408055 | 4 | 4 |
| 50 | 101408056 | 3 | 3 |
| 51 | 101408057 | 3.5 | 4 |
| 52 | 101408058 | 4 | 4 |
| 53 | 101408059 | 4 | 4 |
| 54 | 101408060 | 4 | 4 |
| 55 | 101408120 | 4 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 56 | 101408121 | 3 | 3 |
| 57 | 101408122 | 3 | 3 |
| 58 | 101408123 | 4 | 4 |
| 59 | 101408124 | 3 | 3 |
| 60 | 101408125 | 3 | 3 |
| 61 | 101408126 | 4 | 4 |
| 62 | 101408127 | 3 | 3 |
| 63 | 101408128 | 3 | 3 |
| 64 | 101408129 | 4 | 4 |
| 65 | 101588001 | 4 | 4 |
| 66 | 101588005 | 4 | 4 |
| 67 | 101588006 | 4 | 4 |
| 68 | 101588010 | 4 | 4 |
| 69 | 101588011 | 3 | 3 |
| 70 | 101588012 | 3.5 | 4 |
| 71 | 101588013 | 4 | 4 |
| 72 | 101588015 | 4 | 4 |
| 73 | 101208059 | 4 | 4 |

The overall performance of students in the above question is then summarized as given below

Table B4.2: Average score of student performance in the course UME509for criteria B1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME509 | 0 | 69.86 | 26 | 0 | 0 | 3.57 |

(ii) Course: Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome 'B1' by giving the following question (Question No. 3: during ESE in December 2016, weightage 10 marks)to the students.

Question:

- 3 (a) Four machines used to produce a family of parts are to be arranged into a GT cell. From / To data for the parts processed by the machines are shown in the table below. Determine the most logical sequence of machines for the data, and construct the network diagram for the data showing where and how many parts enter and exit the system.

| From | To | | | |
|------|----|----|---|----|
| | 1 | 2 | 3 | 4 |
| 1 | 0 | 10 | 0 | 40 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | 50 | 0 | 0 | 20 |
| 4 | 0 | 50 | 0 | 0 |

(b) What is the difference between the chain and hybrid type of structure in a classification and coding scheme?

Student's performance in the above question is given below:

Table B4.3: Student's performance in question targeting 'B1'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | Ankit Sehgal | 0.0 | 1 |
| 2 | 101308033 | Ekansh Kumar Srivastava | 2.0 | 1 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | 3.0 | 2 |
| 4 | 101308067 | Ketan Chauhan | 2.0 | 1 |
| 5 | 101308069 | Kirat Singh Basur | 8.0 | 4 |
| 6 | 101308070 | Kshitij Sharma | 5.5 | 3 |
| 7 | 101308071 | Lokendra Kumar | 3.5 | 3 |
| 8 | 101308074 | Manik Saharan | 7.0 | 4 |
| 9 | 101308075 | Manish Pandoh | 2.0 | 1 |
| 10 | 101308077 | Manutkarsh Kirpal | 3.5 | 3 |
| 11 | 101308078 | Nidan Prakash | 2.0 | 1 |
| 12 | 101308079 | Nikhil Aggarwal | 6.0 | 4 |
| 13 | 101308080 | Nikhil Ganta | 8.0 | 4 |
| 14 | 101308082 | Paramjot Singh | 4.5 | 3 |
| 15 | 101308083 | Paras | 3.0 | 2 |
| 16 | 101308085 | Prabhman Vir | 7.0 | 4 |
| 17 | 101308088 | Pulkit Kapoor | 6.0 | 4 |
| 18 | 101308089 | Puneet Singh | 3.5 | 3 |
| 19 | 101308090 | Rajat Gupta | 4.0 | 3 |
| 20 | 101308091 | Ramnish Kumar | 6.0 | 4 |
| 21 | 101308093 | Rohan Kaushal | 4.0 | 3 |
| 22 | 101308094 | Sagar Singla | 5.5 | 3 |
| 23 | 101308096 | Sahil Sharma | 5.5 | 3 |
| 24 | 101308097 | Samdeep Singh Sabharwal | 1.0 | 1 |
| 25 | 101308098 | Sameer Bhalla | 6.0 | 4 |
| 26 | 101308099 | Sartaj Singh | 2.0 | 1 |
| 27 | 101308101 | Shikhar Gaur | 5.5 | 3 |
| 28 | 101308102 | Shreyas Bhayana | 2.5 | 2 |
| 29 | 101308103 | Shubham | 2.0 | 1 |
| 30 | 101308104 | Shubham Bhama | 2.0 | 1 |
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 2.0 | 1 |
| 33 | 101308108 | Siddharth Ghiya | 10.0 | 5 |
| 34 | 101308109 | Siddharth Gupta | 5.5 | 3 |

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-----------------------------|----------------|----------------------|
| 35 | 101308110 | Siddharth Vasu | 2.0 | 1 |
| 36 | 101308111 | Sidhant | 2.0 | 1 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 0.0 | 1 |
| 38 | 101308113 | Sourav Singla | 10.0 | 5 |
| 39 | 101308114 | Tanjay Pathak | 2.0 | 1 |
| 40 | 101308115 | Tanuj Lamba | 4.5 | 3 |
| 41 | 101308116 | Utsav Mudgal | 2.0 | 1 |
| 42 | 101308117 | Vaibhav Pratap Singh Pundir | 2.0 | 1 |
| 43 | 101308118 | Varmmeet Singh Gulati | 1.5 | 1 |
| 44 | 101308119 | Varun Atri | 5.0 | 3 |
| 45 | 101308120 | Vedant Mansotra | 4.5 | 3 |
| 46 | 101308121 | Vikrant Nanda | 1.0 | 1 |
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 5.0 | 3 |
| 49 | 101308124 | Vivek Pundir | 2.0 | 1 |
| 50 | 101308125 | Yashwardhan Sharma | 1.5 | 1 |
| 51 | 101488008 | Ishan | 1.0 | 1 |
| 52 | 101488012 | Mohit Goyal | 5.0 | 3 |
| 53 | 101488013 | Navjot Rihal | 0.0 | 1 |
| 54 | 101488014 | Nikhil Gupta | 5.0 | 3 |
| 55 | 101488015 | Sankit | 3.5 | 3 |
| 56 | 101488016 | Sarang Vashisht | 2.0 | 1 |
| 57 | 101488017 | Varun Bansal | 6.0 | 4 |
| 58 | 101488018 | Vishnu Kalra | 6.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table B4.4: Average score of student performance in the course UME702for criteria A1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 3.6 | 17.9 | 32.1 | 5.4 | 41.1 | 2.38 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria B1 as given below in Table B4.5:

Table B4.5: Weighted average student class performance (course portfolio) for criteria B1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 0 | 69.86 | 26 | 0 | 0 | 3.57 | 4 |
| UME702 | 3.6 | 17.9 | 32.1 | 5.4 | 41.1 | 2.38 | 5 |
| Weighted average score | 2.00 | 40.99 | 29.39 | 3.00 | 22.83 | 2.91 | 9 |

b) Indirect measures for Performance criteria B1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table B4.6: Weighted average student course survey for criteria B1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 8.87 | 51.45 | 36.34 | 3.67 | 0 | 3.67 | 4 |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| Weighted average score | 24.88 | 47.38 | 25.85 | 2.38 | 0.00 | 3.96 | 9 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table B4.7: Assessment for criteria B1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.70 | 29.03 | 25.80 | 6.45 | 0 | 4.00 |
| Alumni survey | 29.62 | 62.96 | 7.40 | 0 | 0 | 4.22 |
| Employer Survey | 66.66 | 25 | 8.33 | 0 | 0 | 4.58 |

c) Overall weighted average score of performance criterion 'B1'

Finally overall weighted average score of performance criterion 'B1' is evaluated as given below in Table B4.8:

Table B4.8: Overall weighted average score of performance criterion 'B1'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|------|-------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 2.00 | 40.99 | 29.39 | 3.00 | 22.83 | 2.91 | 5 |
| Weighted average student course survey | 24.88 | 47.38 | 25.85 | 2.38 | 0.00 | 3.96 | 4 |
| Graduating student survey | 38.70 | 29.03 | 25.80 | 6.45 | 0.00 | 4 | 3 |
| Alumni survey | 29.62 | 62.96 | 7.40 | 0.00 | 0.00 | 4.22 | 3 |
| Employer survey | 66.66 | 25 | 8.33 | 0.00 | 0.00 | 4.58 | 3 |
| Overall weighted score | 28.58 | 41.41 | 20.83 | 2.44 | 6.34 | 3.82 | 18 |

Assessment of Outcome 'B' using performance criterion B2

Performance criteria 'B2': Use appropriate equipment and techniques for data collection

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Manufacturing Technology (UME509) and Computer Aided Manufacturing (UME702) were used to assess performance criteria B2 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Manufacturing Technology (UME509)

The above performance criteria is used to measure the attainment of outcome 'B2' by giving the following question (During Lab in July-Dec2016, weightage 5 marks) to the students.

Question 2: To machine the desired work piece using lathe to create desired specimen using turning operations only. (Tool used: Vernier Calliper, micrometer, outside caliper and scale)

Student's performance in the above question is given below:

Table B4.9: Student's performance in question targeting 'B2'; course: UME509

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 1 | 101408001 | 4 | 4 |
| 2 | 101408002 | 3.5 | 4 |
| 3 | 101408003 | 4 | 4 |
| 4 | 101408004 | 4 | 4 |
| 5 | 101408005 | 4 | 4 |
| 6 | 101408006 | 3.5 | 4 |
| 7 | 101408007 | 4 | 4 |
| 8 | 101408008 | 0 | 0 |
| 9 | 101408009 | 4 | 4 |
| 10 | 101408010 | 0 | 0 |
| 11 | 101408011 | 3.5 | 4 |
| 12 | 101408012 | 4 | 4 |
| 13 | 101408013 | 3.5 | 4 |
| 14 | 101408014 | 3 | 3 |
| 15 | 101408015 | 4 | 4 |
| 16 | 101408016 | 4 | 4 |
| 17 | 101408017 | 3.5 | 4 |
| 18 | 101408019 | 4 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 19 | 101408020 | 4 | 4 |
| 20 | 101408022 | 3.5 | 4 |
| 21 | 101408023 | 4 | 4 |
| 22 | 101408024 | 4 | 4 |
| 23 | 101408025 | 3.5 | 4 |
| 24 | 101408026 | 3.5 | 4 |
| 25 | 101408028 | 4 | 4 |
| 26 | 101408029 | 4 | 4 |
| 27 | 101408030 | 4 | 4 |
| 28 | 101408031 | 4 | 4 |
| 29 | 101408032 | 0 | 0 |
| 30 | 101408033 | 4 | 4 |
| 31 | 101408034 | 4 | 4 |
| 32 | 101408035 | 4 | 4 |
| 33 | 101408036 | 3.5 | 4 |
| 34 | 101408037 | 3.5 | 4 |
| 35 | 101408038 | 3.5 | 4 |
| 36 | 101408039 | 3.5 | 4 |
| 37 | 101408040 | 3.5 | 4 |
| 38 | 101408041 | 0 | 0 |
| 39 | 101408042 | 3.5 | 4 |
| 40 | 101408043 | 4 | 4 |
| 41 | 101408044 | 3.5 | 4 |
| 42 | 101408045 | 4 | 4 |
| 43 | 101408047 | 3.5 | 4 |
| 44 | 101408048 | 4 | 4 |
| 45 | 101408049 | 3.5 | 4 |
| 46 | 101408050 | 4 | 4 |
| 47 | 101408051 | 3.5 | 4 |
| 48 | 101408052 | 4 | 4 |
| 49 | 101408055 | 3.5 | 4 |
| 50 | 101408056 | 4 | 4 |
| 51 | 101408057 | 3.5 | 4 |
| 52 | 101408058 | 4 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 53 | 101408059 | 4 | 4 |
| 54 | 101408060 | 4 | 4 |
| 55 | 101408120 | 4 | 4 |
| 56 | 101408121 | 4 | 4 |
| 57 | 101408122 | 4 | 4 |
| 58 | 101408123 | 4 | 4 |
| 59 | 101408124 | 0 | 0 |
| 60 | 101408125 | 3.5 | 4 |
| 61 | 101408126 | 4 | 4 |
| 62 | 101408127 | 3.5 | 4 |
| 63 | 101408128 | 3.5 | 4 |
| 64 | 101408129 | 4 | 4 |
| 65 | 101588001 | 4 | 4 |
| 66 | 101588005 | 4 | 4 |
| 67 | 101588006 | 4 | 4 |
| 68 | 101588010 | 4 | 4 |
| 69 | 101588011 | 0 | 0 |
| 70 | 101588012 | 3.5 | 4 |
| 71 | 101588013 | 4 | 4 |
| 72 | 101588015 | 3.5 | 4 |
| 73 | 101208059 | 3.5 | 4 |

The overall performance of students in the above question is then summarized as given below

Table B4.10: Average score of student performance in the course UME509 for criteria B2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME509 | 0 | 90.41 | 1 | 0 | 0 | 3.65 |

(ii) **Course:** Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome 'B2' by giving the following question (Question No. 7: during ESE in December 2016, weightage 14 marks) to the students.

Question:

7(a) Discuss the following used for quality control: (8)

- (i) Scanning laser beam device
- (ii) Noncontact nonoptical technologies.

(b) Discuss the different functions that are accomplished by the computer in CIMS. (6)

Student's performance in the above question is given below:

Table B4.11: Student's performance in question targeting 'B2'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 14) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | Ankit Sehgal | 5.0 | 2 |
| 2 | 101308033 | Ekansh Kumar Srivastava | 7.0 | 3 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | 9.0 | 4 |
| 4 | 101308067 | Ketan Chauhan | 4.5 | 2 |
| 5 | 101308069 | Kirat Singh Basur | 3.0 | 2 |
| 6 | 101308070 | Kshitij Sharma | 4.0 | 2 |
| 7 | 101308071 | Lokendra Kumar | 4.5 | 2 |
| 8 | 101308074 | Manik Saharan | 9.0 | 4 |
| 9 | 101308075 | Manish Pandoh | 12.0 | 5 |
| 10 | 101308077 | Manutkarsh Kirpal | 7.0 | 3 |
| 11 | 101308078 | Nidan Prakash | 8.0 | 4 |
| 12 | 101308079 | Nikhil Aggarwal | 7.5 | 3 |
| 13 | 101308080 | Nikhil Ganta | 5.5 | 3 |
| 14 | 101308082 | Paramjot Singh | 2.0 | 1 |
| 15 | 101308083 | Paras | 10.0 | 4 |
| 16 | 101308085 | Prabhman Vir | 0.0 | 1 |
| 17 | 101308088 | Pulkit Kapoor | 4.0 | 2 |
| 18 | 101308089 | Puneet Singh | 6.5 | 3 |
| 19 | 101308090 | Rajat Gupta | 4.0 | 2 |
| 20 | 101308091 | Ramnish Kumar | 10.5 | 4 |
| 21 | 101308093 | Rohan Kaushal | 10.0 | 4 |
| 22 | 101308094 | Sagar Singla | 7.5 | 3 |
| 23 | 101308096 | Sahil Sharma | 6.0 | 3 |
| 24 | 101308097 | Samdeep Singh Sabharwal | 8.5 | 4 |
| 25 | 101308098 | Sameer Bhalla | 6.0 | 3 |
| 26 | 101308099 | Sartaj Singh | 5.0 | 2 |
| 27 | 101308101 | Shikhar Gaur | 5.5 | 3 |

| S. No. | Roll No. | Name of student | Marks (MM: 14) | Score (Scale 1 to 5) |
|--------|-----------|-----------------------------|----------------|----------------------|
| 28 | 101308102 | Shreyas Bhayana | 9.5 | 4 |
| 29 | 101308103 | Shubham | 11.5 | 5 |
| 30 | 101308104 | Shubham Bhama | 1.0 | 1 |
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 5.5 | 3 |
| 33 | 101308108 | Siddharth Ghiya | 6.5 | 3 |
| 34 | 101308109 | Siddharth Gupta | 10.0 | 4 |
| 35 | 101308110 | Siddharth Vasu | 7.5 | 3 |
| 36 | 101308111 | Sidhant | 2.5 | 1 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 4.0 | 2 |
| 38 | 101308113 | Sourav Singla | 6.5 | 3 |
| 39 | 101308114 | Tanjay Pathak | 9.0 | 4 |
| 40 | 101308115 | Tanuj Lamba | 11.0 | 5 |
| 41 | 101308116 | Utsav Mudgal | 9.0 | 4 |
| 42 | 101308117 | Vaibhav Pratap Singh Pundir | 8.5 | 4 |
| 43 | 101308118 | Varmeet Singh Gulati | 0.0 | 1 |
| 44 | 101308119 | Varun Atri | 12.5 | 5 |
| 45 | 101308120 | Vedant Mansotra | 10.0 | 4 |
| 46 | 101308121 | Vikrant Nanda | 5.0 | 2 |
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 9.0 | 4 |
| 49 | 101308124 | Vivek Pundir | 7.0 | 3 |
| 50 | 101308125 | Yashwardhan Sharma | 5.5 | 3 |
| 51 | 101488008 | Ishan | 4.0 | 2 |
| 52 | 101488012 | Mohit Goyal | 8.5 | 4 |
| 53 | 101488013 | Navjot Rihal | 5.5 | 3 |
| 54 | 101488014 | Nikhil Gupta | 10.0 | 4 |
| 55 | 101488015 | Sankit | 2.0 | 1 |
| 56 | 101488016 | Sarang Vashisht | 8.0 | 4 |
| 57 | 101488017 | Varun Bansal | 6.0 | 3 |
| 58 | 101488018 | Vishnu Kalra | 6.5 | 3 |

The overall performance of students in the above question is then summarized as given below

Table B4.12: Average score of student performance in the course UME702for criteria B2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|-------|---|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 32.2 | 49.15 | 11.86 | 0 | 6.7 | 4 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria B2 as given below in Table B4.19:

Table B4.13: Weighted Average Student class performance (course portfolio) for criteria B2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 0 | 90.41 | 1 | 0 | 0 | 3.65 | 5 |
| UME702 | 32.2 | 49.15 | 11.86 | 0 | 6.7 | 4.00 | 5 |
| Weighted average score | 16.10 | 69.78 | 6.43 | 0.00 | 3.35 | 3.82 | 10 |

b.) Assessment Tool: Student Course Survey

Table B4.14: Average score of student course survey for criteria B2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 8.87 | 51.45 | 36.34 | 3.67 | 0 | 3.67 | 5 |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| Weighted average score | 23.28 | 47.79 | 26.90 | 2.51 | 0.00 | 3.93 | 10 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table B4.15: Assessment for criteria B2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 |
| Employer Survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 |

Finally overall weighted average score of performance criterion 'B2' is evaluated as given below in Table B4.16:

Table B4.16: Overall weighted average score of performance criterion 'B2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 16.10 | 69.78 | 6.43 | 0.00 | 3.35 | 3.82 | 5.00 |
| Weighted average student course survey | 23.28 | 47.79 | 26.90 | 2.51 | 0.00 | 3.93 | 4.00 |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 | 3.00 |
| Overall weighted score | 32.15 | 49.50 | 14.69 | 1.63 | 0.93 | 4.07 | 18.00 |

Assessment of Outcome 'B' using performance criterion B3

Performance criteria 'B3': Applying scientific and/or engineering principles towards solving engineering problems.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Manufacturing Technology (UME509) and Computer Aided Manufacturing (UME702) were used to assess performance criteria B1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Manufacturing Technology (UME509)

The above performance criteria is used to measure the attainment of outcome 'B3' by giving the following question (During Lab in July-Dec2016, weightage 5 marks) to the students.

Question 3: To determine the clay content for given sample of molding sand, determine grain finess number and moisture content of silica sand.

Student's performance in the above question is given below:

Table B4.17: Student's performance in question targeting 'B3'; course: UME509

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|---------------|----------------------|
| 1 | 101408001 | 3.5 | 4 |
| 2 | 101408002 | 4 | 4 |
| 3 | 101408003 | 3.5 | 4 |
| 4 | 101408004 | 3.5 | 4 |
| 5 | 101408005 | 3 | 3 |
| 6 | 101408006 | 3 | 3 |
| 7 | 101408007 | 3 | 3 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 8 | 101408008 | 0 | 0 |
| 9 | 101408009 | 3.5 | 4 |
| 10 | 101408010 | 0 | 0 |
| 11 | 101408011 | 3 | 3 |
| 12 | 101408012 | 3 | 3 |
| 13 | 101408013 | 0 | 0 |
| 14 | 101408014 | 3 | 3 |
| 15 | 101408015 | 3 | 3 |
| 16 | 101408016 | 2 | 2 |
| 17 | 101408017 | 3.5 | 4 |
| 18 | 101408019 | 4 | 4 |
| 19 | 101408020 | 3.5 | 4 |
| 20 | 101408022 | 3 | 3 |
| 21 | 101408023 | 4.5 | 5 |
| 22 | 101408024 | 0 | 0 |
| 23 | 101408025 | 3 | 3 |
| 24 | 101408026 | 3.5 | 4 |
| 25 | 101408028 | 2.5 | 3 |
| 26 | 101408029 | 4 | 4 |
| 27 | 101408030 | 3.5 | 4 |
| 28 | 101408031 | 3 | 3 |
| 29 | 101408032 | 2 | 2 |
| 30 | 101408033 | 3 | 3 |
| 31 | 101408034 | 3.5 | 4 |
| 32 | 101408035 | 3.5 | 4 |
| 33 | 101408036 | 3.5 | 4 |
| 34 | 101408037 | 3 | 3 |
| 35 | 101408038 | 3.5 | 4 |
| 36 | 101408039 | 3.5 | 4 |
| 37 | 101408040 | 3 | 3 |
| 38 | 101408041 | 3 | 3 |
| 39 | 101408042 | 3 | 3 |
| 40 | 101408043 | 4.5 | 5 |
| 41 | 101408044 | 4 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 42 | 101408045 | 3 | 3 |
| 43 | 101408047 | 3 | 3 |
| 44 | 101408048 | 3.5 | 4 |
| 45 | 101408049 | 3.5 | 4 |
| 46 | 101408050 | 3 | 3 |
| 47 | 101408051 | 2.5 | 3 |
| 48 | 101408052 | 3.5 | 4 |
| 49 | 101408055 | 3 | 3 |
| 50 | 101408056 | 3.5 | 4 |
| 51 | 101408057 | 0 | 0 |
| 52 | 101408058 | 3.5 | 4 |
| 53 | 101408059 | 4.5 | 5 |
| 54 | 101408060 | 4.5 | 5 |
| 55 | 101408120 | 3.5 | 4 |
| 56 | 101408121 | 3 | 3 |
| 57 | 101408122 | 3 | 3 |
| 58 | 101408123 | 4 | 4 |
| 59 | 101408124 | 3.5 | 4 |
| 60 | 101408125 | 3.5 | 4 |
| 61 | 101408126 | 3.5 | 4 |
| 62 | 101408127 | 3.5 | 4 |
| 63 | 101408128 | 3.5 | 4 |
| 64 | 101408129 | 3.5 | 4 |
| 65 | 101588001 | 4.5 | 5 |
| 66 | 101588005 | 3 | 3 |
| 67 | 101588006 | 3.5 | 4 |
| 68 | 101588010 | 4 | 4 |
| 69 | 101588011 | 3.5 | 4 |
| 70 | 101588012 | 3.5 | 4 |
| 71 | 101588013 | 4 | 4 |
| 72 | 101588015 | 4.5 | 5 |
| 73 | 101208059 | 4.5 | 5 |

The overall performance of students in the above question is then summarized as given below

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|-------|------|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME509 | 9.58 | 52.05 | 35.62 | 1.37 | 0 | 3.66 |

(II) Course: Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome ‘B3’ by giving the following question (Question No. 4: during ESE in December 2016, weightage 10 marks) to the students.

Question:

- 4(a) Suppose that we are presently at day 15 on the production schedule calendar for a company. (6)
 There are three jobs (shop order A, B and C) in the queue for a particular work center. The jobs arrived at the work center in the order A, then B, then C. The following table gives the parameters of the scheduling problem for each job. Sequence the jobs using the ‘least slack’ and ‘critical ratio’ priority rules.

| Job | Remaining process time (days) | Due date |
|-----|-------------------------------|----------|
| A | 5 | 25 |
| B | 16 | 34 |
| C | 7 | 24 |

- (b) Discuss the different functions of a shop floor control system in an industry. (4)

Student’s performance in the above question is given below:

Table B4.18: Student’s performance in question targeting ‘B3’; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | Ankit Sehgal | 6.0 | 4 |
| 2 | 101308033 | Ekansh Kumar Srivastava | 4.5 | 3 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | 1.5 | 1 |
| 4 | 101308067 | Ketan Chauhan | 7.5 | 5 |
| 5 | 101308069 | Kirat Singh Basur | 0.5 | 1 |
| 6 | 101308070 | Kshitij Sharma | 4.5 | 3 |
| 7 | 101308071 | Lokendra Kumar | 3.5 | 2 |
| 8 | 101308074 | Manik Saharan | 6.0 | 4 |
| 9 | 101308075 | Manish Pandoh | 6.5 | 4 |
| 10 | 101308077 | Manutkarsh Kirpal | 5.5 | 3 |
| 11 | 101308078 | Nidan Prakash | 8.5 | 5 |
| 12 | 101308079 | Nikhil Aggarwal | 10.0 | 5 |

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-----------------------------|-------------------|-------------------------|
| 13 | 101308080 | Nikhil Ganta | 6.5 | 4 |
| 14 | 101308082 | Paramjot Singh | 6.0 | 4 |
| 15 | 101308083 | Paras | 8.5 | 5 |
| 16 | 101308085 | Prabhman Vir | 1.0 | 1 |
| 17 | 101308088 | Pulkit Kapoor | 7.5 | 5 |
| 18 | 101308089 | Puneet Singh | 4.0 | 2 |
| 19 | 101308090 | Rajat Gupta | 1.0 | 1 |
| 20 | 101308091 | Ramnish Kumar | 10.0 | 5 |
| 21 | 101308093 | Rohan Kaushal | 2.0 | 1 |
| 22 | 101308094 | Sagar Singla | 9.0 | 5 |
| 23 | 101308096 | Sahil Sharma | 4.5 | 3 |
| 24 | 101308097 | Samdeep Singh Sabharwal | 2.5 | 2 |
| 25 | 101308098 | Sameer Bhalla | 1.0 | 1 |
| 26 | 101308099 | Sartaj Singh | 5.5 | 3 |
| 27 | 101308101 | Shikhar Gaur | 7.5 | 5 |
| 28 | 101308102 | Shreyas Bhayana | 7.5 | 5 |
| 29 | 101308103 | Shubham | 8.5 | 5 |
| 30 | 101308104 | Shubham Bhama | 8.0 | 5 |
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 3.0 | 2 |
| 33 | 101308108 | Siddharth Ghiya | 5.0 | 3 |
| 34 | 101308109 | Siddharth Gupta | 10.0 | 5 |
| 35 | 101308110 | Siddharth Vasu | 7.0 | 4 |
| 36 | 101308111 | Sidhant | 8.0 | 5 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 9.5 | 5 |
| 38 | 101308113 | Sourav Singla | 9.5 | 5 |
| 39 | 101308114 | Tanjay Pathak | 8.0 | 5 |
| 40 | 101308115 | Tanuj Lamba | 5.5 | 3 |
| 41 | 101308116 | Utsav Mudgal | 8.0 | 5 |
| 42 | 101308117 | Vaibhav Pratap Singh Pundir | 6.0 | 4 |
| 43 | 101308118 | Varmeet Singh Gulati | 3.0 | 2 |
| 44 | 101308119 | Varun Atri | 9.0 | 5 |
| 45 | 101308120 | Vedant Mansotra | 3.0 | 2 |
| 46 | 101308121 | Vikrant Nanda | 2.0 | 1 |

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|--------------------|----------------|----------------------|
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 2.0 | 1 |
| 49 | 101308124 | Vivek Pundir | 2.0 | 1 |
| 50 | 101308125 | Yashwardhan Sharma | 3.0 | 2 |
| 51 | 101488008 | Ishan | 9.0 | 5 |
| 52 | 101488012 | Mohit Goyal | 7.5 | 5 |
| 53 | 101488013 | Navjot Rihal | -1.0 | 0 |
| 54 | 101488014 | Nikhil Gupta | 10.0 | 5 |
| 55 | 101488015 | Sankit | 6.0 | 4 |
| 56 | 101488016 | Sarang Vashisht | 0.0 | 1 |
| 57 | 101488017 | Varun Bansal | 7.0 | 4 |
| 58 | 101488018 | Vishnu Kalra | 10.0 | 5 |

The overall performance of students in the above question is then summarized as given below

Table B4.19: Average score of student performance in the course UME702 for criteria B3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 40 | 16.4 | 12.7 | 12.7 | 18.2 | 3.47 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria B3 as given below in Table B4.20:

Table B4.20: Weighted Average Student class performance (course portfolio) for criteria B3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 9.58 | 52.05 | 35.62 | 1.37 | 0 | 3.66 | 5 |
| UME702 | 40 | 16.4 | 12.7 | 12.7 | 18.2 | 3.47 | 5 |
| Weighted average score | 24.79 | 34.23 | 24.16 | 7.04 | 9.10 | 3.57 | 10 |

b.) Assessment Tool: Student Course Survey

Table B4.21: Average score of student course survey for criteria B3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 8.87 | 51.45 | 36.34 | 3.67 | 0 | 3.67 | 5 |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| Weighted average score | 23.28 | 47.79 | 26.90 | 2.51 | 0.00 | 3.93 | 10 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table B4.22: Assessment for criteria B3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 |
| Employer Survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 |

Finally overall weighted average score of performance criterion ‘B3’ is evaluated as given below in Table B4.23:

Table B4.23: Overall weighted average score of performance criterion ‘B3’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|-------|-------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 24.79 | 34.23 | 24.16 | 7.04 | 9.10 | 3.57 | 5.00 |
| Weighted average student course survey | 23.28 | 47.79 | 26.90 | 2.51 | 0.00 | 3.93 | 4.00 |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 | 3.00 |
| Overall weighted score | 34.56 | 39.63 | 19.61 | 3.59 | 2.53 | 4.00 | 18.00 |

Assessment of Outcome 'B' using performance criterion B4

Performance criteria 'B4' : Applying statistical methods in analyzing data.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Manufacturing Technology (UME509) and Computer Aided Manufacturing (UME702) were used to assess performance criteria B1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Manufacturing Technology (UME509)

The above performance criteria is used to measure the attainment of outcome 'B4' by giving the following question (During Lab in July-Dec2016, weightage 5 marks) to the students.

Question4: Prepare sand casting of the following specimen with Aluminum as Work piece: Directional solidification to be considered and also considered air cooling.

Student's performance in the above question is given below:

Table B4.24: Student's performance in question targeting 'B4'; course: UME509

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|---------------|----------------------|
| 1 | 101408001 | 4 | 4 |
| 2 | 101408002 | 4 | 4 |
| 3 | 101408003 | 3.5 | 4 |
| 4 | 101408004 | 4 | 4 |
| 5 | 101408005 | 4.5 | 5 |
| 6 | 101408006 | 3 | 3 |
| 7 | 101408007 | 3 | 3 |
| 8 | 101408008 | 3.5 | 4 |
| 9 | 101408009 | 3 | 3 |
| 10 | 101408010 | 0 | 0 |
| 11 | 101408011 | 4 | 4 |
| 12 | 101408012 | 4.5 | 5 |
| 13 | 101408013 | 0 | 0 |
| 14 | 101408014 | 2 | 2 |
| 15 | 101408015 | 3.5 | 4 |
| 16 | 101408016 | 4.5 | 5 |
| 17 | 101408017 | 3 | 3 |
| 18 | 101408019 | 3.5 | 4 |
| 19 | 101408020 | 3.5 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|------------------|-------------------------|
| 20 | 101408022 | 4 | 4 |
| 21 | 101408023 | 3.5 | 4 |
| 22 | 101408024 | 4 | 4 |
| 23 | 101408025 | 4 | 4 |
| 24 | 101408026 | 4.5 | 5 |
| 25 | 101408028 | 4 | 4 |
| 26 | 101408029 | 3.5 | 4 |
| 27 | 101408030 | 3.5 | 4 |
| 28 | 101408031 | 4 | 4 |
| 29 | 101408032 | 4 | 4 |
| 30 | 101408033 | 4 | 4 |
| 31 | 101408034 | 4 | 4 |
| 32 | 101408035 | 4.5 | 5 |
| 33 | 101408036 | 4 | 4 |
| 34 | 101408037 | 4 | 4 |
| 35 | 101408038 | 4.5 | 5 |
| 36 | 101408039 | 0 | 0 |
| 37 | 101408040 | 0 | 0 |
| 38 | 101408041 | 4.5 | 5 |
| 39 | 101408042 | 4.5 | 5 |
| 40 | 101408043 | 4.5 | 5 |
| 41 | 101408044 | 3 | 3 |
| 42 | 101408045 | 4.5 | 5 |
| 43 | 101408047 | 3 | 3 |
| 44 | 101408048 | 4.5 | 5 |
| 45 | 101408049 | 4.5 | 5 |
| 46 | 101408050 | 4 | 4 |
| 47 | 101408051 | 4.5 | 5 |
| 48 | 101408052 | 4 | 4 |
| 49 | 101408055 | 4 | 4 |
| 50 | 101408056 | 3 | 3 |
| 51 | 101408057 | 3 | 3 |
| 52 | 101408058 | 3.5 | 4 |
| 53 | 101408059 | 4 | 4 |

| S. No. | Roll No. | Marks (MM: 5) | Score (Scale 1 to 5) |
|--------|-----------|---------------|----------------------|
| 54 | 101408060 | 3.5 | 4 |
| 55 | 101408120 | 4 | 4 |
| 56 | 101408121 | 3.5 | 4 |
| 57 | 101408122 | 4 | 4 |
| 58 | 101408123 | 3.5 | 4 |
| 59 | 101408124 | 2 | 2 |
| 60 | 101408125 | 4 | 4 |
| 61 | 101408126 | 4.5 | 5 |
| 62 | 101408127 | 4 | 4 |
| 63 | 101408128 | 3.5 | 4 |
| 64 | 101408129 | 3 | 3 |
| 65 | 101588001 | 4 | 4 |
| 66 | 101588005 | 2 | 2 |
| 67 | 101588006 | 3 | 3 |
| 68 | 101588010 | 4.5 | 5 |
| 69 | 101588011 | 4 | 4 |
| 70 | 101588012 | 4 | 4 |
| 71 | 101588013 | 3.5 | 4 |
| 72 | 101588015 | 4 | 4 |
| 73 | 101208059 | 3.5 | 4 |

The overall performance of students in the above question is then summarized as given below

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|-------|------|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME509 | 19.17 | 56.16 | 15.06 | 4.11 | 0 | 3.74 |

(II) Course: Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome 'B4' by giving the following question (Question No. 6: during ESE in December 2016, weightage 16 marks) to the students.

Question:

- 6(a) Differentiate between the following: (12)
- Miniload and Man-on-board type of AS/RS system.
 - AS/RS system and carousel storage system.
 - Bar codes and RFID type of AIDC technologies.

(b) Discuss the different types of linear bar codes available for product identification. (4)

Student's performance in the above question is given below:

Table B4.25: Student's performance in question targeting 'B4'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 16) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | Ankit Sehgal | 0.0 | 1 |
| 2 | 101308033 | Ekansh Kumar Srivastava | 9.5 | 3 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | 12.0 | 4 |
| 4 | 101308067 | Ketan Chauhan | 2.0 | 1 |
| 5 | 101308069 | Kirat Singh Basur | 12.5 | 4 |
| 6 | 101308070 | Kshitij Sharma | 7.0 | 3 |
| 7 | 101308071 | Lokendra Kumar | 0.0 | 1 |
| 8 | 101308074 | Manik Saharan | 0.0 | 1 |
| 9 | 101308075 | Manish Pandoh | -1.0 | 0 |
| 10 | 101308077 | Manutkarsh Kirpal | 4.0 | 2 |
| 11 | 101308078 | Nidan Prakash | 7.5 | 3 |
| 12 | 101308079 | Nikhil Aggarwal | 9.0 | 3 |
| 13 | 101308080 | Nikhil Ganta | 4.0 | 2 |
| 14 | 101308082 | Paramjot Singh | 6.5 | 3 |
| 15 | 101308083 | Paras | 15.0 | 5 |
| 16 | 101308085 | Prabhman Vir | 8.5 | 3 |
| 17 | 101308088 | Pulkit Kapoor | 12.0 | 4 |
| 18 | 101308089 | Puneet Singh | 10.5 | 4 |
| 19 | 101308090 | Rajat Gupta | 10.5 | 4 |
| 20 | 101308091 | Ramnish Kumar | 15.0 | 5 |
| 21 | 101308093 | Rohan Kaushal | 15.5 | 5 |
| 22 | 101308094 | Sagar Singla | 14.0 | 5 |
| 23 | 101308096 | Sahil Sharma | 10.5 | 4 |
| 24 | 101308097 | Samdeep Singh Sabharwal | 14.5 | 5 |
| 25 | 101308098 | Sameer Bhalla | 13.0 | 4 |
| 26 | 101308099 | Sartaj Singh | 6.0 | 2 |
| 27 | 101308101 | Shikhar Gaur | 12.5 | 4 |
| 28 | 101308102 | Shreyas Bhayana | 15.0 | 5 |
| 29 | 101308103 | Shubham | 14.5 | 5 |
| 30 | 101308104 | Shubham Bhama | 5.0 | 2 |

| S. No. | Roll No. | Name of student | Marks (MM: 16) | Score (Scale 1 to 5) |
|--------|-----------|-----------------------------|----------------|----------------------|
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 10.0 | 3 |
| 33 | 101308108 | Siddharth Ghiya | 7.5 | 3 |
| 34 | 101308109 | Siddharth Gupta | 15.0 | 5 |
| 35 | 101308110 | Siddharth Vasu | 15.0 | 5 |
| 36 | 101308111 | Sidhant | 15.0 | 5 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 11.5 | 4 |
| 38 | 101308113 | Sourav Singla | 13.5 | 5 |
| 39 | 101308114 | Tanjay Pathak | 12.5 | 4 |
| 40 | 101308115 | Tanuj Lamba | 6.5 | 3 |
| 41 | 101308116 | Utsav Mudgal | 9.5 | 3 |
| 42 | 101308117 | Vaibhav Pratap Singh Pundir | 10.0 | 3 |
| 43 | 101308118 | Varmeet Singh Gulati | 0.0 | 1 |
| 44 | 101308119 | Varun Atri | 6.5 | 3 |
| 45 | 101308120 | Vedant Mansotra | 10.0 | 3 |
| 46 | 101308121 | Vikrant Nanda | -1.0 | 0 |
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 13.0 | 4 |
| 49 | 101308124 | Vivek Pundir | 14.5 | 5 |
| 50 | 101308125 | Yashwardhan Sharma | 14.0 | 5 |
| 51 | 101488008 | Ishan | 12.0 | 4 |
| 52 | 101488012 | Mohit Goyal | 13.5 | 5 |
| 53 | 101488013 | Navjot Rihal | 12.0 | 4 |
| 54 | 101488014 | Nikhil Gupta | 12.0 | 4 |
| 55 | 101488015 | Sankit | 14.0 | 5 |
| 56 | 101488016 | Sarang Vashisht | 10.0 | 3 |
| 57 | 101488017 | Varun Bansal | 3.0 | 2 |
| 58 | 101488018 | Vishnu Kalra | 11.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table B4.26: Average score of student performance in the course UME702 for criteria B4

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 27.8 | 27.8 | 25.9 | 9.3 | 9.3 | 3.56 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria B4 as given below in Table B4.27:

Table B4.27: Weighted Average Student class performance (course portfolio) for criteria B4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 19.17 | 56.16 | 15.06 | 4.11 | 0 | 3.74 | 4 |
| UME702 | 27.8 | 27.8 | 25.9 | 9.3 | 9.3 | 3.56 | 5 |
| Weighted average score | 23.96 | 40.40 | 21.08 | 6.99 | 5.17 | 3.64 | 9 |

b.) Assessment Tool: Student Course Survey

Table B4.28: Average score of student course survey for criteria B4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME509 | 8.87 | 51.45 | 36.34 | 3.67 | 0 | 3.67 | 4 |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| Weighted average score | 24.88 | 47.38 | 25.85 | 2.38 | 0.00 | 3.96 | 9 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table B4.29.: Assessment for criteria B4 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 |
| Employer Survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 |

Finally overall weighted average score of performance criterion 'B4' is evaluated as given below in Table B4.30:

Table B4.30: Overall weighted average score of performance criterion 'B4'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 23.96 | 40.40 | 21.08 | 6.99 | 5.17 | 3.64 | 5.00 |
| Weighted average student course survey | 24.88 | 47.38 | 25.85 | 2.38 | 0.00 | 3.96 | 4.00 |
| Graduating student survey | 38.71 | 29.03 | 25.81 | 6.45 | 0.00 | 4.00 | 3.00 |
| Alumni survey | 29.63 | 62.96 | 7.41 | 0.00 | 0.00 | 4.22 | 3.00 |
| Employer survey | 66.67 | 25.00 | 8.33 | 0.00 | 0.00 | 4.58 | 3.00 |
| Overall weighted score | 34.69 | 41.25 | 18.52 | 3.55 | 1.44 | 4.03 | 18.00 |

Overall assessment of program outcome B using scores of B1, B2, B3 and B4

In the above sections, each of the individual performance criteria B1, B2, B3 and B4 have been assessed. The performance for attainment of outcome B has been completed using the attainment values for B1, B2, B3 and B4 and is provided below:

Table B4.31 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome B.

Table B4.31: Overall score for outcome B at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| B1 | 28.58 | 41.41 | 20.83 | 2.44 | 6.34 | 3.82 | 4 |
| B2 | 32.15 | 49.50 | 14.69 | 1.63 | 0.93 | 4.07 | 5 |
| B3 | 34.56 | 39.63 | 19.61 | 3.59 | 2.53 | 4.00 | 5 |
| B4 | 34.69 | 41.25 | 18.52 | 3.55 | 1.44 | 4.03 | 4 |
| Overall score | 32.59 | 43.13 | 18.27 | 2.78 | 2.47 | 3.99 | 18 |

Track Record and assessment of attainment of program outcome ‘B’ over the last three academic years

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

The following table B4.42 presents the performance criteria-wise assessment score distribution for outcome ‘B’

Table B4.32: Performance criteria-wise assessment score distribution of outcome B

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| B | B1 | 4.07 | 3.83 | 3.82 |
| | B2 | 4.26 | 3.93 | 4.07 |
| | B3 | 4.32 | 3.92 | 4.00 |
| | B4 | 3.62 | 3.90 | 4.03 |

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

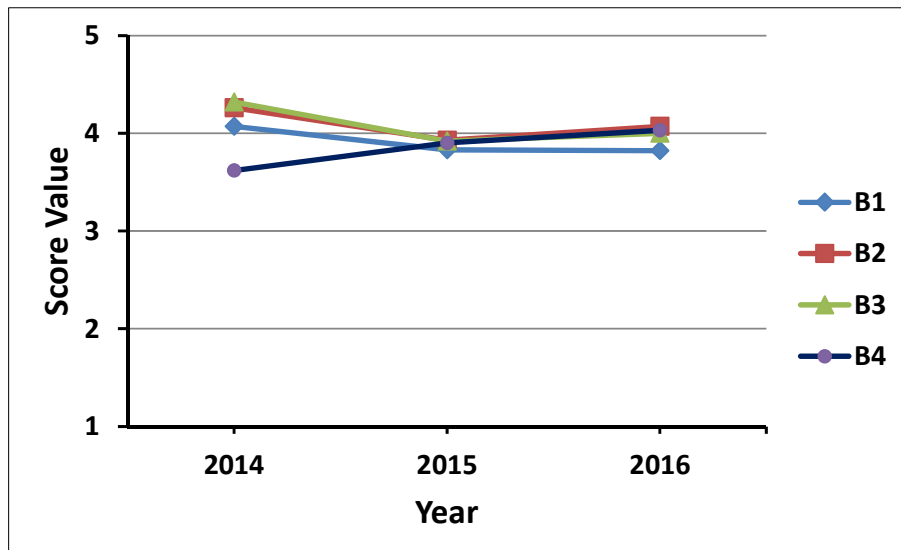


Figure B4.1: Performance criteria-wise assessment score distribution of outcome B

Level of attainment of program outcome ‘B’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table B4.43 presents the overall weighted score of outcome ‘B’ over the last three academic years

Table B4.33: Overall weighted score of outcome ‘B’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.11 | good |
| 2015 | 3.90 | good |
| 2016 | 3.99 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘B’ over a period of last three years.

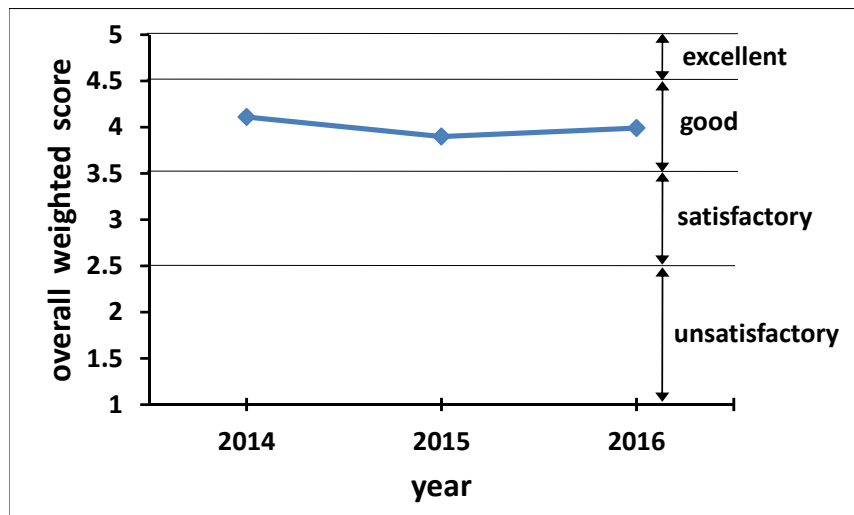


Figure B4.2: Overall weighted score of outcome ‘B’ over a period of last three years

The following actions have been taken based on the analysis of Outcome B

| Weighted Score for Outcome B | Recommendation | Reason | Implemented from |
|------------------------------|---|---|------------------|
| 3.90 | <ul style="list-style-type: none"> • Addition of laboratory component in the subject of Mechatronics | Students are able to conduct experiments on mechatronics based equipment. | July, 2014 |

**Assessment of Attainment of Program Outcome
'C'
(Year 2016)**

for the

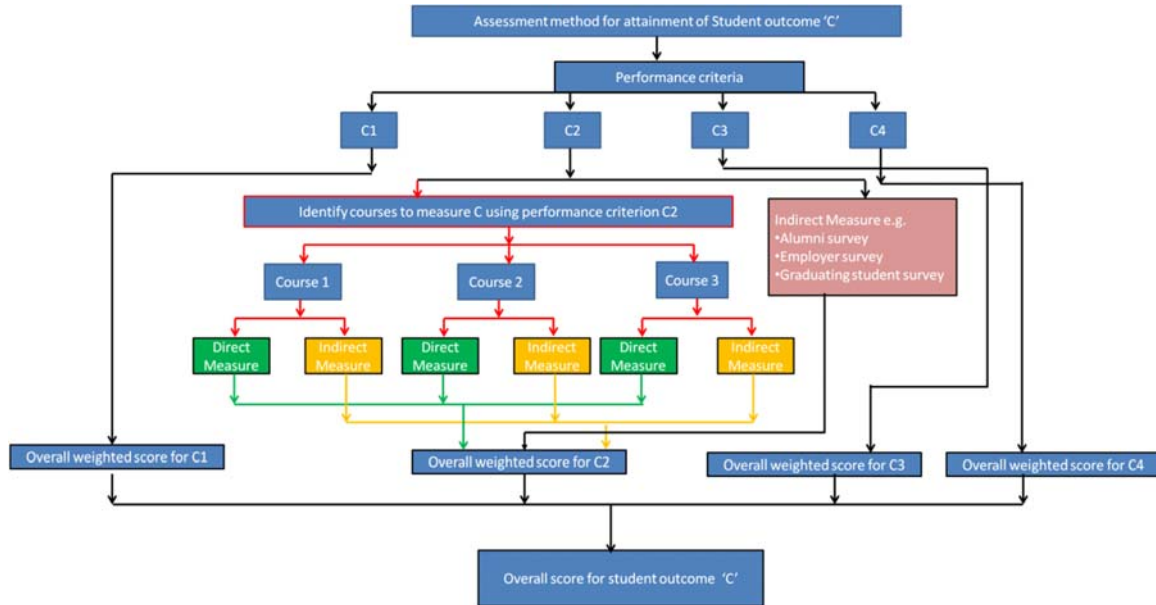
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome C

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following course has been considered for the assessment of program outcome 'C'

Courses:

1. Machine Design (UME508)

Outcome C has been assessed by three performance criteria C1, C2, and C3. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these three performance criteria has been used to measure the overall measure of outcome C.

1) Assessment of Outcome 'C' using performance criterion C1

Performance criteria 'C1': Analyzes needs to produce problem definition for thermal and mechanical systems.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: The course namely Machine Design (UME508) was used to assess performance criteria C1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Machine Design (UME508)

The above performance criterion is used to measure the attainment of outcome 'C' by giving the design assignment to the students.

**Design Assignment: UME508 MACHINE DESIGN
Mechanical Engineering Department
THAPAR UNIVERSITY, PATIALA**

Submission Due date: 10th November 2016

Note:

- Use the specific standard system, such as IS, etc while selecting materials and generating drawings.
- If the assignments are found to be copied, all the students involved will be given a high penalty, irrespective of the quality of the assignment.
- Four (max) students create a group and work as a team on a design assignment.

Each design assignment should contain the following:

1. A cover page containing the name & roll no., course name and code
2. All the relevant calculations, material selections, analyses and design thoughts.
3. Attach data, tables, figures, charts, etc from standard design/data book and add a "Reference" section at the end of the assignment listing all the referred books, articles, etc.
4. Include CAD modelling, design optimization, dimensional drawing, etc.
5. Write about the group member's individual contribution

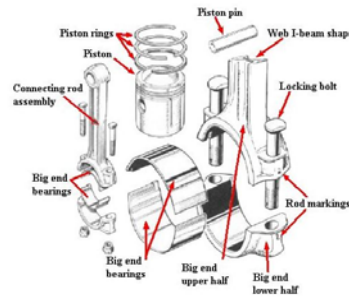
Problem 1: You are asked to design the transmission shafts used in a speed reducer system. Identify such an application used around you. As a designer you are asked to extract the relevant information from the existing system and prepare the shaft layout. Formulate the problem by specifying the materials and service conditions, locations and nature of the shaft mountings, torque that has to be transmitted, speed ranges, etc. Calculate the bending and torsional moment, bearing reactions and complete the design of the shaft(s) considering all the sections specify the minimum acceptable diameter for the shafts based on safe stresses and/or deflection. Also, specify the tolerances on their dimensions.

Problem 2: Visit the central workshop or some automobile workshops nearby your Institute campus. Identify an application involving lifting of load and collect the information on load and height ranges. You are asked to design a screw jack which can serve the above purpose. Design should include the design of screw, nut, handle, cup and body. Also discuss, what design improvement has been brought into your design over the existing design.

Problem 3: Identify atleast two applications involving riveted or welded joint. For this purpose you are suggested to survey various installations around your campus. Take the essential feedback and collect necessary technical information. Formulate the design problem and calculate the design parameters.

Problem 4: Shown below is the blow up of an assembly of connecting rod. Two bolts are used to connect its upper half to the lower half. The rod is often subjected to fluctuating tensile stresses depending on the operating

conditions. The objective is to design the bolts by assuming a practical range of a periodic cyclic load for a 4 stroke engine application. Assume appropriate material, factor of safety, shape, size and reliability factors. If possible, optimize the proposed design of the bolts in terms of weight (or dimensions) by proposing alternate materials/shape characteristics.



Problem 5: A screw jack is used to raise and lower the load of x KN to a height of y meter. Design the individual components such as (i) Body (ii) Nut (iii) Screw (iv) Washer (v) Cup and (vi) Tommy bar.

Discuss in detail the suitable materials for individual components and force analysis. Discuss the application of design ergonomics to improve the operational maneuverability of this device that you can think of. If possible, try to optimize the design of the device in terms of weight (or dimensions) by proposing alternate shape attributes.

Problem 6: Take an example of a real world application of a mechanical system where flange coupling is used to connect two shafts. Provide an overview of the system and extract all the necessary technical inputs required for the design of the coupling. Design and produce CAD drawing of the coupling.

Student’s performance in the above question is given below:

Table C4.1: Student’s performance in question targeting ‘C1’; course: UME508

| S.No. | Roll no. | Name | Assignment Marks (7) | Score (1-5) |
|-------|-----------|-------------------------|----------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 3.5 | 3 |
| 2 | 101408002 | Aayush Khera | 6 | 5 |
| 3 | 101408003 | Abhishek Baruah | 4 | 3 |
| 4 | 101408004 | Abhishek Pandey | 4 | 3 |
| 5 | 101408005 | Abhishek Sharma | 4.5 | 4 |
| 6 | 101408006 | Abhishek Singh Nathawat | 4 | 3 |
| 7 | 101408007 | Abhishesh Aggarwal | 4 | 3 |
| 8 | 101408008 | Adit Goel | 0 | 1 |
| 9 | 101408009 | Aditya Shubham | 4 | 3 |
| 10 | 101408010 | Aerk Dimri | 4.5 | 4 |
| 11 | 101408011 | Ajitesh Bindal | 4.5 | 4 |
| 12 | 101408012 | Akhilesh Sharma | 4 | 3 |
| 13 | 101408013 | Akin | 4.5 | 4 |

Attainment of Outcome C

| | | | | |
|----|-----------|-------------------------|-----|---|
| 14 | 101408014 | Akshansh Jain | 4 | 3 |
| 15 | 101408015 | Akshay Bajaj | 6 | 5 |
| 16 | 101408016 | Aman Singla | 5 | 5 |
| 17 | 101408017 | Amar Raj Singh | 5 | 5 |
| 18 | 101408019 | Anand Vardhan | 5 | 5 |
| 19 | 101408020 | Anil Barwar | 4 | 3 |
| 20 | 101408021 | Ankit Kumar | 2.5 | 2 |
| 21 | 101408022 | Ankit Verma | 4.5 | 4 |
| 22 | 101408023 | Ankush Narula | 6 | 5 |
| 23 | 101408025 | Anurag Verma | 4 | 3 |
| 24 | 101408026 | Arjun Raina | 5.5 | 5 |
| 25 | 101408028 | Arpit Kandhari | 6 | 5 |
| 26 | 101408029 | Ashish Goyal | 6 | 5 |
| 27 | 101408030 | Ashok Ranwa | 4 | 3 |
| 28 | 101408031 | Ashwinder Singh | 5 | 5 |
| 29 | 101408032 | Atul | 4 | 3 |
| 30 | 101408033 | Avanshu Shrivastav | 5.5 | 5 |
| 31 | 101408034 | Ayush Pandey | 5.5 | 5 |
| 32 | 101408035 | Ayush Rai | 5 | 5 |
| 33 | 101408036 | Channdeeep | 5 | 5 |
| 34 | 101408037 | Chetan Katyal | 0 | 1 |
| 35 | 101408038 | Daksh Garg | 4.5 | 4 |
| 36 | 101408039 | Deepanshu Mohan | 2.5 | 2 |
| 37 | 101408041 | Dheerendra K. Chaudhary | 4 | 3 |
| 38 | 101408042 | Dhruv Sharma | 4.5 | 4 |
| 39 | 101408043 | Divyesh Gupta | 6 | 5 |
| 40 | 101408044 | Ekamjot Singh | 4 | 3 |
| 41 | 101408045 | Gaurav Gupta | 5 | 5 |
| 42 | 101408047 | Gurbaksh Singh | 4 | 3 |
| 43 | 101408048 | Gurneet Singh Aujla | 4.5 | 4 |
| 44 | 101408049 | Hardik Vashishtha | 4 | 3 |
| 45 | 101408050 | Harish Jala | 4.5 | 4 |
| 46 | 101408051 | Harjot Singh | 4 | 3 |
| 47 | 101408052 | Harmandeep Singh | 4 | 3 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 48 | 101408055 | Harnoor Singh | 4 | 3 |
| 49 | 101408056 | Harpreet Singh | 4 | 3 |
| 50 | 101408057 | Himalaya Nath Chinoriya | 4.5 | 4 |
| 51 | 101408058 | Himanshu Raj | 4.5 | 4 |
| 52 | 101408059 | Ishaan Mangla | 4.5 | 4 |
| 53 | 101408060 | Ishjot Singh Jaggi | 4.5 | 4 |
| 54 | 101408120 | Shivendra Kumar | 4 | 3 |
| 55 | 101408121 | Shlok Chanduka | 4 | 3 |
| 56 | 101408122 | Shubham Gupta | 5 | 5 |
| 57 | 101408123 | Shubham Saxena | 4.5 | 4 |
| 58 | 101408124 | Shubham Sharma | 4.5 | 4 |
| 59 | 101408125 | Sidharth Hinger | 4.5 | 4 |
| 60 | 101408126 | Simranpreet Singh | 4.5 | 4 |
| 61 | 101408127 | Sunpreet Kochhar | 5.5 | 5 |
| 62 | 101408128 | Tanmay Mathur | 5.5 | 5 |
| 63 | 101408129 | Tanvir Sidhu | 4.5 | 4 |
| 64 | 101588001 | Arpanjot Singh | 6 | 5 |
| 65 | 101588005 | Harshit Kashyap | 5 | 5 |
| 66 | 101588006 | Jashandeep Singh | 6 | 5 |
| 67 | 101588010 | Rachit Joshi | 5 | 5 |
| 68 | 101588011 | Rajinder Singh Sidhu | 4 | 3 |
| 69 | 101588012 | Rajit Devgan | 4.5 | 4 |
| 70 | 101588013 | Shubham Sharma | 6 | 5 |
| 71 | 101588015 | Tejinder Singh | 5.5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table C4.2: Average score of student performance in the course UME508 for criteria C1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 35.2 | 26.8 | 32.4 | 2.8 | 2.8 | 3.89 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria C1 as given below in Table C4.3:

Table C4.3: Weighted Average Student class performance (course portfolio) for criteria C1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 35.2 | 26.8 | 32.4 | 2.8 | 2.8 | 3.89 | 5 |
| Weighted average score | 35.20 | 26.80 | 32.40 | 2.80 | 2.80 | 3.89 | 5 |

b) Indirect measures for Performance criteria C1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table C4.4: Average score of student course survey for criteria C1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 53.11 | 38.54 | 8.35 | 0 | 0 | 4.45 | 5 |
| Weighted average score | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 5 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table C4.5: Assessment for criteria C1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 |
| Employer Survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 |

c) Overall weighted average score of performance criterion ‘C1’

Finally overall weighted average score of performance criterion ‘C1’ is evaluated as given below in Table C4.6:

Table C4.6: Overall weighted average score of performance criterion ‘C1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|--------------|--------------|-------------|-------------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 35.20 | 26.80 | 32.40 | 2.80 | 2.80 | 3.89 | 5.00 |
| Weighted average student course survey | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 4.00 |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 | 3.00 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 | 3.00 |
| Employer survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 | 3.00 |
| Overall weighted score | 38.84 | 38.98 | 19.55 | 1.85 | 0.78 | 4.13 | 18 |

Assessment of Outcome ‘C’ using performance criterion C2

Performance criteria ‘C2’: Carries out design process to satisfy project requirement for thermal and mechanical systems.

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: The course namely Machine Design (UME508) was used to assess performance criteria C1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Machine Design (UME508)

The above performance criteria is used to measure the attainment of outcome ‘C’ by giving the following question (Question: ESE Q2) to the students.

Question: A household is required to transmit 25 kW at 500 rpm from an electric motor to a water pump. Design a bushed pin type flexible coupling for connecting the electric motor to the water pump. (15)

Student’s performance in the above question is given below:

Table C4.7: Student’s performance in question targeting ‘C2’; course: UME508

| S.No. | Roll no. | Name | ESE Q2 MARKS (15) | Score (1-5) |
|-------|-----------|-----------------|-------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 2.5 | 2 |
| 2 | 101408002 | Aayush Khera | 13.5 | 5 |
| 3 | 101408003 | Abhishek Baruah | 1 | 1 |
| 4 | 101408004 | Abhishek Pandey | 6 | 3 |
| 5 | 101408005 | Abhishek Sharma | 8.5 | 4 |

Attainment of Outcome C

| | | | | |
|----|-----------|-------------------------|------|---|
| 6 | 101408006 | Abhishek Singh Nathawat | 9 | 4 |
| 7 | 101408007 | Abhishesh Aggarwal | 1 | 1 |
| 8 | 101408008 | Adit Goel | -1 | 0 |
| 9 | 101408009 | Aditya Shubham | 10 | 5 |
| 10 | 101408010 | Aerk Dimri | -1 | 0 |
| 11 | 101408011 | Ajitesh Bindal | 6 | 3 |
| 12 | 101408012 | Akhilesh Sharma | 8 | 4 |
| 13 | 101408013 | Akin | 0 | 1 |
| 14 | 101408014 | Akshansh Jain | 9 | 4 |
| 15 | 101408015 | Akshay Bajaj | 0 | 1 |
| 16 | 101408016 | Aman Singla | 1 | 1 |
| 17 | 101408017 | Amar Raj Singh | 8.5 | 4 |
| 18 | 101408019 | Anand Vardhan | 15 | 5 |
| 19 | 101408020 | Anil Barwar | 11 | 5 |
| 20 | 101408021 | Ankit Kumar | -1 | 0 |
| 21 | 101408022 | Ankit Verma | 0 | 1 |
| 22 | 101408023 | Ankush Narula | 13 | 5 |
| 23 | 101408024 | Anurag Kumar | -1 | 0 |
| 24 | 101408025 | Anurag Verma | 11.5 | 5 |
| 25 | 101408026 | Arjun Raina | -1 | 0 |
| 26 | 101408028 | Arpit Kandhari | 9 | 4 |
| 27 | 101408029 | Ashish Goyal | 12 | 5 |
| 28 | 101408030 | Ashok Ranwa | 7.5 | 4 |
| 29 | 101408031 | Ashwinder Singh | 13.5 | 5 |
| 30 | 101408032 | Atul | 2 | 1 |
| 31 | 101408033 | Avanshu Shrivastav | 9 | 4 |
| 32 | 101408034 | Ayush Pandey | 12.5 | 5 |
| 33 | 101408035 | Ayush Rai | 3.5 | 2 |
| 34 | 101408036 | Channdeeep | 7 | 4 |
| 35 | 101408037 | Chetan Katyal | 13.5 | 5 |
| 36 | 101408038 | Daksh Garg | 1 | 1 |
| 37 | 101408039 | Deepanshu Mohan | -1 | 0 |
| 38 | 101408040 | Devjot Singh Sewak | -1 | 0 |
| 39 | 101408041 | Dheerendra K. | 11.5 | 5 |

| | | Chaudhary | | |
|----|-----------|----------------------------|------|---|
| 40 | 101408042 | Dhruv Sharma | 0 | 1 |
| 41 | 101408043 | Divyesh Gupta | 13 | 5 |
| 42 | 101408044 | Ekamjot Singh | 5.5 | 3 |
| 43 | 101408045 | Gaurav Gupta | 11.5 | 5 |
| 44 | 101408046 | Gurasees Singh | -1 | 0 |
| 45 | 101408047 | Gurbaksh Singh | 5 | 3 |
| 46 | 101408048 | Gurneet Singh Aujla | 3 | 2 |
| 47 | 101408049 | Hardik Vashishtha | 0 | 1 |
| 48 | 101408050 | Harish Jala | 1 | 1 |
| 49 | 101408051 | Harjot Singh | -1 | 0 |
| 50 | 101408052 | Harmandeep Singh | 1 | 1 |
| 51 | 101408055 | Harnoor Singh | 1 | 1 |
| 52 | 101408056 | Harpreet Singh | 6.5 | 4 |
| 53 | 101408057 | Himalaya Nath Chinoriya | 0 | 1 |
| 54 | 101408058 | Himanshu Raj | 11.5 | 5 |
| 55 | 101408059 | Ishaan Mangla | 9 | 4 |
| 56 | 101408060 | Ishjot Singh Jaggi | 3 | 2 |
| 57 | 101408120 | Shivendra Kumar | 8.5 | 4 |
| 58 | 101408121 | Shlok Chanduka | 11 | 5 |
| 59 | 101408122 | Shubham Gupta | 15 | 5 |
| 60 | 101408123 | Shubham Saxena | 11 | 5 |
| 61 | 101408124 | Shubham Sharma | 14 | 5 |
| 62 | 101408125 | Sidharth Hinger | 0 | 1 |
| 63 | 101408126 | Simranpreet Singh | 0 | 1 |
| 64 | 101408127 | Sunpreet Kochhar | 10 | 5 |
| 65 | 101408128 | Tanmay Mathur | 5.5 | 3 |
| 66 | 101408129 | Tanvir Sidhu | 6.5 | 4 |
| 67 | 101588001 | Arpanjot Singh | 10 | 5 |
| 68 | 101588005 | Harshit Kashyap | 9 | 4 |
| 69 | 101588006 | Jashandeep Singh | 15 | 5 |
| 70 | 101588010 | Rachit Joshi | 12 | 5 |
| 71 | 101588011 | Rajinder Singh Sidhu | 2.5 | 2 |
| 72 | 101588012 | Rajit Devgan | -1 | 0 |

| | | | | |
|----|-----------|----------------|----|---|
| 73 | 101588013 | Shubham Sharma | 15 | 5 |
| 74 | 101588015 | Tejinder Singh | 12 | 5 |

The overall performance of students in the above question is then summarized as given below

Table C4.8: Average score of student performance in the course UME508 for criteria C2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|-----|----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 37.5 | 21.9 | 7.8 | 7.8 | 25 | 3.39 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria C2 as given below in Table C4.21:

Table C4.9: Weighted Average Student class performance (course portfolio) for criteria C2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 37.5 | 21.9 | 7.8 | 7.8 | 25 | 3.39 | 5 |
| Weighted average score | 37.50 | 21.90 | 7.80 | 7.80 | 25.00 | 3.39 | 5 |

b) Indirect measures for Performance criteria C2 (Surveys)

i.) Assessment Tool: Student Course Survey

Table C4.10: Average score of student course survey for criteria C2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 53.11 | 38.54 | 8.35 | 0 | 0 | 4.45 | 5 |
| Weighted average score | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 5 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table C4.11: Assessment for criteria C2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 |
| Employer Survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 |

c) Overall weighted average score of performance criterion 'C2'

Finally overall weighted average score of performance criterion 'C2' is evaluated as given below in Table C4.12:

Table C4.12: Overall weighted average score of performance criterion 'C2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------|-------|------|-------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 37.50 | 21.90 | 7.80 | 7.80 | 25.00 | 3.39 | 5.00 |
| Weighted average student course survey | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 4.00 |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 | 3.00 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 | 3.00 |
| Employer survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 | 3.00 |
| Overall weighted score | 39.48 | 37.62 | 12.71 | 3.24 | 6.94 | 3.99 | 18 |

Assessment of Outcome 'C' using performance criterion C3

Performance criteria 'C3': Can work within realistic constraints in realizing systems.

Step 1: The course namely Machine Design (UME508) was used to assess performance criteria C1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Machine Design (UME508)

The above performance criterion is used to measure the attainment of outcome 'C' by giving the design assignment to the students. The design assignment is given in 'C1' criteria.

Student's performance in the above question is given below:

Table C4.13: Student's performance in question targeting 'C3'; course: UME508

| S.No. | Roll no. | Name | Assignment Marks (7) | Score (1-5) |
|-------|-----------|-------------------------|----------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 3.5 | 3 |
| 2 | 101408002 | Aayush Khera | 6 | 5 |
| 3 | 101408003 | Abhishek Baruah | 4 | 3 |
| 4 | 101408004 | Abhishek Pandey | 4 | 3 |
| 5 | 101408005 | Abhishek Sharma | 4.5 | 4 |
| 6 | 101408006 | Abhishek Singh Nathawat | 4 | 3 |
| 7 | 101408007 | Abhishesh Aggarwal | 4 | 3 |
| 8 | 101408008 | Adit Goel | 0 | 1 |
| 9 | 101408009 | Aditya Shubham | 4 | 3 |
| 10 | 101408010 | Aerk Dimri | 4.5 | 4 |
| 11 | 101408011 | Ajitesh Bindal | 4.5 | 4 |

Attainment of Outcome C

| | | | | |
|----|-----------|-------------------------|-----|---|
| 12 | 101408012 | Akhilesh Sharma | 4 | 3 |
| 13 | 101408013 | Akin | 4.5 | 4 |
| 14 | 101408014 | Akshansh Jain | 4 | 3 |
| 15 | 101408015 | Akshay Bajaj | 6 | 5 |
| 16 | 101408016 | Aman Singla | 5 | 5 |
| 17 | 101408017 | Amar Raj Singh | 5 | 5 |
| 18 | 101408019 | Anand Vardhan | 5 | 5 |
| 19 | 101408020 | Anil Barwar | 4 | 3 |
| 20 | 101408021 | Ankit Kumar | 2.5 | 2 |
| 21 | 101408022 | Ankit Verma | 4.5 | 4 |
| 22 | 101408023 | Ankush Narula | 6 | 5 |
| 23 | 101408025 | Anurag Verma | 4 | 3 |
| 24 | 101408026 | Arjun Raina | 5.5 | 5 |
| 25 | 101408028 | Arpit Kandhari | 6 | 5 |
| 26 | 101408029 | Ashish Goyal | 6 | 5 |
| 27 | 101408030 | Ashok Ranwa | 4 | 3 |
| 28 | 101408031 | Ashwinder Singh | 5 | 5 |
| 29 | 101408032 | Atul | 4 | 3 |
| 30 | 101408033 | Avanshu Shrivastav | 5.5 | 5 |
| 31 | 101408034 | Ayush Pandey | 5.5 | 5 |
| 32 | 101408035 | Ayush Rai | 5 | 5 |
| 33 | 101408036 | Channdeeep | 5 | 5 |
| 34 | 101408037 | Chetan Katyal | 0 | 1 |
| 35 | 101408038 | Daksh Garg | 4.5 | 4 |
| 36 | 101408039 | Deepanshu Mohan | 2.5 | 2 |
| 37 | 101408041 | Dheerendra K. Chaudhary | 4 | 3 |
| 38 | 101408042 | Dhruv Sharma | 4.5 | 4 |
| 39 | 101408043 | Divyesh Gupta | 6 | 5 |
| 40 | 101408044 | Ekamjot Singh | 4 | 3 |
| 41 | 101408045 | Gaurav Gupta | 5 | 5 |
| 42 | 101408047 | Gurbaksh Singh | 4 | 3 |
| 43 | 101408048 | Gurneet Singh Aujla | 4.5 | 4 |
| 44 | 101408049 | Hardik Vashishtha | 4 | 3 |
| 45 | 101408050 | Harish Jala | 4.5 | 4 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 46 | 101408051 | Harjot Singh | 4 | 3 |
| 47 | 101408052 | Harmandeep Singh | 4 | 3 |
| 48 | 101408055 | Harnoor Singh | 4 | 3 |
| 49 | 101408056 | Harpreet Singh | 4 | 3 |
| 50 | 101408057 | Himalaya Nath Chinoriya | 4.5 | 4 |
| 51 | 101408058 | Himanshu Raj | 4.5 | 4 |
| 52 | 101408059 | Ishaan Mangla | 4.5 | 4 |
| 53 | 101408060 | Ishjot Singh Jaggi | 4.5 | 4 |
| 54 | 101408120 | Shivendra Kumar | 4 | 3 |
| 55 | 101408121 | Shlok Chanduka | 4 | 3 |
| 56 | 101408122 | Shubham Gupta | 5 | 5 |
| 57 | 101408123 | Shubham Saxena | 4.5 | 4 |
| 58 | 101408124 | Shubham Sharma | 4.5 | 4 |
| 59 | 101408125 | Sidharth Hinger | 4.5 | 4 |
| 60 | 101408126 | Simranpreet Singh | 4.5 | 4 |
| 61 | 101408127 | Sunpreet Kochhar | 5.5 | 5 |
| 62 | 101408128 | Tanmay Mathur | 5.5 | 5 |
| 63 | 101408129 | Tanvir Sidhu | 4.5 | 4 |
| 64 | 101588001 | Arpanjot Singh | 6 | 5 |
| 65 | 101588005 | Harshit Kashyap | 5 | 5 |
| 66 | 101588006 | Jashandeep Singh | 6 | 5 |
| 67 | 101588010 | Rachit Joshi | 5 | 5 |
| 68 | 101588011 | Rajinder Singh Sidhu | 4 | 3 |
| 69 | 101588012 | Rajit Devgan | 4.5 | 4 |
| 70 | 101588013 | Shubham Sharma | 6 | 5 |
| 71 | 101588015 | Tejinder Singh | 5.5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table C4.14: Average score of student performance in the course UME508 for criteria C3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 35.2 | 26.8 | 32.4 | 2.8 | 2.8 | 3.89 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria C3 as given below in Table C4.31:

Table C4.15: Weighted Average Student class performance (course portfolio) for criteria C3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 35.2 | 26.8 | 32.4 | 2.8 | 2.8 | 3.89 | 5 |
| Weighted average score | 35.20 | 26.80 | 32.40 | 2.80 | 2.80 | 3.89 | 5 |

b) Indirect measures for Performance criteria C3 (Surveys)

i.) Assessment Tool: Student Course Survey

Table C4.16: Average score of student course survey for criteria C3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 53.11 | 38.54 | 8.35 | 0 | 0 | 4.45 | 5 |
| Weighted average score | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 5 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table C4.17: Assessment for criteria C3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 |
| Employer Survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 |

c) Overall weighted average score of performance criterion ‘C3’

Finally overall weighted average score of performance criterion ‘C3’ is evaluated as given below in Table C4.18:

Table C4.18: Overall weighted average score of performance criterion ‘C3’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|-------|-------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 35.20 | 26.80 | 32.40 | 2.80 | 2.80 | 3.89 | 5.00 |
| Weighted average student course survey | 53.11 | 38.54 | 8.35 | 0.00 | 0.00 | 4.45 | 4.00 |
| Graduating student survey | 32.26 | 25.81 | 35.48 | 6.45 | 0.00 | 3.84 | 3.00 |
| Alumni survey | 29.63 | 59.26 | 11.11 | 0.00 | 0.00 | 4.19 | 3.00 |
| Employer survey | 41.67 | 52.78 | 5.56 | 0.00 | 0.00 | 4.36 | 3.00 |
| Overall weighted score | 38.84 | 38.98 | 19.55 | 1.85 | 0.78 | 4.13 | 18 |

Overall assessment of program outcome C using scores of C1, C2, and C3

In the above sections, each of the individual performance criteria C1, C2, and C3 have been assessed. The performance for attainment of outcome C has been completed using the attainment values for C1, C2, and C3 is provided below:

Table C4.19 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome C.

Table C4.19: Overall score for outcome C at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| C1 | 38.84 | 38.98 | 19.55 | 1.85 | 0.78 | 4.13 | 5 |
| C2 | 39.48 | 37.62 | 12.71 | 3.24 | 6.94 | 3.99 | 5 |
| C3 | 38.84 | 38.98 | 19.55 | 1.85 | 0.78 | 4.13 | 4 |
| Overall score | 39.07 | 38.50 | 17.11 | 2.35 | 2.26 | 4.08 | 14 |

Track Record and assessment of attainment of program outcome ‘C’ over the last three academic years

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

The following table C4.20 presents the performance criteria-wise assessment score distribution for outcome ‘C’

Table C4.20: Performance criteria-wise assessment score distribution of outcome C

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| C | C1 | 4 | 3.86 | 4.13 |
| | C2 | 4.05 | 3.85 | 3.99 |
| | C3 | 4.05 | 3.80 | 4.13 |
| | C4 | -- | 3.85 | 3.83 |

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

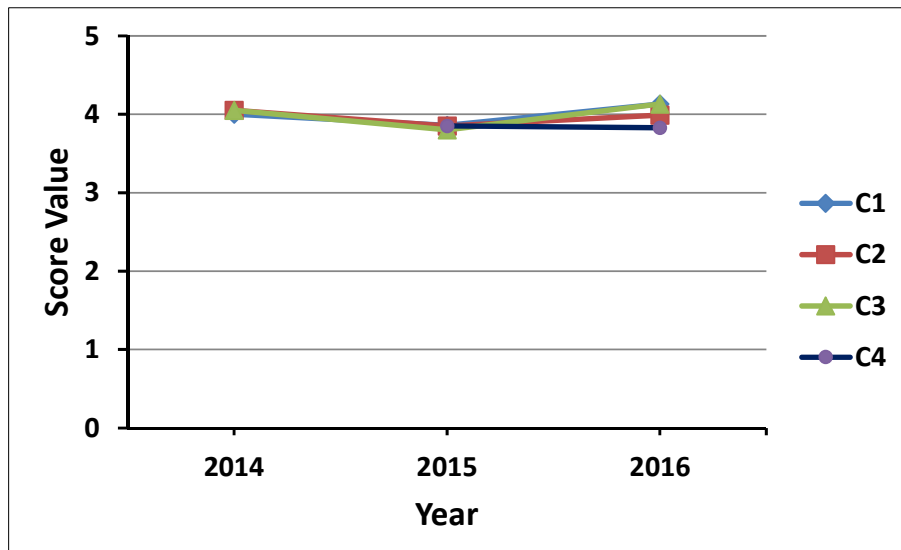


Figure C4.2: Performance criteria-wise assessment score distribution of outcome C

Level of attainment of program outcome ‘C’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table C4.21 presents the overall weighted score of outcome ‘C’ over the last three academic years.

Table C4.21: Overall weighted score of outcome ‘C’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.03 | good |
| 2015 | 3.84 | good |
| 2016 | 4.04 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘C’ over a period of last three years.

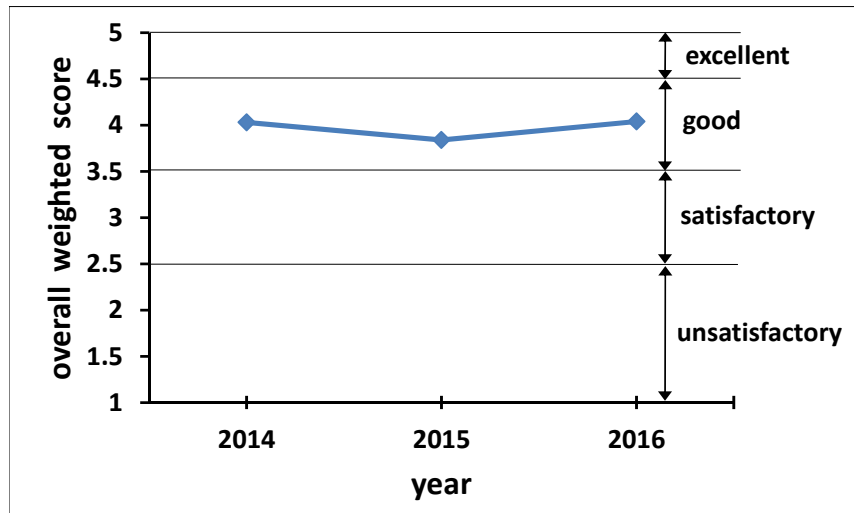


Figure C4.3: overall weighted score of outcome ‘C’ over a period of last three years

The following actions have been taken based on the analysis of Outcome C

| Weighted Score for Outcome C | Recommendation | Reason | Implemented from |
|------------------------------|---|---|-------------------------|
| 3.84 | <ul style="list-style-type: none"> • Addition of the subject, ‘Industrial Automation’ • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students can design a system, process to meet desired automation needs. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'D'
(Year 2016)**

for the

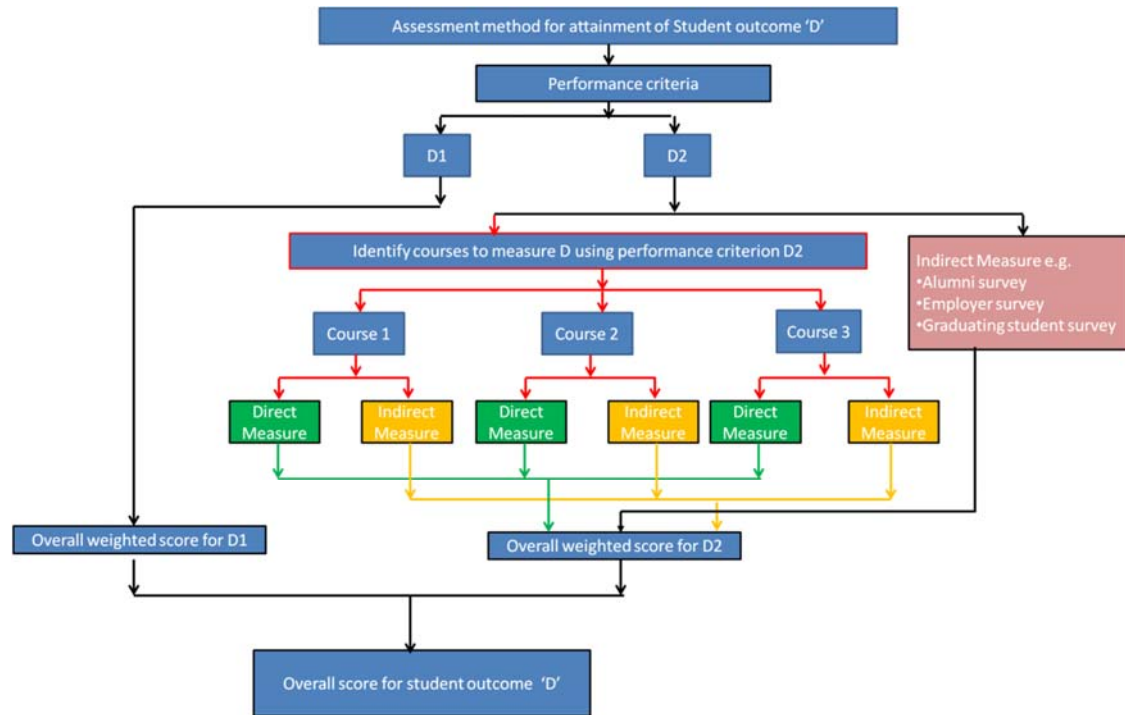
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome D

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'D'

Courses:

1. Mechanical System Design (UME 801)

Outcome D has been assessed by two performance criteria D1 and D2. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these two performance criteria has been used to measure the overall measure of outcome D.

1) Assessment of Outcome 'D' using performance criterion D1

Performance criteria 'D1': Shares responsibility and information schedule with others in team.

a.) Assessment Tool: Student's performance using course portfolio

Step I: One course namely 1. Mechanical System Design (UME 801) was used to assess performance criteria D1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Mechanical System Design (UME 801)

The above performance criteria is used to measure the attainment of outcome 'D1' by giving the following question (Question No.: First Evaluation, February 2016) to the students.

Question: First Evaluation: Product selection and approximate CAD modelling or sketches of product. Need analysis, function analysis and objective of the product. (10)

Student's performance in the above question is given below:

Table D4.1: Student's performance in question targeting 'D1'; course: UME801

| S.No. | Roll no. | Name | MARKS (10) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 8.0 | 5 |
| 2 | 101208002 | Aditya Anand | 6.0 | 3 |
| 3 | 101208003 | Ajaywinder Singh | 8.0 | 5 |
| 4 | 101208004 | AkankshVashistha | 8.0 | 5 |
| 5 | 101208005 | Akshay | 8.0 | 5 |
| 6 | 101208006 | AkshayKaura | 8.0 | 5 |
| 7 | 101208007 | AmanJamwal | 8.0 | 5 |
| 8 | 101208008 | Aman Sharma | 8.0 | 5 |
| 9 | 101208009 | AmanVerma | 8.0 | 5 |
| 10 | 101208010 | Amandeep Singh Aulakh | 6.0 | 3 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 7.0 | 4 |
| 12 | 101208012 | Amol | 6.0 | 3 |
| 13 | 101208013 | Amrinder Singh | 7.0 | 4 |
| 14 | 101208016 | AnkurWasdev | 7.0 | 4 |
| 15 | 101208017 | AnshumanHanda | 7.0 | 4 |
| 16 | 101208019 | Anuj Kumar | 7.0 | 4 |
| 17 | 101208020 | AnuragPanthey | 8.0 | 5 |
| 18 | 101208022 | Arshdeep Singh | 8.0 | 5 |
| 19 | 101208023 | Arvind | 8.0 | 5 |
| 20 | 101208024 | ArvindMahey | 9.0 | 5 |
| 21 | 101208025 | Ashish Tandon | 9.0 | 5 |
| 22 | 101208026 | AshutoshPalta | 7.0 | 4 |
| 23 | 101208027 | AtulBatish | 9.0 | 5 |
| 24 | 101208028 | Aviral Prasad | 7.0 | 4 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 25 | 101208029 | AyushUniyal | 7.0 | 4 |
| 26 | 101208030 | Bhanu Sharma | 7.0 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 8.0 | 5 |
| 28 | 101208032 | Charanjeet Singh | 8.0 | 5 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 7.0 | 4 |
| 30 | 101208034 | Chirag Jain | 7.0 | 4 |
| 31 | 101208035 | Debopam Das | 9.0 | 5 |
| 32 | 101208036 | Deepak Singh | 7.0 | 4 |
| 33 | 101208037 | G S Tushar | 7.0 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 9.0 | 5 |
| 35 | 101208039 | Gaurav Garg | 9.0 | 5 |
| 36 | 101208040 | Gaurav Goyal | 8.0 | 5 |
| 37 | 101208042 | Gaurav Kakkar | 7.0 | 4 |
| 38 | 101208044 | Guriqbal Singh | 7.5 | 4 |
| 39 | 101208045 | Gurleen Singh | 7.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 7.0 | 4 |
| 41 | 101208048 | Harish Garg | 8.0 | 5 |
| 42 | 101208049 | Harsh Raheja | 8.0 | 5 |
| 43 | 101208051 | HimanshuGambhir | 9.0 | 5 |
| 44 | 101208052 | Ishita Jain | 8.5 | 5 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 8.5 | 5 |
| 46 | 101208054 | Jatin Mittal | 7.5 | 4 |
| 47 | 101208055 | Jatin Singh | 9.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 7.5 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 7.5 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 7.0 | 4 |
| 51 | 101208060 | KapilChaand | 8.5 | 5 |
| 52 | 101208061 | Karan Mehra | 8.5 | 5 |
| 53 | 101208062 | Karanbir Singh Sandhar | 8.5 | 5 |
| 54 | 101208063 | KartikSingla | 8.0 | 5 |
| 55 | 101208064 | Kiranpreet Singh | 7.5 | 4 |
| 56 | 101208065 | KunalGarg | 7.0 | 4 |
| 57 | 101208066 | Kushagra | 6.0 | 3 |
| 58 | 101208068 | Manan Shah | 8.0 | 5 |
| 59 | 101208069 | ManavJuneja | 8.0 | 5 |
| 60 | 101208070 | Manjot Singh | 7.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 8.0 | 5 |
| 62 | 101208073 | Mrigank Gupta | 8.0 | 5 |
| 63 | 101208075 | Navraj Singh | 8.0 | 5 |
| 64 | 101208076 | Nikhil Sehdev | 7.0 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 6.0 | 3 |
| 66 | 101208078 | Nishant Bansal | 7.0 | 4 |
| 67 | 101208079 | NishantGoyal | 7.0 | 4 |
| 68 | 101208080 | NishantKabra | 6.0 | 3 |
| 69 | 101208081 | NiteeshDua | 9.0 | 5 |

| | | | | |
|-----|-----------|--------------------|-----|---|
| 70 | 101208082 | Nitin Mahajan | 8.0 | 5 |
| 71 | 101208083 | Nitish Gupta | 8.0 | 5 |
| 72 | 101208084 | Omang | 7.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 8.0 | 5 |
| 74 | 101208086 | Pranav Lakhina | 8.0 | 5 |
| 75 | 101208088 | Pulkit Gupta | 6.0 | 3 |
| 76 | 101208089 | Puneet Arora | 6.5 | 4 |
| 77 | 101208090 | PurushottamMeena | 6.5 | 4 |
| 78 | 101208091 | Rahul Agarwal | 7.0 | 4 |
| 79 | 101208092 | Rahul Goyal | 7.5 | 4 |
| 80 | 101208093 | RajatParmar | 7.0 | 4 |
| 81 | 101208094 | Rajat Sharma | 7.0 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 7.5 | 4 |
| 83 | 101208096 | Ravinder Singh | 7.5 | 4 |
| 84 | 101208097 | Ritvik Singh | 6.5 | 4 |
| 85 | 101208101 | Sagar Saini | 6.5 | 4 |
| 86 | 101208102 | Sahil Arora | 6.5 | 4 |
| 87 | 101208104 | SanchitSachdeva | 8.5 | 5 |
| 88 | 101208106 | SarthakMattas | 8.5 | 5 |
| 89 | 101208107 | Saurav Sharma | 8.5 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 8.5 | 5 |
| 91 | 101208110 | Shashank Jain | 7.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 8.5 | 5 |
| 93 | 101208112 | Shourya Singh | 7.0 | 4 |
| 94 | 101208113 | Shray Mehta | 7.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 8.5 | 5 |
| 96 | 101208115 | Shubham Bansal | 8.8 | 5 |
| 97 | 101208116 | Shubham Chaudhary | 8.4 | 5 |
| 98 | 101208117 | ShubhamSaha | 9.0 | 5 |
| 99 | 101208118 | ShubhamSen | 6.2 | 4 |
| 100 | 101208120 | Sugam Arora | 6.4 | 4 |
| 101 | 101208121 | Sukhdev Singh | 6.4 | 4 |
| 102 | 101208123 | Sunil Singh | 6.4 | 4 |
| 103 | 101208125 | Tanveer Mehta | 8.8 | 5 |
| 104 | 101208126 | Tejinder Pal Singh | 9.0 | 5 |
| 105 | 101208129 | UllasChugh | 9.0 | 5 |
| 106 | 101208131 | VarinderSingla | 9.0 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 8.5 | 5 |
| 108 | 101208133 | VinayGarg | 8.7 | 5 |
| 109 | 101208134 | VineshGarg | 8.8 | 5 |
| 110 | 101208136 | VivekGoyal | 8.5 | 5 |
| 111 | 101208138 | YashKhemka | 8.8 | 5 |
| 112 | 101208139 | Yuvraj Singh | 9.1 | 5 |
| 113 | 101208140 | JiveshBedi | 9.0 | 5 |
| 114 | 101208142 | Vasu Sharma | 8.0 | 5 |

| | | | | |
|-----|-----------|-----------------|-----|---|
| 115 | 101388001 | Amit Tripathi | 6.0 | 3 |
| 116 | 101388002 | AnkitSetia | 6.0 | 3 |
| 117 | 101388003 | Jaswant Singh | 7.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 9.0 | 5 |
| 119 | 101388005 | Rahul Sharma | 9.0 | 5 |
| 120 | 101388006 | Rahul Verma | 8.7 | 5 |
| 121 | 101388007 | Rahul Verma | 9.0 | 5 |
| 122 | 101388008 | Rajan | 8.8 | 5 |
| 123 | 101388009 | Ramandeep Singh | 7.5 | 4 |
| 124 | 101388010 | Shivam Bhatia | 7.5 | 4 |
| 125 | 101388011 | Sukhvir Singh | 7.5 | 4 |
| 126 | 101388012 | Sunil Kumar | 6.0 | 3 |

The overall performance of students in the above question is then summarized as given below

Table D4.2: Average score of student performance in the course UME801 for criteria D1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 52.4 | 39.7 | 7.9 | 0 | 0 | 4.44 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria D1 as given below in Table D4.3:

Table D4.3: Weighted Average Student class performance (course portfolio) for criteria D1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 52.4 | 39.7 | 7.9 | 0 | 0 | 4.45 | 4 |
| Weighted average score | 52.40 | 39.70 | 7.90 | 0.00 | 0.00 | 4.45 | 4 |

b) Indirect measures for Performance criteria D1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table D4.4: Average score of student course survey for criteria D1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|--------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 20.387 | 45.231 | 25.34 | 9.123 | 0 | 3.77 | 4 |
| Weighted average score | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table D4.5: Assessment for criteria D1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 51.85 | 44.44 | 3.70 | 0.00 | 0.00 | 4.48 |
| Employer Survey | 58.33 | 38.89 | 0.00 | 0.00 | 0.00 | 4.47 |

c) Overall weighted average score of performance criterion 'D1'

Finally overall weighted average score of performance criterion 'D1' is evaluated as given below in

Table D4.6:

Table D4.6: Overall weighted average score of performance criterion 'D1'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 52.4 | 39.7 | 7.9 | 0.0 | 0.0 | 4.4 | 5.0 |
| Weighted average student course survey | 20.4 | 45.2 | 25.3 | 9.1 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 61.3 | 35.5 | 3.2 | 0.0 | 0.0 | 4.6 | 3.0 |
| Alumni survey | 51.9 | 44.4 | 3.7 | 0.0 | 0.0 | 4.5 | 3.0 |
| Employer survey | 58.3 | 38.9 | 0.0 | 0.0 | 0.0 | 4.5 | 3.0 |
| Overall weighted score | 47.7 | 40.9 | 9.0 | 2.0 | 0.0 | 4.3 | 18.0 |

Assessment of Outcome 'D' using performance criterion D2

Performance criteria 'D2': Participates in the development and selection of ideas.

The above performance criteria is used to measure the attainment of outcome 'D' by giving the following question (From the First Evaluation of the course) to the students.

Question: First Evaluation: Product selection and approximate CAD modelling or sketches of product. Need analysis, function analysis and objective of the product. (10)

Student's performance in the above question is given below:

Table D4.7: Student's performance in question targeting 'D2'; course: UME801

| S.No. | Rollno. | Name | MARKS (10) | SCORE (1-5) |
|-------|-----------|------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 8.0 | 5 |
| 2 | 101208002 | Aditya Anand | 6.0 | 3 |
| 3 | 101208003 | Ajaywinder Singh | 8.0 | 5 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 4 | 101208004 | AkankshVashistha | 8.0 | 5 |
| 5 | 101208005 | Akshay | 8.0 | 5 |
| 6 | 101208006 | AkshayKaura | 8.0 | 5 |
| 7 | 101208007 | AmanJamwal | 8.0 | 5 |
| 8 | 101208008 | Aman Sharma | 8.0 | 5 |
| 9 | 101208009 | AmanVerma | 8.0 | 5 |
| 10 | 101208010 | Amandeep Singh Aulakh | 6.0 | 3 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 7.0 | 4 |
| 12 | 101208012 | Amol | 6.0 | 3 |
| 13 | 101208013 | Amrinder Singh | 7.0 | 4 |
| 14 | 101208016 | AnkurWasdev | 7.0 | 4 |
| 15 | 101208017 | AnshumanHanda | 7.0 | 4 |
| 16 | 101208019 | Anuj Kumar | 7.0 | 4 |
| 17 | 101208020 | AnuragPanthey | 8.0 | 5 |
| 18 | 101208022 | Arshdeep Singh | 8.0 | 5 |
| 19 | 101208023 | Arvind | 8.0 | 5 |
| 20 | 101208024 | ArvindMahey | 9.0 | 5 |
| 21 | 101208025 | Ashish Tandon | 9.0 | 5 |
| 22 | 101208026 | AshutoshPalta | 7.0 | 4 |
| 23 | 101208027 | AtulBatish | 9.0 | 5 |
| 24 | 101208028 | Aviral Prasad | 7.0 | 4 |
| 25 | 101208029 | AyushUniyal | 7.0 | 4 |
| 26 | 101208030 | Bhanu Sharma | 7.0 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 8.0 | 5 |
| 28 | 101208032 | Charanjeet Singh | 8.0 | 5 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 7.0 | 4 |
| 30 | 101208034 | Chirag Jain | 7.0 | 4 |
| 31 | 101208035 | Debopam Das | 9.0 | 5 |
| 32 | 101208036 | Deepak Singh | 7.0 | 4 |
| 33 | 101208037 | G S Tushar | 7.0 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 9.0 | 5 |
| 35 | 101208039 | Gaurav Garg | 9.0 | 5 |
| 36 | 101208040 | Gaurav Goyal | 8.0 | 5 |
| 37 | 101208042 | Gaurav Kakkar | 7.0 | 4 |
| 38 | 101208044 | Guriqbal Singh | 7.5 | 4 |
| 39 | 101208045 | Gurleen Singh | 7.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 7.0 | 4 |

| | | | | |
|----|-----------|------------------------|-----|---|
| 41 | 101208048 | Harish Garg | 8.0 | 5 |
| 42 | 101208049 | Harsh Raheja | 8.0 | 5 |
| 43 | 101208051 | HimanshuGambhir | 9.0 | 5 |
| 44 | 101208052 | Ishita Jain | 8.5 | 5 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 8.5 | 5 |
| 46 | 101208054 | Jatin Mittal | 7.5 | 4 |
| 47 | 101208055 | Jatin Singh | 9.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 7.5 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 7.5 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 7.0 | 4 |
| 51 | 101208060 | KapilChaand | 8.5 | 5 |
| 52 | 101208061 | Karan Mehra | 8.5 | 5 |
| 53 | 101208062 | Karanbir Singh Sandhar | 8.5 | 5 |
| 54 | 101208063 | KartikSingla | 8.0 | 5 |
| 55 | 101208064 | Kiranpreet Singh | 7.5 | 4 |
| 56 | 101208065 | KunalGarg | 7.0 | 4 |
| 57 | 101208066 | Kushagra | 6.0 | 3 |
| 58 | 101208068 | Manan Shah | 8.0 | 5 |
| 59 | 101208069 | ManavJuneja | 8.0 | 5 |
| 60 | 101208070 | Manjot Singh | 7.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 8.0 | 5 |
| 62 | 101208073 | Mrigank Gupta | 8.0 | 5 |
| 63 | 101208075 | Navraj Singh | 8.0 | 5 |
| 64 | 101208076 | Nikhil Sehdev | 7.0 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 6.0 | 3 |
| 66 | 101208078 | Nishant Bansal | 7.0 | 4 |
| 67 | 101208079 | NishantGoyal | 7.0 | 4 |
| 68 | 101208080 | NishantKabra | 6.0 | 3 |
| 69 | 101208081 | NiteeshDua | 9.0 | 5 |
| 70 | 101208082 | Nitin Mahajan | 8.0 | 5 |
| 71 | 101208083 | Nitish Gupta | 8.0 | 5 |
| 72 | 101208084 | Omang | 7.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 8.0 | 5 |
| 74 | 101208086 | Pranav Lakhina | 8.0 | 5 |
| 75 | 101208088 | Pulkit Gupta | 6.0 | 3 |
| 76 | 101208089 | Puneet Arora | 6.5 | 4 |
| 77 | 101208090 | PurushottamMeena | 6.5 | 4 |

| | | | | |
|-----|-----------|--------------------|-----|---|
| 78 | 101208091 | Rahul Agarwal | 7.0 | 4 |
| 79 | 101208092 | Rahul Goyal | 7.5 | 4 |
| 80 | 101208093 | RajatParmar | 7.0 | 4 |
| 81 | 101208094 | Rajat Sharma | 7.0 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 7.5 | 4 |
| 83 | 101208096 | Ravinder Singh | 7.5 | 4 |
| 84 | 101208097 | Ritvik Singh | 6.5 | 4 |
| 85 | 101208101 | Sagar Saini | 6.5 | 4 |
| 86 | 101208102 | Sahil Arora | 6.5 | 4 |
| 87 | 101208104 | SanchitSachdeva | 8.5 | 5 |
| 88 | 101208106 | SarthakMattas | 8.5 | 5 |
| 89 | 101208107 | Saurav Sharma | 8.5 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 8.5 | 5 |
| 91 | 101208110 | Shashank Jain | 7.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 8.5 | 5 |
| 93 | 101208112 | Shourya Singh | 7.0 | 4 |
| 94 | 101208113 | Shray Mehta | 7.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 8.5 | 5 |
| 96 | 101208115 | Shubham Bansal | 8.8 | 5 |
| 97 | 101208116 | Shubham Chaudhary | 8.4 | 5 |
| 98 | 101208117 | ShubhamSaha | 9.0 | 5 |
| 99 | 101208118 | ShubhamSen | 6.2 | 4 |
| 100 | 101208120 | Sugam Arora | 6.4 | 4 |
| 101 | 101208121 | Sukhdev Singh | 6.4 | 4 |
| 102 | 101208123 | Sunil Singh | 6.4 | 4 |
| 103 | 101208125 | Tanveer Mehta | 8.8 | 5 |
| 104 | 101208126 | Tejinder Pal Singh | 9.0 | 5 |
| 105 | 101208129 | UllasChugh | 9.0 | 5 |
| 106 | 101208131 | VarinderSingla | 9.0 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 8.5 | 5 |
| 108 | 101208133 | VinayGarg | 8.7 | 5 |
| 109 | 101208134 | VineshGarg | 8.8 | 5 |
| 110 | 101208136 | VivekGoyal | 8.5 | 5 |
| 111 | 101208138 | YashKhemka | 8.8 | 5 |
| 112 | 101208139 | Yuvraj Singh | 9.1 | 5 |
| 113 | 101208140 | JiveshBedi | 9.0 | 5 |
| 114 | 101208142 | Vasu Sharma | 8.0 | 5 |

| | | | | |
|-----|-----------|-----------------|-----|---|
| 115 | 101388001 | Amit Tripathi | 6.0 | 3 |
| 116 | 101388002 | AnkitSetia | 6.0 | 3 |
| 117 | 101388003 | Jaswant Singh | 7.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 9.0 | 5 |
| 119 | 101388005 | Rahul Sharma | 9.0 | 5 |
| 120 | 101388006 | Rahul Verma | 8.7 | 5 |
| 121 | 101388007 | Rahul Verma | 9.0 | 5 |
| 122 | 101388008 | Rajan | 8.8 | 5 |
| 123 | 101388009 | Ramandeep Singh | 7.5 | 4 |
| 124 | 101388010 | Shivam Bhatia | 7.5 | 4 |
| 125 | 101388011 | Sukhvir Singh | 7.5 | 4 |
| 126 | 101388012 | Sunil Kumar | 6.0 | 3 |

The overall performance of students in the above question is then summarized as given below

Table D4.8: Average score of student performance in the course UME801 for criteria D2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 52.4 | 39.7 | 7.9 | 0 | 0 | 4.44 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria D2 as given below in Table D4.9:

Table D4.9: Weighted Average Student class performance (course portfolio) for criteria D2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 52.4 | 39.7 | 7.9 | 0 | 0 | 4.45 | 4 |
| Weighted average score | 52.40 | 39.70 | 7.90 | 0.00 | 0.00 | 4.45 | 4 |

b) Indirect measures for Performance criteria D2 (Surveys)

i.) Assessment Tool: Student Course Survey

Table D4.10: Average score of student course survey for criteria D2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |
| Weighted average score | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table D4.11: Assessment for criteria D2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 51.85 | 44.44 | 3.70 | 0.00 | 0.00 | 4.48 |
| Employer Survey | 58.33 | 38.89 | 0.00 | 0.00 | 0.00 | 4.47 |

c) Overall weighted average score of performance criterion ‘D2’

Finally overall weighted average score of performance criterion ‘D2’ is evaluated as given below in Table D4.12:

Table D4.12: Overall weighted average score of performance criterion ‘D2’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 52.4 | 39.7 | 7.9 | 0.0 | 0.0 | 4.4 | 5.0 |
| Weighted average student course survey | 20.4 | 45.2 | 25.3 | 9.1 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 61.3 | 35.5 | 3.2 | 0.0 | 0.0 | 4.6 | 3.0 |
| Alumni survey | 51.9 | 44.4 | 3.7 | 0.0 | 0.0 | 4.5 | 3.0 |
| Employer survey | 58.3 | 38.9 | 0.0 | 0.0 | 0.0 | 4.5 | 3.0 |
| Overall weighted score | 47.7 | 40.9 | 9.0 | 2.0 | 0.0 | 4.3 | 18.0 |

Overall assessment of program outcome D using scores of D1 and D2

In the above sections, each of the individual performance criteria D1 and D2 have been assessed. The performance for attainment of outcome D has been completed using the attainment values for D1 and D2 and is provided below:

Table D4.13 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome D.

Table D4.13: Overall score for outcome D at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| D1 | 47.67 | 40.88 | 8.98 | 2.03 | 0.00 | 4.33 | 5 |
| D2 | 47.67 | 40.88 | 8.98 | 2.03 | 0.00 | 4.33 | 5 |
| Overall score | 47.67 | 40.88 | 8.98 | 2.03 | 0.00 | 4.33 | 10 |

Track Record and assessment of attainment of program outcome ‘D’ over the last three academic years

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

The following table D4.14 presents the performance criteria-wise assessment score distribution for outcome ‘D’

Table D4.14: Performance criteria-wise assessment score distribution of outcome D

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| D | D1 | 4.17 | 4.00 | 4.33 |
| | D2 | 4.14 | 4.00 | 4.33 |

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

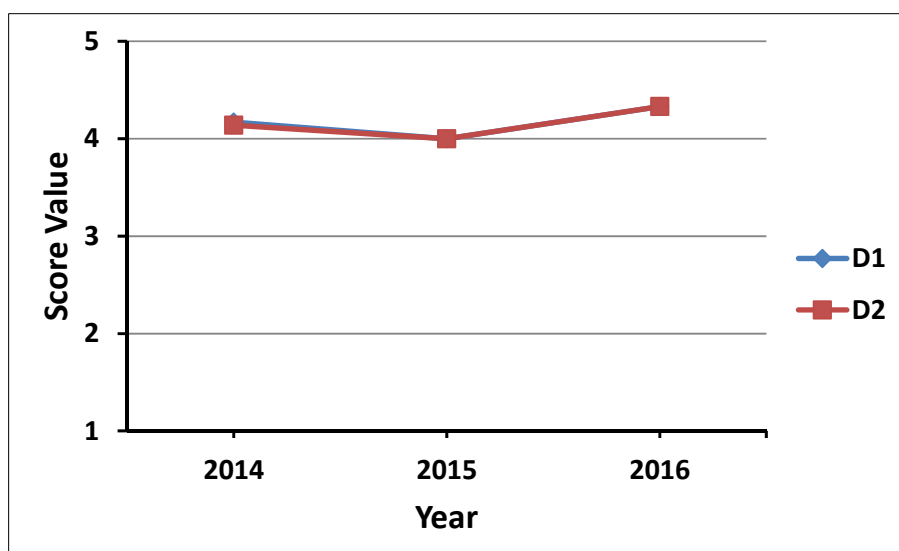


Figure D4.2: Performance criteria-wise assessment score distribution of outcome D

Level of attainment of program outcome ‘D’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table D4.15 presents the overall weighted score of outcome ‘D’ over the last three academic years.

Table D4.15: Overall weighted score of outcome ‘D’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.16 | good |
| 2015 | 4.00 | good |
| 2016 | 4.33 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘D’ over a period of last three years.

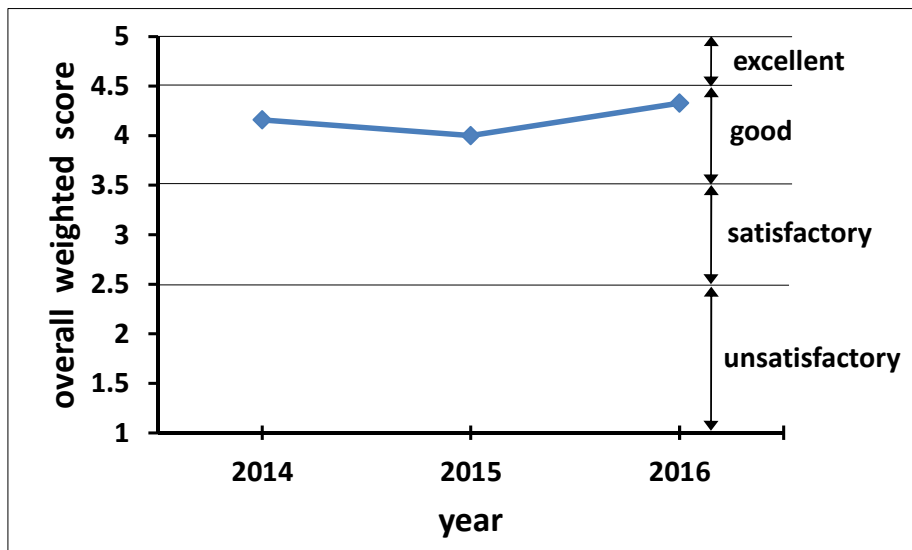


Figure D4.3: overall weighted score of outcome ‘D’ over a period of last three years

The following actions have been taken based on the analysis of Outcome D

| Weighted Score for Outcome D | Recommendation | Reason | Implemented from |
|------------------------------|---|---|-------------------------|
| 4.00 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students can learn to share responsibility and work in teams. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'E'
(Year 2016)**

for the

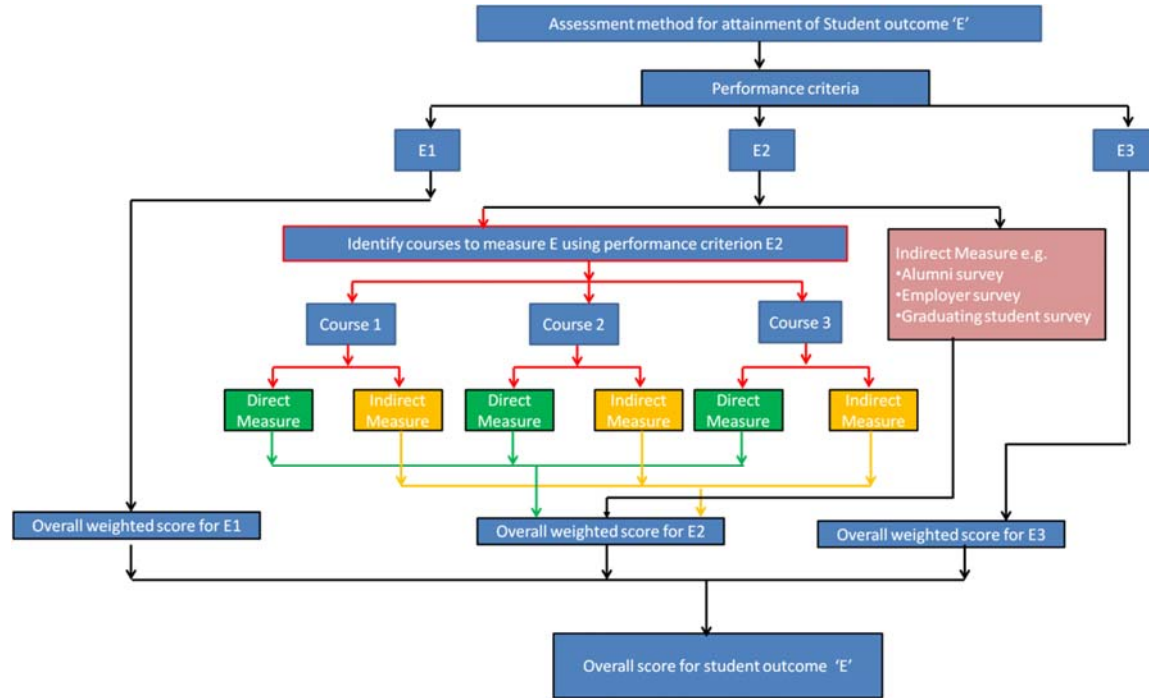
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome E

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'E'

Courses:

1. Machine Design(UME 508)
2. Machining Science (UME 705)

Outcome E has been assessed by three performance criteria E1, E2 and E3. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these three performance criteria has been used to measure the overall measure of outcome E.

1) Assessment of Outcome 'E' using performance criterion E1

A. Performance criteria 'E1':

E1. Classifies information to identify engineering problems.

B.

Question:

- (a) What do you mean by chip reduction coefficient and side flow factor? Also discuss the term: HI-E range along with graphs. (10)
- (b) Calculate shear angle, cutting force and feed force for the alloy steel machined at cutting speed of 185 m/min. The tool used is having rake angle of 8° . The width of cut is 2 mm and uncut chip thickness is 0.2 mm. The value of coefficient of friction between tool and chip is 0.4. The shear stress of work material may be taken as 350 N/mm². Apply the Merchant's first solution.(10)

The above performance criteria is used to measure the attainment of outcome 'E1' by giving the following question (Question No.:1 during EST in Dec 2016, weightage 20 marks) to the students.

Student's performance in the above question is given below:

Table E4.1: Student's performance in question targeting 'E1'; course: UME705

| S. No. | Roll No. | E1 | Weight (Scale 1 to 5) |
|--------|-----------|---------------------------------|--------------------------|
| | | (Q. No. 1 in EST) (20 Marks) | |
| 1 | 101208118 | 5 | 3 |
| 2 | 101308015 | 4 | 2 |
| 3 | 101308033 | 4 | 2 |
| 4 | 101308059 | 2 | 1 |
| 5 | 101308067 | 7 | 3 |
| 6 | 101308069 | 0 | 1 |
| 7 | 101308070 | 0 | 1 |
| 8 | 101308071 | 0 | 1 |
| 9 | 101308074 | 0 | 1 |
| 10 | 101308075 | 4 | 2 |
| 11 | 101308077 | 7 | 3 |
| 12 | 101308078 | 0 | 1 |
| 13 | 101308079 | 20 | 5 |
| 14 | 101308080 | 12 | 5 |
| 15 | 101308082 | 9 | 4 |
| 16 | 101308083 | 13 | 5 |
| 17 | 101308085 | 10 | 4 |

Attainment of Outcome E

| | | | |
|----|-----------|----|---|
| 18 | 101308088 | 15 | 5 |
| 19 | 101308089 | 2 | 1 |
| 20 | 101308090 | 8 | 4 |
| 21 | 101308091 | 12 | 5 |
| 22 | 101308093 | 0 | 1 |
| 23 | 101308094 | 13 | 5 |
| 24 | 101308096 | 10 | 4 |
| 25 | 101308097 | 0 | 1 |
| 26 | 101308098 | 5 | 3 |
| 27 | 101308099 | 5 | 3 |
| 28 | 101308101 | 0 | 1 |
| 29 | 101308102 | 15 | 5 |
| 30 | 101308103 | 9 | 4 |
| 31 | 101308104 | 8 | 4 |
| 32 | 101308105 | 12 | 5 |
| 33 | 101308106 | 7 | 3 |
| 34 | 101308108 | 11 | 4 |
| 35 | 101308109 | 15 | 5 |
| 36 | 101308110 | 7 | 3 |
| 37 | 101308111 | 20 | 5 |
| 38 | 101308112 | 0 | 1 |
| 39 | 101308113 | 14 | 5 |
| 40 | 101308114 | 8 | 3 |
| 41 | 101308115 | 12 | 5 |
| 42 | 101308116 | 7 | 3 |
| 43 | 101308117 | 20 | 5 |
| 44 | 101308118 | 6 | 3 |
| 45 | 101308119 | 9 | 4 |
| 46 | 101308120 | 14 | 5 |
| 47 | 101308121 | 0 | 1 |
| 48 | 101308122 | 0 | 1 |
| 49 | 101308123 | 9 | 4 |
| 50 | 101308124 | 9 | 4 |
| 51 | 101308125 | 14 | 5 |
| 52 | 101414007 | 0 | 1 |

| | | | |
|----|-----------|----|---|
| 53 | 101414023 | 0 | 1 |
| 54 | 101414026 | 04 | 2 |
| 55 | 101414027 | 1 | 1 |
| 56 | 101414028 | 6 | 3 |
| 57 | 101414029 | | |
| 58 | 101414030 | 5 | 3 |
| 59 | 101414031 | 9 | 4 |
| 60 | 101414032 | 2 | 1 |
| 61 | 101414033 | 0 | 1 |
| 62 | 101414035 | 3 | 2 |
| 63 | 101464001 | 4 | 2 |
| 64 | 101464003 | 6 | 3 |
| 65 | 101464004 | 12 | 5 |
| 66 | 101464005 | 05 | 3 |
| 67 | 101464006 | 05 | 3 |
| 68 | 101464007 | 08 | 4 |
| 69 | 101464008 | 00 | 1 |
| 70 | 101488008 | 2 | 1 |
| 71 | 101488012 | 15 | 5 |
| 72 | 101488013 | 3 | 2 |
| 73 | 101488014 | 5 | 3 |
| 74 | 101488015 | 00 | 1 |
| 75 | 101488016 | 00 | 1 |
| 76 | 101488017 | 0 | 1 |
| 77 | 101488018 | 08 | 4 |
| 78 | 101594002 | 0 | 1 |

The overall performance of students in the above question is then summarized as given below

Table E4.2: Weighted Average Student Class Performance (course portfolio) for Attribute E1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME705 | 20.5 | 17.9 | 20.5 | 8.9 | 32 | 3.65 |

(ii) **Course:** Machine Design(UME 508)

Performance criteria ‘E1’: Classifies information to identify engineering problems.

The above performance criteria is used to measure the attainment of outcome ‘E’ by giving the following question (QUESTION 6 OF ESE) to the students.

Question: Design completely the screw rod, nut, collar and handle of a manually operated automobile screw jack to raise a load 30 kN with a maximum lift of 300 mm, at a rubbing speed not less than 2.5 m/min and not more than 3 m/min. The screw rod should be single start square threaded. Select suitable materials with the appropriate justifications and list all the design parameters for the various components. Neglect the buckling effect of screw rod. Use the uniform wear theory for the estimation of collar friction torque. Assume factor of safety for all the components as 5, Young’s modulus for steel to be 200 kN/mm², manual effort at the input of the drive as 350 N, and average coefficient of friction between screw and nut as 0.15. (20)

Student’s performance in the above question is given below:

Table E4.3: Student’s performance in question targeting ‘E1’; course: UME508

| S.No. | Roll no. | Name | ESE Q6 Marks (20) | Score (1-5) |
|-------|-----------|-------------------------|-------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 3 | 2 |
| 2 | 101408002 | AayushKhera | 17.5 | 5 |
| 3 | 101408003 | AbhishekBaruah | 8 | 3 |
| 4 | 101408004 | Abhishek Pandey | 9 | 4 |
| 5 | 101408005 | Abhishek Sharma | 15 | 5 |
| 6 | 101408006 | Abhishek Singh Nathawat | 13.5 | 5 |
| 7 | 101408007 | Abhishesh Aggarwal | 3 | 2 |
| 8 | 101408008 | AditGoel | -1 | 0 |
| 9 | 101408009 | Aditya Shubham | 8.5 | 4 |
| 10 | 101408010 | AerkDimri | -1 | 0 |
| 11 | 101408011 | AjiteshBindal | 16 | 5 |
| 12 | 101408012 | Akhilesh Sharma | 0.5 | 1 |
| 13 | 101408013 | Akin | 0 | 1 |
| 14 | 101408014 | Akshansh Jain | 5 | 2 |
| 15 | 101408015 | Akshay Bajaj | 15 | 5 |
| 16 | 101408016 | AmanSingla | 17 | 5 |
| 17 | 101408017 | Amar Raj Singh | 10.5 | 4 |
| 18 | 101408019 | AnandVardhan | 19 | 5 |

| | | | | |
|----|-----------|-------------------------|------|---|
| 19 | 101408020 | Anil Barwar | 4.5 | 2 |
| 20 | 101408021 | Ankit Kumar | -1 | 0 |
| 21 | 101408022 | AnkitVerma | 0 | 1 |
| 22 | 101408023 | AnkushNarula | 14.5 | 5 |
| 23 | 101408024 | Anurag Kumar | -1 | 0 |
| 24 | 101408025 | AnuragVerma | 16 | 5 |
| 25 | 101408026 | Arjun Raina | -1 | 0 |
| 26 | 101408028 | ArpitKandhari | 17 | 5 |
| 27 | 101408029 | Ashish Goyal | 17 | 5 |
| 28 | 101408030 | Ashok Ranwa | 5 | 2 |
| 29 | 101408031 | Ashwinder Singh | 10.5 | 4 |
| 30 | 101408032 | Atul | 0 | 1 |
| 31 | 101408033 | AvanshuShrivastav | 13.5 | 5 |
| 32 | 101408034 | Ayush Pandey | 14.5 | 5 |
| 33 | 101408035 | AyushRai | 10 | 4 |
| 34 | 101408036 | Channdeeep | 16 | 5 |
| 35 | 101408037 | ChetanKatyal | 14 | 5 |
| 36 | 101408038 | DakshGarg | 0 | 1 |
| 37 | 101408039 | Deepanshu Mohan | -1 | 0 |
| 38 | 101408040 | Devjot Singh Sewak | -1 | 0 |
| 39 | 101408041 | Dheerendra K. Chaudhary | 10 | 4 |
| 40 | 101408042 | Dhruv Sharma | 20 | 5 |
| 41 | 101408043 | Divyesh Gupta | 13 | 5 |
| 42 | 101408044 | Ekamjot Singh | 6 | 2 |
| 43 | 101408045 | Gaurav Gupta | 13.5 | 5 |
| 44 | 101408046 | Gurasees Singh | -1 | 0 |
| 45 | 101408047 | Gurbaksh Singh | 9 | 4 |
| 46 | 101408048 | Gurneet Singh Aujla | 5 | 2 |
| 47 | 101408049 | HardikVashishtha | 14 | 5 |
| 48 | 101408050 | Harish Jala | 19.5 | 5 |
| 49 | 101408051 | Harjot Singh | -1 | 0 |
| 50 | 101408052 | Harmandeep Singh | 7 | 3 |
| 51 | 101408055 | Harnoor Singh | 15 | 5 |
| 52 | 101408056 | Harpreet Singh | 10 | 4 |

| | | | | |
|----|-----------|------------------------|------|---|
| 53 | 101408057 | Himalaya NathChinoriya | 0 | 1 |
| 54 | 101408058 | Himanshu Raj | 4 | 2 |
| 55 | 101408059 | Ishaan Mangla | 13.5 | 5 |
| 56 | 101408060 | Ishjot Singh Jaggi | 12 | 5 |
| 57 | 101408120 | Shivendra Kumar | 12 | 5 |
| 58 | 101408121 | ShlokChanduka | 15.5 | 5 |
| 59 | 101408122 | Shubham Gupta | 15 | 5 |
| 60 | 101408123 | ShubhamSaxena | 15.5 | 5 |
| 61 | 101408124 | Shubham Sharma | 10 | 4 |
| 62 | 101408125 | SidharthHinger | 0 | 1 |
| 63 | 101408126 | Simranpreet Singh | 0 | 1 |
| 64 | 101408127 | SunpreetKochhar | 1 | 1 |
| 65 | 101408128 | TanmayMathur | 12 | 5 |
| 66 | 101408129 | Tanvir Sidhu | 14.5 | 5 |
| 67 | 101588001 | Arpanjot Singh | 19.5 | 5 |
| 68 | 101588005 | HarshitKashyap | 13 | 5 |
| 69 | 101588006 | Jashandeep Singh | 12 | 5 |
| 70 | 101588010 | Rachit Joshi | 7 | 3 |
| 71 | 101588011 | Rajinder Singh Sidhu | 16 | 5 |
| 72 | 101588012 | RajitDevgan | -1 | 0 |
| 73 | 101588013 | Shubham Sharma | 17 | 5 |
| 74 | 101588015 | Tejinder Singh | 16 | 5 |

The overall performance of students in the above question is then summarized as given below

Table E4.4: Average score of student performance in the course UME508 for criteria E1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 54.7 | 14.1 | 4.7 | 12.5 | 14.1 | 3.83 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria E1 as given below in Table E4.5:

Table E4.5: Weighted Average Student class performance (course portfolio) for criteria E1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 54.7 | 14.1 | 4.7 | 12.5 | 14.1 | 3.83 | 5 |
| UME705 | 20.5 | 17.9 | 20.5 | 8.9 | 32 | 2.85 | 4 |
| Weighted average score | 39.50 | 15.79 | 11.72 | 10.90 | 22.06 | 3.40 | 9 |

b) Indirect measures for Performance criteria E1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table E4.6: Average score of student course survey for criteria E1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 57.23 | 33.30 | 3.67 | 6.12 | 0.00 | 4.43 | 5.00 |
| UME705 | 51.86 | 21.45 | 9.89 | 8.25 | 8.56 | 4.00 | 4.00 |
| Weighted average score | 54.85 | 28.03 | 6.43 | 7.06 | 3.80 | 4.24 | 9.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table E4.7: Assessment for criteria E1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 29.03 | 6.45 | 0.00 | 3.94 |
| Alumni survey | 48.15 | 40.74 | 7.41 | 3.70 | 0.00 | 4.33 |
| Employer Survey | 75.00 | 22.22 | 2.78 | 0.00 | 0.00 | 4.72 |

c) Overall weighted average score of performance criterion 'E1'

Finally overall weighted average score of performance criterion 'E1' is evaluated as given below in Table E4.8:

Table E4.8: Overall weighted average score of performance criterion 'E1'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|------|------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 39.5 | 15.8 | 11.7 | 10.9 | 22.1 | 3.4 | 5.0 |
| Weighted average student course survey | 54.8 | 28.0 | 6.4 | 7.1 | 3.8 | 4.2 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 29.0 | 6.5 | 0.0 | 3.9 | 3.0 |
| Alumni survey | 48.1 | 40.7 | 7.4 | 3.7 | 0.0 | 4.3 | 3.0 |
| Employer survey | 75.0 | 22.2 | 2.8 | 0.0 | 0.0 | 4.7 | 3.0 |
| Overall weighted score | 49.6 | 25.9 | 11.2 | 6.3 | 7.0 | 4.1 | 18.0 |

Assessment of Outcome 'E' using performance criterion E2

Performance criteria 'E2': *Develop appropriate models to formulate solutions.*

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Twocourses namely Machine Design (UME 508) and Machining Science (UME 705) were used to assess performance criteria E2 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Machine Design (UME 508)

The above performance criteria is used to measure the attainment of outcome 'E' by giving the following question (Question No.:1 during MST in 2016, weightage 15 marks) to the students.

Question:

A circular rod made of machined and cold drawn steel 45C8 having ultimate strength of 630 N/mm². The member is subjected to a variable axial load varying from 70 kN (tensile) to 300 kN (compressive). Take fatigue stress concentration factor as 1.8 and factor of safety as 2.0. Find a suitable diameter of the rod for 50% design reliability. (15)

Student's performance in the above question is given below:

Table E4.9: Student's performance in question targeting 'E2'; course: UME508

| S.No. | Roll no. | Name | ESE Q3 Marks (15) | Score (1-5) |
|-------|-----------|-----------------|-------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 7 | 4 |
| 2 | 101408002 | AayushKhera | 6 | 3 |
| 3 | 101408003 | AbhishekBaruah | 5 | 3 |
| 4 | 101408004 | Abhishek Pandey | 6 | 3 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 5 | 101408005 | Abhishek Sharma | 6 | 3 |
| 6 | 101408006 | Abhishek Singh Nathawat | 4 | 2 |
| 7 | 101408007 | Abhishesh Aggarwal | 5 | 3 |
| 8 | 101408008 | AditGoel | -1 | 0 |
| 9 | 101408009 | Aditya Shubham | 5 | 3 |
| 10 | 101408010 | AerkDimri | -1 | 0 |
| 11 | 101408011 | AjiteshBindal | 15 | 5 |
| 12 | 101408012 | Akhilesh Sharma | 5 | 3 |
| 13 | 101408013 | Akin | 2 | 1 |
| 14 | 101408014 | Akshansh Jain | 8 | 4 |
| 15 | 101408015 | Akshay Bajaj | 4.5 | 3 |
| 16 | 101408016 | AmanSingla | 7 | 4 |
| 17 | 101408017 | Amar Raj Singh | 14 | 5 |
| 18 | 101408019 | AnandVardhan | 14 | 5 |
| 19 | 101408020 | Anil Barwar | 12 | 5 |
| 20 | 101408021 | Ankit Kumar | -1 | 0 |
| 21 | 101408022 | AnkitVerma | 5 | 3 |
| 22 | 101408023 | AnkushNarula | 8 | 4 |
| 23 | 101408024 | Anurag Kumar | -1 | 0 |
| 24 | 101408025 | AnuragVerma | 8 | 4 |
| 25 | 101408026 | Arjun Raina | -1 | 0 |
| 26 | 101408028 | ArpitKandhari | 11 | 5 |
| 27 | 101408029 | Ashish Goyal | 11 | 5 |
| 28 | 101408030 | Ashok Ranwa | 6 | 3 |
| 29 | 101408031 | Ashwinder Singh | 6 | 3 |
| 30 | 101408032 | Atul | 4 | 2 |
| 31 | 101408033 | AvanshuShrivastav | 10 | 5 |
| 32 | 101408034 | Ayush Pandey | 13 | 5 |
| 33 | 101408035 | AyushRai | 5 | 3 |
| 34 | 101408036 | Channdeeep | 7 | 4 |
| 35 | 101408037 | ChetanKatyal | 11 | 5 |
| 36 | 101408038 | DakshGarg | 1 | 1 |
| 37 | 101408039 | Deepanshu Mohan | -1 | 0 |
| 38 | 101408040 | Devjot Singh Sewak | -1 | 0 |

| | | | | |
|----|-----------|-------------------------|------|---|
| 39 | 101408041 | Dheerendra K. Chaudhary | 12 | 5 |
| 40 | 101408042 | Dhruv Sharma | 14 | 5 |
| 41 | 101408043 | Divyesh Gupta | 15 | 5 |
| 42 | 101408044 | Ekamjot Singh | 6 | 3 |
| 43 | 101408045 | Gaurav Gupta | 14 | 5 |
| 44 | 101408046 | Gurasees Singh | -1 | 0 |
| 45 | 101408047 | Gurbaksh Singh | 9 | 4 |
| 46 | 101408048 | Gurneet Singh Aujla | 1 | 1 |
| 47 | 101408049 | HardikVashishtha | 13 | 5 |
| 48 | 101408050 | Harish Jala | 8 | 4 |
| 49 | 101408051 | Harjot Singh | -1 | 0 |
| 50 | 101408052 | Harmandeep Singh | 5.5 | 3 |
| 51 | 101408055 | Harnoor Singh | 6 | 3 |
| 52 | 101408056 | Harpreet Singh | 7 | 4 |
| 53 | 101408057 | Himalaya NathChinoriya | 0 | 1 |
| 54 | 101408058 | Himanshu Raj | 5 | 3 |
| 55 | 101408059 | Ishaan Mangla | 8 | 4 |
| 56 | 101408060 | Ishjot Singh Jaggi | 6 | 3 |
| 57 | 101408120 | Shivendra Kumar | 4.5 | 3 |
| 58 | 101408121 | ShlokChanduka | 8 | 4 |
| 59 | 101408122 | Shubham Gupta | 11.5 | 5 |
| 60 | 101408123 | ShubhamSaxena | 14 | 5 |
| 61 | 101408124 | Shubham Sharma | 14 | 5 |
| 62 | 101408125 | SidharthHinger | 2.5 | 2 |
| 63 | 101408126 | Simranpreet Singh | 2 | 1 |
| 64 | 101408127 | SunpreetKochhar | 14 | 5 |
| 65 | 101408128 | TanmayMathur | 7 | 4 |
| 66 | 101408129 | Tanvir Sidhu | 8 | 4 |
| 67 | 101588001 | Arpanjot Singh | 14 | 5 |
| 68 | 101588005 | HarshitKashyap | 9 | 4 |
| 69 | 101588006 | Jashandeep Singh | 6 | 3 |
| 70 | 101588010 | Rachit Joshi | 7 | 4 |
| 71 | 101588011 | Rajinder Singh Sidhu | 4 | 2 |
| 72 | 101588012 | RajitDevgan | -1 | 0 |

| | | | | |
|----|-----------|----------------|----|---|
| 73 | 101588013 | Shubham Sharma | 8 | 4 |
| 74 | 101588015 | Tejinder Singh | 10 | 5 |

Table E4.10: Weighted Average Student Class Performance (course portfolio) for Attribute E2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|----|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 31.3 | 25 | 29.7 | 6.3 | 7.8 | 3.66 |

(ii) Course: Machining Science (UME 705)

The above performance criteria is used to measure the attainment of outcome 'E2' by giving the following question (Question No. 2(b): during MST in September 2016, weightage 5 marks) to the students.

Question:

| |
|--|
| <p>(a) Mild steel bars of 50 mm diameter are to be turned over a length of 160 mm with a depth of cut of 1.5 mm, feed of 0.2 mm/rev. at 230 rpm by HSS and Carbide tools on same conditions. If the tool life equation for both tools is given by $VT^{0.2}f^{0.3}d^{0.12}=50$. Determine how many components may be turned before regrinding both tools.(8)</p> <p>(b) During machining of a steel, tool I gave $VT^{0.1}=60$ while tool II gave $VT^{0.16}=85$ as tool life equations. The tool changing time for both tools was 3 min. Which tool will give a higher production rate?(6)</p> <p>(c) With the help of neat diagram, explain the mechanisms of Flank Wear, Crater Wear and Chipping for tool damage during cutting operations(6)</p> |
|--|

The above performance criteria is used to measure the attainment of outcome 'E2' by giving the following question (Question No.:4 during EST in Dec 2016, weightage 20 marks) to the students.

Student's performance in the above question is given below:

Table E4.11: Student's performance in question targeting 'E2'; course: UME705

| S. No. | Roll No. | E2 | Weight (Scale 1 to 5) |
|--------|-----------|------------------------------|-----------------------|
| | | (Q. No. 1 in EST) (20 Marks) | |
| 1 | 101208118 | 5 | 3 |
| 2 | 101308015 | 4 | 2 |
| 3 | 101308033 | 9 | 4 |
| 4 | 101308059 | 9 | 4 |
| 5 | 101308067 | 7 | 3 |
| 6 | 101308069 | 5 | 3 |

Attainment of Outcome E

| | | | |
|----|-----------|-----|---|
| 7 | 101308070 | 4 | 2 |
| 8 | 101308071 | 3 | 2 |
| 9 | 101308074 | 12 | 5 |
| 10 | 101308075 | 8 | 4 |
| 11 | 101308077 | 1 | 1 |
| 12 | 101308078 | 15 | 5 |
| 13 | 101308079 | 13 | 5 |
| 14 | 101308080 | 5 | 3 |
| 15 | 101308082 | 14 | 5 |
| 16 | 101308083 | 6 | 3 |
| 17 | 101308085 | 7 | 3 |
| 18 | 101308088 | 17 | 5 |
| 19 | 101308089 | 7 | 3 |
| 20 | 101308090 | 10 | 4 |
| 21 | 101308091 | 15 | 5 |
| 22 | 101308093 | 6 | 3 |
| 23 | 101308094 | 8 | 4 |
| 24 | 101308096 | 12 | 5 |
| 25 | 101308097 | 0 | 1 |
| 26 | 101308098 | 8 | 4 |
| 27 | 101308099 | 6 | 3 |
| 28 | 101308101 | 10 | 4 |
| 29 | 101308102 | 17 | 5 |
| 30 | 101308103 | 5 | 3 |
| 31 | 101308104 | 4 | 2 |
| 32 | 101308105 | 4.5 | 2 |
| 33 | 101308106 | 9 | 4 |
| 34 | 101308108 | 10 | 4 |
| 35 | 101308109 | 10 | 4 |
| 36 | 101308110 | 14 | 5 |
| 37 | 101308111 | 15 | 5 |
| 38 | 101308112 | 4 | 2 |
| 39 | 101308113 | 15 | 5 |
| 40 | 101308114 | 9 | 4 |
| 41 | 101308115 | 06 | 3 |

Attainment of Outcome E

| | | | |
|----|-----------|----|---|
| 42 | 101308116 | 11 | 4 |
| 43 | 101308117 | 14 | 5 |
| 44 | 101308118 | 4 | 2 |
| 45 | 101308119 | 14 | 5 |
| 46 | 101308120 | 14 | 5 |
| 47 | 101308121 | 2 | 1 |
| 48 | 101308122 | 0 | 1 |
| 49 | 101308123 | 15 | 5 |
| 50 | 101308124 | 7 | 3 |
| 51 | 101308125 | 6 | 3 |
| 52 | 101414007 | 7 | 3 |
| 53 | 101414023 | 11 | 4 |
| 54 | 101414026 | 09 | 4 |
| 55 | 101414027 | 8 | 4 |
| 56 | 101414028 | 9 | 4 |
| 57 | 101414029 | 0 | 1 |
| 58 | 101414030 | 17 | 5 |
| 59 | 101414031 | 5 | 3 |
| 60 | 101414032 | 08 | 4 |
| 61 | 101414033 | 00 | 1 |
| 62 | 101414035 | 3 | 2 |
| 63 | 101464001 | 16 | 5 |
| 64 | 101464003 | 11 | 4 |
| 65 | 101464004 | 14 | 5 |
| 66 | 101464005 | 10 | 4 |
| 67 | 101464006 | 18 | 5 |
| 68 | 101464007 | 04 | 2 |
| 69 | 101464008 | 03 | 2 |
| 70 | 101488008 | 17 | 5 |
| 71 | 101488012 | 9 | 4 |
| 72 | 101488013 | 10 | 4 |
| 73 | 101488014 | 12 | 5 |
| 74 | 101488015 | 12 | 5 |
| 75 | 101488016 | 10 | 4 |
| 76 | 101488017 | 4 | 2 |

| | | | |
|----|-----------|----|---|
| 77 | 101488018 | 04 | 2 |
| 78 | 101594002 | 14 | 5 |

Table E4.12: Weighted Average Student Class Performance (course portfolio) for Attribute E2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME705 | 29.4 | 29.4 | 19.2 | 15.3 | 6.4 | 3.59 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria E2 as given below in Table E4.13:

Table E4.13: Weighted Average Student class performance (course portfolio) for criteria E2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 31.3 | 25 | 29.7 | 6.3 | 7.8 | 3.66 | 5 |
| UME705 | 29.4 | 29.4 | 19.2 | 15.3 | 6.4 | 3.59 | 4 |
| Weighted average score | 30.46 | 26.96 | 25.03 | 10.30 | 7.18 | 3.63 | 9 |

b) Indirect measures for Performance criteria E2 (Surveys)

i.) Assessment Tool: Student Course Survey

Table E4.14: Average score of student course survey for criteria E2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 57.23 | 33.30 | 3.67 | 6.12 | 0.00 | 4.43 | 5.00 |
| UME705 | 51.86 | 21.45 | 9.89 | 8.25 | 8.56 | 4.00 | 4.00 |
| Weighted average score | 54.85 | 28.03 | 6.43 | 7.06 | 3.80 | 4.24 | 9.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table E4.15: Assessment for criteria E2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 29.03 | 6.45 | 0.00 | 3.94 |
| Alumni survey | 48.15 | 40.74 | 7.41 | 3.70 | 0.00 | 4.33 |
| Employer Survey | 75.00 | 22.22 | 2.78 | 0.00 | 0.00 | 4.72 |

c) Overall weighted average score of performance criterion 'E2'

Finally overall weighted average score of performance criterion 'E2' is evaluated as given below in Table E4.16:

Table E4.16: Overall weighted average score of performance criterion 'E2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|------|------|------|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 30.5 | 27.0 | 25.0 | 10.3 | 7.2 | 3.6 | 5.0 |
| Weighted average student course survey | 54.8 | 28.0 | 6.4 | 7.1 | 3.8 | 4.2 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 29.0 | 6.5 | 0.0 | 3.9 | 3.0 |
| Alumni survey | 48.1 | 40.7 | 7.4 | 3.7 | 0.0 | 4.3 | 3.0 |
| Employer survey | 75.0 | 22.2 | 2.8 | 0.0 | 0.0 | 4.7 | 3.0 |
| Overall weighted score | 47.1 | 29.0 | 14.9 | 6.1 | 2.8 | 4.1 | 18.0 |

Assessment of Outcome 'E' using performance criterion E3

Performance criteria 'E3': Uses analytical, computational and/or experimental methods to obtain solutions.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Machine Design (UME 508) and Machining Science (UME 705) were used to assess performance criteria E3 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Machine Design (UME 508)

The above performance criteria is used to measure the attainment of outcome 'E3' by giving the following question (Question No.:4(b) during MST in September 2016, weightage 7 marks) to the students.

Question:

Tutorial Evaluations (8)

Student's performance in the above question is given below:

Table E4.17: Student's performance in question targeting 'E3'; course: UME508

| S.No. | Rollno. | Name | Tutorial Marks (8) | Score (1-5) |
|-------|-----------|-------------------------|--------------------|-------------|
| 1 | 101408001 | Aashish Kumar | 6.5 | 4 |
| 2 | 101408002 | AayushKhera | 8 | 5 |
| 3 | 101408003 | AbhishekBaruah | 6 | 4 |
| 4 | 101408004 | Abhishek Pandey | 6.5 | 4 |
| 5 | 101408005 | Abhishek Sharma | 6 | 4 |
| 6 | 101408006 | Abhishek Singh Nathawat | 6 | 4 |

| | | | | |
|----|-----------|-------------------------|------|---|
| 7 | 101408007 | Abhishesh Aggarwal | 6.5 | 4 |
| 8 | 101408008 | AditGoel | 4 | 2 |
| 9 | 101408009 | Aditya Shubham | 6.5 | 4 |
| 10 | 101408010 | AerkDimri | 4 | 2 |
| 11 | 101408011 | AjiteshBindal | 7 | 5 |
| 12 | 101408012 | Akhilesh Sharma | 4 | 2 |
| 13 | 101408013 | Akin | 6.5 | 4 |
| 14 | 101408014 | Akshansh Jain | 5.5 | 3 |
| 15 | 101408015 | Akshay Bajaj | 5.5 | 3 |
| 16 | 101408016 | AmanSingla | 6.5 | 4 |
| 17 | 101408017 | Amar Raj Singh | 6.5 | 4 |
| 18 | 101408019 | AnandVardhan | 7.5 | 5 |
| 19 | 101408020 | Anil Barwar | 7 | 5 |
| 20 | 101408021 | Ankit Kumar | 3 | 1 |
| 21 | 101408022 | AnkitVerma | 4 | 2 |
| 22 | 101408023 | AnkushNarula | 8 | 5 |
| 23 | 101408024 | Anurag Kumar | 5.5 | 3 |
| 24 | 101408025 | AnuragVerma | 5.5 | 3 |
| 25 | 101408026 | Arjun Raina | 4 | 2 |
| 26 | 101408028 | ArpitKandhari | 5.75 | 4 |
| 27 | 101408029 | Ashish Goyal | 7 | 5 |
| 28 | 101408030 | Ashok Ranwa | 4 | 2 |
| 29 | 101408031 | Ashwinder Singh | 7 | 5 |
| 30 | 101408032 | Atul | 4 | 2 |
| 31 | 101408033 | AvanshuShrivastav | 5.5 | 3 |
| 32 | 101408034 | Ayush Pandey | 6.75 | 4 |
| 33 | 101408035 | AyushRai | 5.5 | 3 |
| 34 | 101408036 | Channdeeep | 6.5 | 4 |
| 35 | 101408037 | ChetanKatyal | 4.5 | 2 |
| 36 | 101408038 | DakshGarg | 5 | 3 |
| 37 | 101408039 | Deepanshu Mohan | 3.5 | 1 |
| 38 | 101408040 | Devjot Singh Sewak | 3 | 1 |
| 39 | 101408041 | Dheerendra K. Chaudhary | 6 | 4 |
| 40 | 101408042 | Dhruv Sharma | 5.5 | 3 |

| | | | | |
|----|-----------|------------------------|------|---|
| 41 | 101408043 | Divyesh Gupta | 8 | 5 |
| 42 | 101408044 | Ekamjot Singh | 6 | 4 |
| 43 | 101408045 | Gaurav Gupta | 7 | 5 |
| 44 | 101408047 | Gurbaksh Singh | 5.5 | 3 |
| 45 | 101408048 | Gurneet Singh Aujla | 6.5 | 4 |
| 46 | 101408049 | HardikVashishtha | 5.5 | 3 |
| 47 | 101408050 | Harish Jala | 5.5 | 3 |
| 48 | 101408051 | Harjot Singh | 6 | 4 |
| 49 | 101408052 | Harmandeep Singh | 5.5 | 3 |
| 50 | 101408055 | Harnoor Singh | 5.5 | 3 |
| 51 | 101408056 | Harpreet Singh | 5.5 | 3 |
| 52 | 101408057 | Himalaya NathChinoriya | 4.5 | 2 |
| 53 | 101408058 | Himanshu Raj | 5.5 | 3 |
| 54 | 101408059 | Ishaan Mangla | 7.5 | 5 |
| 55 | 101408060 | Ishjot Singh Jaggi | 7.25 | 5 |
| 56 | 101408120 | Shivendra Kumar | 6.5 | 4 |
| 57 | 101408121 | ShlokChanduka | 5.5 | 3 |
| 58 | 101408122 | Shubham Gupta | 6.5 | 4 |
| 59 | 101408123 | ShubhamSaxena | 6.5 | 4 |
| 60 | 101408124 | Shubham Sharma | 5.5 | 3 |
| 61 | 101408125 | SidharthHinger | 5 | 3 |
| 62 | 101408126 | Simranpreet Singh | 5 | 3 |
| 63 | 101408127 | SunpreetKochhar | 6 | 4 |
| 64 | 101408128 | TanmayMathur | 4.5 | 2 |
| 65 | 101408129 | Tanvir Sidhu | 4.5 | 2 |
| 66 | 101588001 | Arpanjot Singh | 8 | 5 |
| 67 | 101588005 | HarshitKashyap | 7 | 5 |
| 68 | 101588006 | Jashandeep Singh | 7 | 5 |
| 69 | 101588010 | Rachit Joshi | 7 | 5 |
| 70 | 101588011 | Rajinder Singh Sidhu | 5 | 3 |
| 71 | 101588012 | RajitDevgan | 6 | 4 |
| 72 | 101588013 | Shubham Sharma | 7.5 | 5 |
| 73 | 101588015 | Tejinder Singh | 8 | 5 |

Table E4.18: Weighted Average Student Class Performance (course portfolio) for Attribute E3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME508 | 23.3 | 30.1 | 27.4 | 15.1 | 4.1 | 3.53 |

(ii) **Course:** Machining Science (UME 705)

The above performance criteria is used to measure the attainment of outcome 'E3' by giving the following question (Question No.:1 during MST in Sept 2016, weightage 10 marks) to the students.

Question:

(a) Determine the minimum material removal rate for the ECM process used to machine alloy plate when a current of 945 ampere is applied. The valencies of dissolution of elements are Mn= (2,4,6,7), Cr= (2,3,6), Cu= (1,2) , Al = 3, Zn = 2, Co = (2, 3), Ti = (3 ,4) , Si = 4, Sn = (2, 4) , W= (6 , 8). The gram atomic weight of the elements present is: Mn= 54.94, Cr= 51.99, Cu= 63.57, Al = 26.97, Zn = 65.37, Co = 58.93, Ti = 47.9, Si = 28.09, Sn = 118.69, W = 183.85 (All values are in gm). The composition (% weight) of the alloy is as under: Mn = 7.2 %, Cr: 4.4 %, Cu: 4.2%, Al = 53.8%, Zn = 15.8%, Co = 11.2 %, Ti = 0.4%, Si = 1.0%, Sn = 0.8%, W =1.2%. The densities of the elements present are: Mn= 7.43, Cr= 7.19, Cu= 8.96, Al = 2.67, Zn = 7.13, Co = 8.85, Ti = 4.51, Si = 2.33, Sn = 7.30, W = 19.3 (All values are in gm/cm³). (10)

(b) Differentiate between a jig and fixture? Explain the Principle of Location and Error of Location used in jigs and fixtures?(10)

The above performance criteria is used to measure the attainment of outcome 'J1' by giving the following question (Question No.:3 during EST in Dec 2016, weightage 20 marks) to the students.

Student's performance in the above question is given below:

Table E4.19: Student's performance in question targeting 'E3'; course: UME705

| S. No. | Roll No. | E3 | Weight (Scale 1 to 5) |
|--------|-----------|---------------------------------|--------------------------|
| | | (Q. No. 1 in EST) (20 Marks) | |
| 1 | 101208118 | 5 | 2 |
| 2 | 101308015 | 9 | 3 |
| 3 | 101308033 | 4 | 2 |
| 4 | 101308059 | 1 | 1 |
| 5 | 101308067 | 7 | 2 |
| 6 | 101308069 | 7 | 2 |

Attainment of Outcome E

| | | | |
|----|-----------|-----|---|
| 7 | 101308070 | 9 | 3 |
| 8 | 101308071 | 6 | 2 |
| 9 | 101308074 | 8 | 3 |
| 10 | 101308075 | 12 | 4 |
| 11 | 101308077 | 3 | 1 |
| 12 | 101308078 | 8 | 3 |
| 13 | 101308079 | 17 | 5 |
| 14 | 101308080 | 0 | 1 |
| 15 | 101308082 | 3 | 1 |
| 16 | 101308083 | 6 | 2 |
| 17 | 101308085 | 10 | 4 |
| 18 | 101308088 | 16 | 5 |
| 19 | 101308089 | 0 | 1 |
| 20 | 101308090 | 16 | 5 |
| 21 | 101308091 | 17 | 5 |
| 22 | 101308093 | 12 | 4 |
| 23 | 101308094 | 12 | 4 |
| 24 | 101308096 | 15 | 5 |
| 25 | 101308097 | 0 | 1 |
| 26 | 101308098 | 7 | 2 |
| 27 | 101308099 | 15 | 5 |
| 28 | 101308101 | 8 | 3 |
| 29 | 101308102 | 10 | 4 |
| 30 | 101308103 | 14 | 4 |
| 31 | 101308104 | 5 | 2 |
| 32 | 101308105 | 4.5 | 2 |
| 33 | 101308106 | 13 | 4 |
| 34 | 101308108 | 06 | 2 |
| 35 | 101308109 | 16 | 5 |
| 36 | 101308110 | 10 | 4 |
| 37 | 101308111 | 12 | 4 |
| 38 | 101308112 | 3 | 1 |
| 39 | 101308113 | 14 | 4 |
| 40 | 101308114 | 13 | 3 |
| 41 | 101308115 | 10 | 4 |

Attainment of Outcome E

| | | | |
|----|-----------|----|---|
| 42 | 101308116 | 10 | 4 |
| 43 | 101308117 | 13 | 3 |
| 44 | 101308118 | 11 | 4 |
| 45 | 101308119 | 11 | 4 |
| 46 | 101308120 | 10 | 4 |
| 47 | 101308121 | 5 | 2 |
| 48 | 101308122 | 0 | 1 |
| 49 | 101308123 | 12 | 4 |
| 50 | 101308124 | 7 | 2 |
| 51 | 101308125 | 8 | 3 |
| 52 | 101414007 | 8 | 3 |
| 53 | 101414023 | 2 | 1 |
| 54 | 101414026 | 10 | 4 |
| 55 | 101414027 | 6 | 2 |
| 56 | 101414028 | 3 | 1 |
| 57 | 101414030 | 15 | 5 |
| 58 | 101414031 | 2 | 1 |
| 59 | 101414032 | 09 | 3 |
| 60 | 101414033 | 05 | 2 |
| 61 | 101414035 | 6 | 2 |
| 62 | 101464001 | 4 | 2 |
| 63 | 101464003 | 4 | 2 |
| 64 | 101464004 | 15 | 5 |
| 65 | 101464005 | 05 | 2 |
| 66 | 101464006 | 12 | 4 |
| 67 | 101464007 | 11 | 4 |
| 68 | 101464008 | 05 | 2 |
| 69 | 101488008 | 9 | 3 |
| 70 | 101488012 | 14 | 4 |
| 71 | 101488013 | 13 | 3 |
| 72 | 101488014 | 14 | 4 |
| 73 | 101488015 | 03 | 1 |
| 74 | 101488016 | 10 | 4 |
| 75 | 101488017 | 9 | 3 |
| 76 | 101488018 | 03 | 1 |

| | | | |
|----|-----------|---|---|
| 77 | 101594002 | 2 | 1 |
| 78 | 101594004 | 8 | 3 |

Table E4.20: Weighted Average Student Class Performance (course portfolio) for Attribute E3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|------|-------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME705 | 11.5 | 26.92 | 18.9 | 23.07 | 17.9 | 2.86 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria E3 as given below in Table E4.21:

Table E4.21: Weighted Average Student class performance (course portfolio) for criteria E3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|-------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 23.3 | 30.1 | 27.4 | 15.1 | 4.1 | 3.53 | 4 |
| UME705 | 11.5 | 26.92 | 18.9 | 23.07 | 17.9 | 2.86 | 5 |
| Weighted average score | 16.74 | 28.33 | 22.68 | 19.53 | 11.77 | 3.16 | 9 |

b) Indirect measures for Performance criteria E3 (Surveys)

i.) Assessment Tool: Student Course Survey

Table E4.22: Average score of student course survey for criteria E3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME508 | 57.23 | 33.30 | 3.67 | 6.12 | 0.00 | 4.43 | 4.00 |
| UME705 | 51.86 | 21.45 | 9.89 | 8.25 | 8.56 | 4.00 | 5.00 |
| Weighted average score | 54.25 | 26.72 | 7.13 | 7.30 | 4.76 | 4.19 | 9.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table E4.23: Assessment for criteria E3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 29.03 | 6.45 | 0.00 | 3.94 |
| Alumni survey | 48.15 | 40.74 | 7.41 | 3.70 | 0.00 | 4.33 |
| Employer Survey | 75.00 | 22.22 | 2.78 | 0.00 | 0.00 | 4.72 |

c) Overall weighted average score of performance criterion ‘E3’

Finally overall weighted average score of performance criterion ‘E3’ is evaluated as given below in Table E4.24:

Table E4.24: Overall weighted average score of performance criterion ‘E3’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|------|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 16.7 | 28.3 | 22.7 | 19.5 | 11.8 | 3.2 | 5.0 |
| Weighted average student course survey | 54.2 | 26.7 | 7.1 | 7.3 | 4.8 | 4.2 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 29.0 | 6.5 | 0.0 | 3.9 | 3.0 |
| Alumni survey | 48.1 | 40.7 | 7.4 | 3.7 | 0.0 | 4.3 | 3.0 |
| Employer survey | 75.0 | 22.2 | 2.8 | 0.0 | 0.0 | 4.7 | 3.0 |
| Overall weighted score | 43.1 | 29.1 | 14.4 | 8.7 | 4.3 | 4.0 | 18.0 |

Overall assessment of program outcome E using scores of E1, E2 and E3

In the above sections, each of the individual performance criteria E1, E2 and E3 have been assessed. The performance for attainment of outcome E has been completed using the attainment values for E1, E2 and E3 and is provided below:

Table E4.25 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome E.

Table E4.25: Overall score for outcome E at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| E1 | 49.60 | 25.95 | 11.22 | 6.29 | 6.97 | 4.05 | 5 |
| E2 | 47.09 | 29.05 | 14.92 | 6.12 | 2.84 | 4.11 | 5 |
| E3 | 43.15 | 29.14 | 14.42 | 8.74 | 4.33 | 3.97 | 4 |
| Overall score | 46.86 | 27.97 | 13.46 | 6.93 | 3.30 | 4.05 | 14 |

Track Record and assessment of attainment of program outcome ‘E’ over the last three academic years

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

The following table E4.26 presents the performance criteria-wise assessment score distribution for outcome ‘E’

Table E4.26: Performance criteria-wise assessment score distribution of outcome E

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| E | E1 | 3.98 | 3.78 | 4.05 |
| | E2 | 3.96 | 3.84 | 4.11 |
| | E3 | 3.96 | 3.66 | 3.97 |

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

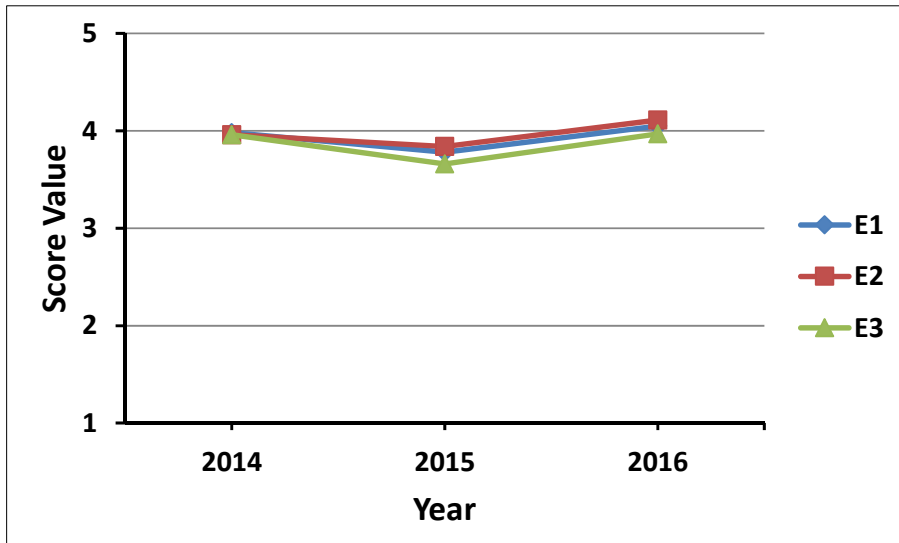


Figure E4.2: Performance criteria-wise assessment score distribution of outcome E

Level of attainment of program outcome ‘E’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table E4.27 presents the overall weighted score of outcome ‘E’ over the last three academic years

Table E4.27: Overall weighted score of outcome ‘E’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 3.97 | good |
| 2015 | 3.77 | good |
| 2016 | 4.05 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘E’ over a period of last three years.

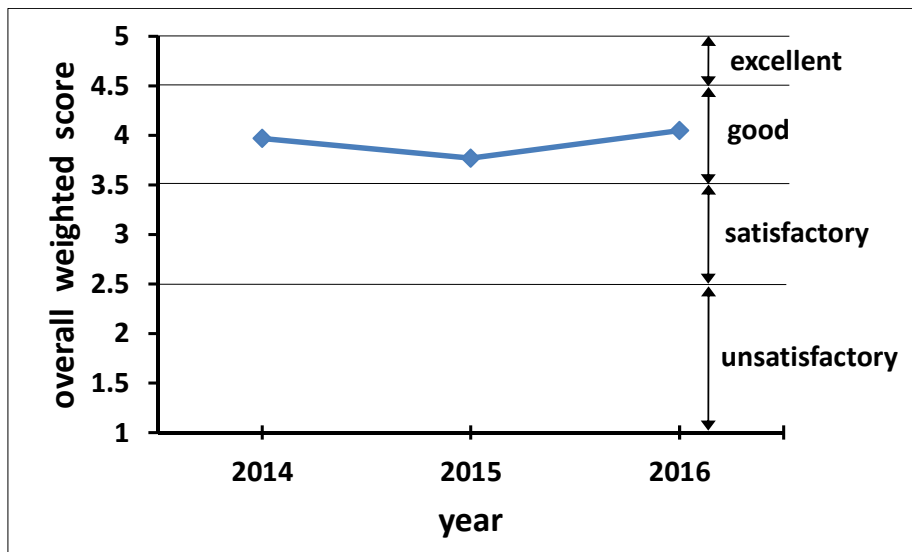


Figure E4.3: Overall weighted score of outcome ‘E’ over a period of last three years

The following actions have been taken based on the analysis of Outcome E

| Weighted Score for Outcome E | Recommendation | Reason | Implemented from |
|------------------------------|--|--|-------------------------|
| 3.77 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II. • Addition of an elective course on Design of Experiments and analysis • Increase in credits of Capstone project | Students can identify, formulate and solve engineering problems. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'F'
(Year 2016)**

for the

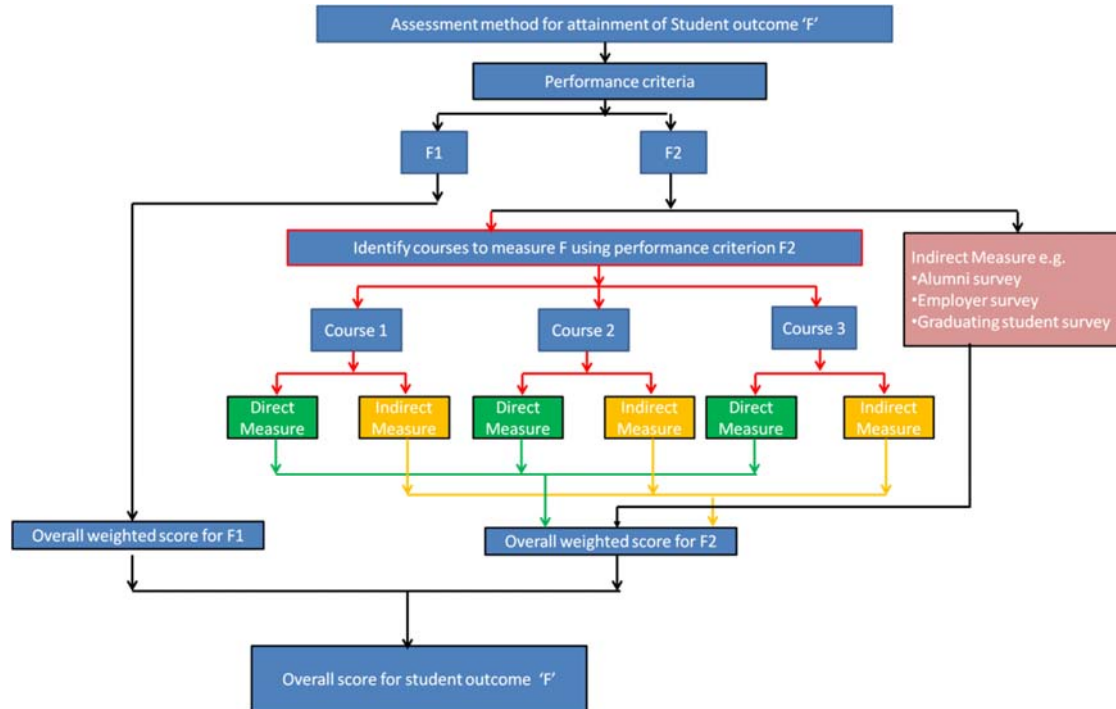
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome F

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'F'

Courses:

1. Project Semester (UME691),

Outcome F has been assessed by two performance criteria F1, and F2. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these two performance criteria has been used to measure the overall measure of outcome F.

1) Assessment of Outcome 'F' using performance criterion F1

Performance criteria 'F1': Evaluates ethical issues that may occur in professional practice using professional codes of ethics.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: One course namely Project Semester (UME691) was used to assess performance criteria A1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Project Semester (UME691)

The above performance criteria is used to measure the attainment of outcome 'F' by giving the following question (Question No.: A(ix) in second visit of Project Semester) to the students.

Question: Refers to the ability to conceptualise all aspects of project and to systematically plan the series of activities to achieve the goal.

Table F4.1: Student's performance targeting 'F1'; course: UME691

| S. No. | Roll No. of Students | F1 | Weight (Scale 1 to 5) |
|--------|----------------------|-----------------------------|-----------------------|
| | | (Q. No. A(iv)) (5 Marks) | |
| 1 | 101308008 | 5 | 5 |
| 2 | 101308013 | 5 | 5 |
| 3 | 101308019 | 4 | 4 |
| 4 | 101308023 | 5 | 5 |
| 5 | 101308024 | 5 | 5 |
| 6 | 101308025 | 5 | 5 |
| 7 | 101308026 | 5 | 5 |
| 8 | 101308027 | 5 | 5 |
| 9 | 101308028 | 5 | 5 |
| 10 | 101308029 | 5 | 5 |
| 11 | 101308031 | 5 | 5 |
| 12 | 101308035 | 5 | 5 |
| 13 | 101308037 | 5 | 5 |
| 14 | 101308038 | 5 | 5 |
| 15 | 101308043 | 5 | 5 |
| 16 | 101308046 | 5 | 5 |
| 17 | 101308054 | 5 | 5 |
| 18 | 101308059 | 5 | 5 |
| 19 | 101308060 | 4 | 4 |
| 20 | 101308061 | 5 | 5 |
| 21 | 101308063 | 5 | 5 |
| 22 | 101308066 | 5 | 5 |
| 23 | 101308067 | 5 | 5 |
| 24 | 101308074 | 4 | 4 |

| | | | |
|----|-----------|---|---|
| 25 | 101308076 | 5 | 5 |
| 26 | 101308077 | 5 | 5 |
| 27 | 101308078 | 5 | 5 |
| 28 | 101308079 | 5 | 5 |
| 29 | 101308083 | 4 | 4 |
| 30 | 101308085 | 4 | 4 |
| 31 | 101308093 | 5 | 5 |
| 32 | 101308094 | 4 | 4 |
| 33 | 101308096 | 4 | 4 |
| 34 | 101308098 | 4 | 4 |
| 35 | 101308099 | 5 | 5 |
| 36 | 101308100 | 5 | 5 |
| 37 | 101308101 | 5 | 5 |
| 38 | 101308111 | 4 | 4 |
| 39 | 101308113 | 5 | 5 |
| 40 | 101308114 | 4 | 4 |
| 41 | 101308116 | 4 | 4 |
| 42 | 101308118 | 4 | 4 |
| 43 | 101308119 | 5 | 5 |
| 44 | 101308120 | 5 | 5 |
| 45 | 101308122 | 5 | 5 |
| 46 | 101308123 | 5 | 5 |
| 47 | 101308124 | 5 | 5 |
| 48 | 101308125 | 5 | 5 |
| 49 | 101309007 | 5 | 5 |
| 50 | 101309022 | 4 | 4 |
| 51 | 101488005 | 5 | 5 |
| 52 | 101488011 | 5 | 5 |
| 53 | 101488012 | 5 | 5 |
| 54 | 101488013 | 5 | 5 |
| 55 | 101488015 | 4 | 4 |
| 56 | 101488017 | 5 | 5 |
| 57 | 101488018 | 5 | 5 |
| 58 | 101489001 | 5 | 5 |
| 59 | 101489002 | 5 | 5 |
| 60 | 101489003 | 5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table F4.2: Average score of student performance in the course UME691for criteria F1

| Course | % of students in each score | | | | | Average Score |
|---------|-----------------------------|-------|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME 691 | 76.67 | 23.33 | 0 | 0 | 0 | 4.77 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria F1 as given below in Table F4.3:

Table F4.3: Weighted Average Student class performance (course portfolio) for criteria F1

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 76.67 | 23.33 | 0 | 0 | 0 | 4.77 | 5 |
| Weighted average score | 76.67 | 23.33 | 0.00 | 0.00 | 0.00 | 4.77 | 5 |

b) Indirect measures for Performance criteria F1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table F4.4: Average score of student course survey for criteria F1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.387 | 38.02 | 36.45 | 3.19 | 0 | 3.80 | 5 |
| Weighted average score | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 5 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table F4.5: Assessment for criteria F1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 41.94 | 32.26 | 16.13 | 9.68 | 0.00 | 4.06 |
| Alumni survey | 62.96 | 22.22 | 11.11 | 3.70 | 0.00 | 4.44 |
| Employer Survey | 69.44 | 27.78 | 2.78 | 0.00 | 0.00 | 4.67 |

c) Overall weighted average score of performance criterion ‘F1’

Finally overall weighted average score of performance criterion ‘F1’ is evaluated as given below in Table F4.6:

Table F4.6: Overall weighted average score of performance criterion ‘F1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 76.7 | 23.3 | 0.0 | 0.0 | 0.0 | 4.8 | 5.0 |
| Weighted average student course survey | 22.4 | 38.0 | 36.5 | 3.2 | 0.0 | 3.8 | 4.0 |

| | | | | | | | |
|---------------------------|------|------|------|-----|-----|-----|------|
| Graduating student survey | 41.9 | 32.3 | 16.1 | 9.7 | 0.0 | 4.1 | 3.0 |
| Alumni survey | 63.0 | 22.2 | 11.1 | 3.7 | 0.0 | 4.4 | 3.0 |
| Employer survey | 69.4 | 27.8 | 2.8 | 0.0 | 0.0 | 4.7 | 3.0 |
| Overall weighted score | 55.3 | 28.6 | 13.1 | 2.9 | 0.0 | 4.4 | 18.0 |

Assessment of Outcome 'F' using performance criterion F2

Performance criteria 'F2': Interacts with industry, project sponsors, professional societies and/or communities in a professional manner.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Project Semester (UME691) and Student F1 Project were used to assess performance criteria F2 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Project Semester (UME691)

The above performance criteria is used to measure the attainment of outcome 'F' by giving the following question (Question No.: A(x) in second visit of Project Semester) to the students.

Question:

Refers to the ability to conceptualise all aspects of project and to systematically plan the series of activities to achieve the goal.

Table F4.7: Student's performance targeting 'F2'; course: UME691

| S. No. | Roll No. of Students | F2 | Weight (Scale 1 to 5) |
|--------|----------------------|-----------------------------|-----------------------|
| | | (Q. No. A(iv)) (5 Marks) | |
| 1 | 101308008 | 5 | 5 |
| 2 | 101308013 | 5 | 5 |
| 3 | 101308019 | 4 | 4 |
| 4 | 101308023 | 5 | 5 |
| 5 | 101308024 | 5 | 5 |
| 6 | 101308025 | 5 | 5 |
| 7 | 101308026 | 5 | 5 |
| 8 | 101308027 | 5 | 5 |
| 9 | 101308028 | 5 | 5 |
| 10 | 101308029 | 5 | 5 |
| 11 | 101308031 | 5 | 5 |
| 12 | 101308035 | 5 | 5 |
| 13 | 101308037 | 5 | 5 |
| 14 | 101308038 | 5 | 5 |
| 15 | 101308043 | 5 | 5 |

Attainment of Outcome F

| | | | |
|----|-----------|---|---|
| 16 | 101308046 | 5 | 5 |
| 17 | 101308054 | 5 | 5 |
| 18 | 101308059 | 5 | 5 |
| 19 | 101308060 | 4 | 4 |
| 20 | 101308061 | 5 | 5 |
| 21 | 101308063 | 5 | 5 |
| 22 | 101308066 | 5 | 5 |
| 23 | 101308067 | 5 | 5 |
| 24 | 101308074 | 4 | 4 |
| 25 | 101308076 | 5 | 5 |
| 26 | 101308077 | 5 | 5 |
| 27 | 101308078 | 5 | 5 |
| 28 | 101308079 | 5 | 5 |
| 29 | 101308083 | 4 | 4 |
| 30 | 101308085 | 4 | 4 |
| 31 | 101308093 | 5 | 5 |
| 32 | 101308094 | 4 | 4 |
| 33 | 101308096 | 4 | 4 |
| 34 | 101308098 | 4 | 4 |
| 35 | 101308099 | 5 | 5 |
| 36 | 101308100 | 5 | 5 |
| 37 | 101308101 | 5 | 5 |
| 38 | 101308111 | 4 | 4 |
| 39 | 101308113 | 5 | 5 |
| 40 | 101308114 | 4 | 4 |
| 41 | 101308116 | 4 | 4 |
| 42 | 101308118 | 4 | 4 |
| 43 | 101308119 | 5 | 5 |
| 44 | 101308120 | 5 | 5 |
| 45 | 101308122 | 5 | 5 |
| 46 | 101308123 | 5 | 5 |
| 47 | 101308124 | 5 | 5 |
| 48 | 101308125 | 5 | 5 |
| 49 | 101309007 | 5 | 5 |
| 50 | 101309022 | 4 | 4 |
| 51 | 101488005 | 5 | 5 |
| 52 | 101488011 | 5 | 5 |
| 53 | 101488012 | 5 | 5 |
| 54 | 101488013 | 5 | 5 |
| 55 | 101488015 | 4 | 4 |
| 56 | 101488017 | 5 | 5 |
| 57 | 101488018 | 5 | 5 |
| 58 | 101489001 | 5 | 5 |
| 59 | 101489002 | 5 | 5 |
| 60 | 101489003 | 5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table F4.8: Average score of student performance in the course UME691for criteria F2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 76.67 | 23.33 | 0 | 0 | 0 | 4.77 |

*Step 2:*The above data is used to evaluate weighted average student class performance (course portfolio) for criteria F2 as given below in Table F4.9:

Table F4.9: Weighted Average Student class performance (course portfolio) for criteria F2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME691 | 76.67 | 23.33 | 0 | 0 | 0 | 4.77 | 5 |
| Weighted average score | 76.67 | 23.33 | 0.00 | 0.00 | 0.00 | 4.77 | 5 |

b.) Assessment Tool: Student Course Survey

Table F4.10: Average score of student course survey for criteria F2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME691 | 7.7 | 23.1 | 25.6 | 43.6 | 0 | 2.95 | 5 |
| Weighted average score | 7.70 | 23.10 | 25.60 | 43.60 | 0.00 | 2.95 | 5 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table F4.11: Assessment for criteria F2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 41.94 | 32.26 | 16.13 | 9.68 | 0.00 | 4.06 |
| Alumni survey | 62.96 | 22.22 | 11.11 | 3.70 | 0.00 | 4.44 |
| Employer Survey | 69.44 | 27.78 | 2.78 | 0.00 | 0.00 | 4.67 |

Finally overall weighted average score of performance criterion 'F2' is evaluated as given below in Table F4.12:

Table F4.12: Overall weighted average score of performance criterion 'F2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|------|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 76.7 | 23.3 | 0.0 | 0.0 | 0.0 | 4.8 | 5.0 |
| Weighted average student course survey | 7.7 | 23.1 | 25.6 | 43.6 | 0.0 | 2.9 | 4.0 |
| Graduating student survey | 41.9 | 32.3 | 16.1 | 9.7 | 0.0 | 4.1 | 3.0 |
| Alumni survey | 63.0 | 22.2 | 11.1 | 3.7 | 0.0 | 4.4 | 3.0 |
| Employer survey | 69.4 | 27.8 | 2.8 | 0.0 | 0.0 | 4.7 | 3.0 |
| Overall weighted score | 52.1 | 25.3 | 10.7 | 11.9 | 0.0 | 4.2 | 18.0 |

Overall assessment of program outcome F using scores of F1 and F2

In the above sections, each of the individual performance criteria F1 and F2 have been assessed. The performance for attainment of outcome F has been completed using the attainment values for F1 and F2 and is provided below:

Table F4.13 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome F.

Table F4.13: Overall score for outcome F at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|-------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| F1 | 55.33 | 28.64 | 13.10 | 2.94 | 0.00 | 4.36 | 5 |
| F2 | 52.07 | 25.32 | 10.69 | 11.92 | 0.00 | 4.18 | 5 |
| Overall score | 53.70 | 26.98 | 11.90 | 7.43 | 0.00 | 4.27 | 10 |

Track Record and assessment of attainment of program outcome ‘F’ over the last three academic years

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

The following table F4.14 presents the performance criteria-wise assessment score distribution for outcome ‘F’

Table F4.14: Performance criteria-wise assessment score distribution of outcome F

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| F | F1 | 4.04 | 4.05 | 4.36 |
| | F2 | 4.05 | 4.03 | 4.18 |

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

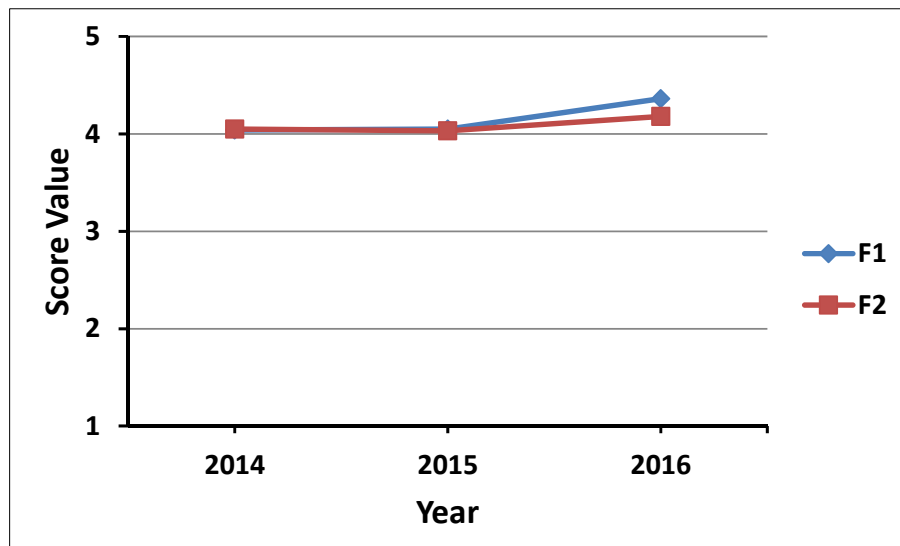


Figure F4.2: Performance criteria-wise assessment score distribution of outcome F

Level of attainment of program outcome ‘F’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table F4.15 presents the overall weighted score of outcome ‘F’ over the last three academic years.

Table F4.15: Overall weighted score of outcome ‘F’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.04 | good |
| 2015 | 4.04 | good |
| 2016 | 4.27 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘F’ over a period of last three years.

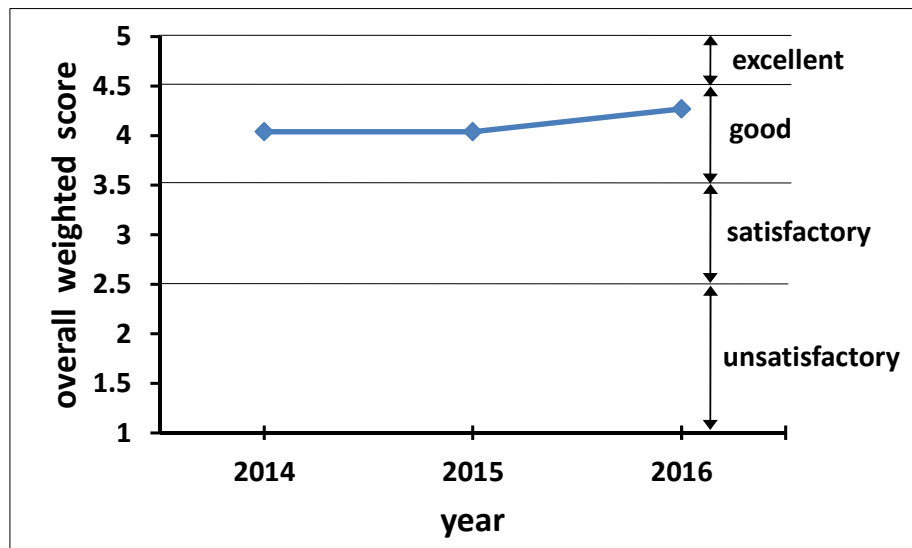


Figure F4.3: Overall weighted score of outcome ‘F’ over a period of last three years

The following actions have been taken based on the analysis of Outcome F

| Weighted Score for Outcome F | Recommendation | Reason | Implemented from |
|------------------------------|---|---|-------------------------|
| 4.04 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students are able to learn professional responsibilities. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'G'
(Year 2016)**

for the

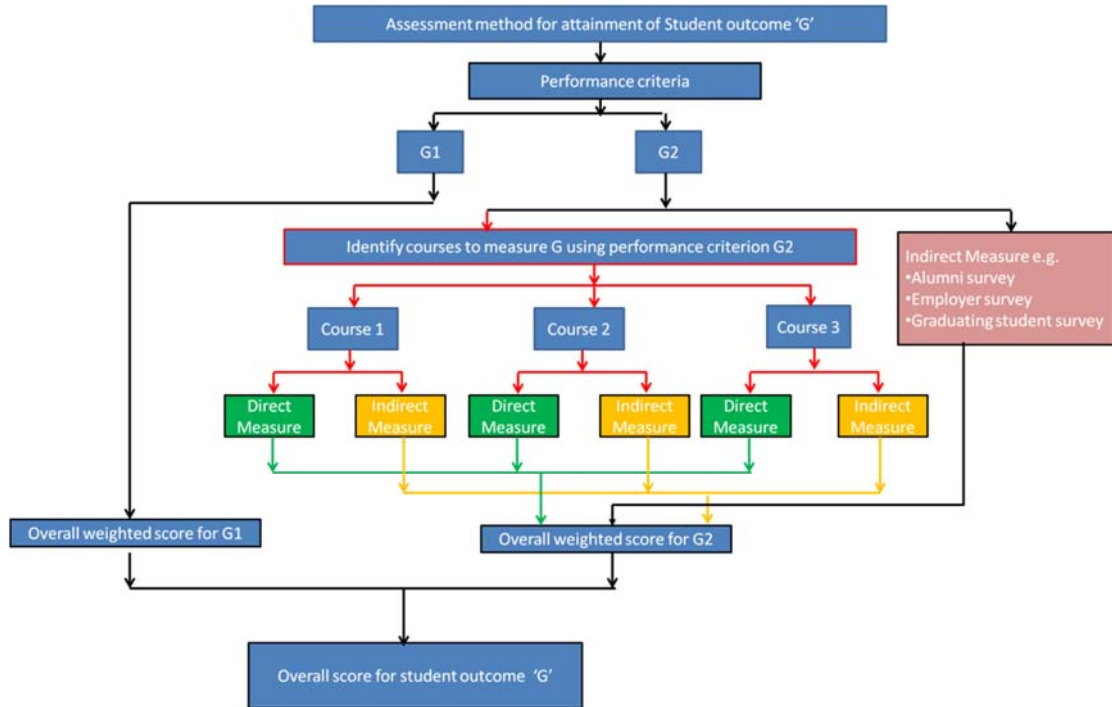
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome G

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'G'

Courses:

1. Project Semester (UME691)
2. Mechanical System Design (UME801)

Outcome G has been assessed by two performance criteria G1, and G2. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these two performance criteria has been used to measure the overall measure of outcome G.

1) Assessment of Outcome 'G' using performance criterion G1

Performance criteria 'G1': Produce a variety of documents such as laboratory or project reports using appropriate formats and grammar with discipline specific conventions including citations.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Project Semester (UME691) and Mechanical System Design (UME801) were used to assess performance criteria G1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Project Semester (UME691)

The above performance criteria is used to measure the attainment of outcome 'G' by giving the following question (EvaluationNo.: ReportWriting during final evaluation of Project Semester in department) to the students.

Question:

Each student has to submit one printed report on the projects completed during training. Students are evaluated on the basis of report writing skills, formatting, grammar mistakes and overall structure of the report.

(The criteria 'G1' is evaluated from the internal panel evaluation and review of the training reports conducted by individual faculty members.)

Table G4.1: Student's performance targeting 'G1'; course: UME691

| S. No. | Roll No. of Students | G1 | |
|--------|----------------------|-------------|-----------------------|
| | | Report (20) | Weight (Scale 1 to 5) |
| 1 | 101308008 | 14.0 | 4 |
| 2 | 101308013 | 14.0 | 4 |
| 3 | 101308019 | 17.0 | 5 |
| 4 | 101308023 | 16.0 | 4 |
| 5 | 101308024 | 16.0 | 4 |
| 6 | 101308025 | 16.0 | 4 |
| 7 | 101308027 | 15.0 | 4 |
| 8 | 101308028 | 13.0 | 4 |
| 9 | 101308029 | 19.0 | 5 |
| 10 | 101308031 | 18.0 | 5 |
| 11 | 101308035 | 16.0 | 4 |
| 12 | 101308037 | 13.0 | 4 |
| 13 | 101308038 | 16.0 | 4 |
| 14 | 101308043 | 14.0 | 4 |
| 15 | 101308046 | 17.0 | 5 |
| 16 | 101308054 | 17.0 | 5 |
| 17 | 101308059 | 15.0 | 4 |
| 18 | 101308060 | 15.0 | 4 |

| | | | |
|----|-----------|------|---|
| 19 | 101308061 | 16.0 | 4 |
| 20 | 101308063 | 18.0 | 5 |
| 21 | 101308066 | 17.0 | 5 |
| 22 | 101308074 | 12.0 | 3 |
| 23 | 101308076 | 14.0 | 4 |
| 24 | 101308077 | 18.0 | 5 |
| 25 | 101308078 | 15.0 | 4 |
| 26 | 101308079 | 16.0 | 4 |
| 27 | 101308083 | 17.0 | 5 |
| 28 | 101308093 | 15.0 | 4 |
| 29 | 101308094 | 14.0 | 4 |
| 30 | 101308096 | 16.0 | 4 |
| 31 | 101308098 | 18.0 | 5 |
| 32 | 101308099 | 14.0 | 4 |
| 33 | 101308100 | 17.0 | 5 |
| 34 | 101308101 | 18.0 | 5 |
| 35 | 101308111 | 17.0 | 5 |
| 36 | 101308113 | 19.0 | 5 |
| 37 | 101308114 | 18.0 | 5 |
| 38 | 101308116 | 18.0 | 5 |
| 39 | 101308118 | 19.0 | 5 |
| 40 | 101308119 | 16.0 | 4 |
| 41 | 101308120 | 14.0 | 4 |
| 42 | 101308122 | 17.0 | 5 |
| 43 | 101308123 | 19.0 | 5 |
| 44 | 101308124 | 18.0 | 5 |
| 45 | 101308125 | 17.0 | 5 |
| 46 | 101309022 | 16.0 | 4 |
| 47 | 101488005 | 18.0 | 5 |
| 48 | 101488011 | 15.0 | 4 |
| 49 | 101488012 | 17.0 | 5 |
| 50 | 101488013 | 15.0 | 4 |
| 51 | 101488015 | 14.0 | 4 |
| 52 | 101488017 | 14.0 | 4 |
| 53 | 101488018 | 15.0 | 4 |
| 54 | 101489001 | 17.0 | 5 |
| 55 | 101489002 | 13.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table G4.2: Average score of student performance in the course UME691for criteria G1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 43.6 | 54.5 | 1.9 | 0 | 0 | 4.4 |

(ii) Course: Mechanical System Design (UME801)

Final Evaluation: Detailed printed report along with PPT presentation and soft copy of CAD & CAE work. (15)

Student's performance in the above question is given below:

Table G4.3: Student's performance in question targeting 'G1'; course: UME801

| S.No. | Roll no. | Name | MARKS (15) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 13.0 | 5 |
| 2 | 101208002 | Aditya Anand | 12.0 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 13.0 | 5 |
| 4 | 101208004 | AkankshVashistha | 12.0 | 4 |
| 5 | 101208005 | Akshay | 13.0 | 5 |
| 6 | 101208006 | AkshayKaura | 13.0 | 5 |
| 7 | 101208007 | AmanJamwal | 12.0 | 4 |
| 8 | 101208008 | Aman Sharma | 12.0 | 4 |
| 9 | 101208009 | AmanVerma | 12.0 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 12.0 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 12.0 | 4 |
| 12 | 101208012 | Amol | 12.0 | 4 |
| 13 | 101208013 | Amrinder Singh | 12.0 | 4 |
| 14 | 101208016 | AnkurWasdev | 12.0 | 4 |
| 15 | 101208017 | AnshumanHanda | 12.0 | 4 |
| 16 | 101208019 | Anuj Kumar | 12.0 | 4 |
| 17 | 101208020 | AnuragPanthey | 13.0 | 5 |
| 18 | 101208022 | Arshdeep Singh | 12.0 | 4 |
| 19 | 101208023 | Arvind | 10.0 | 4 |
| 20 | 101208024 | ArvindMahey | 10.0 | 4 |
| 21 | 101208025 | Ashish Tandon | 10.0 | 4 |
| 22 | 101208026 | AshutoshPalta | 12.0 | 4 |
| 23 | 101208027 | AtulBatish | 10.0 | 4 |
| 24 | 101208028 | Aviral Prasad | 10.0 | 4 |
| 25 | 101208029 | AyushUniyal | 10.0 | 4 |
| 26 | 101208030 | Bhanu Sharma | 12.0 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 10.0 | 4 |
| 28 | 101208032 | Charanjeet Singh | 10.0 | 4 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 12.0 | 4 |
| 30 | 101208034 | Chirag Jain | 12.0 | 4 |
| 31 | 101208035 | Debopam Das | 10.0 | 4 |
| 32 | 101208036 | Deepak Singh | 10.0 | 4 |
| 33 | 101208037 | G S Tushar | 10.0 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 10.0 | 4 |
| 35 | 101208039 | Gaurav Garg | 10.0 | 4 |
| 36 | 101208040 | Gaurav Goyal | 10.0 | 4 |
| 37 | 101208042 | Gaurav Kakkar | 12.0 | 4 |

| | | | | |
|----|-----------|------------------------|------|---|
| 38 | 101208044 | Guriqbal Singh | 12.0 | 4 |
| 39 | 101208045 | Gurleen Singh | 11.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 11.0 | 4 |
| 41 | 101208048 | Harish Garg | 12.0 | 4 |
| 42 | 101208049 | Harsh Raheja | 12.0 | 4 |
| 43 | 101208051 | HimanshuGambhir | 14.0 | 5 |
| 44 | 101208052 | Ishita Jain | 12.0 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 12.0 | 4 |
| 46 | 101208054 | Jatin Mittal | 12.0 | 4 |
| 47 | 101208055 | Jatin Singh | 14.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 12.0 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 12.0 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 11.0 | 4 |
| 51 | 101208060 | KapilChaand | 12.0 | 4 |
| 52 | 101208061 | Karan Mehra | 12.0 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 12.0 | 4 |
| 54 | 101208063 | KartikSingla | 12.0 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 12.0 | 4 |
| 56 | 101208065 | KunalGarg | 10.0 | 4 |
| 57 | 101208066 | Kushagra | 12.0 | 4 |
| 58 | 101208068 | Manan Shah | 12.0 | 4 |
| 59 | 101208069 | ManavJuneja | 13.0 | 5 |
| 60 | 101208070 | Manjot Singh | 10.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 12.0 | 4 |
| 62 | 101208073 | Mrigank Gupta | 13.0 | 5 |
| 63 | 101208075 | Navraj Singh | 12.0 | 4 |
| 64 | 101208076 | Nikhil Sehdev | 10.0 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 12.0 | 4 |
| 66 | 101208078 | Nishant Bansal | 10.0 | 4 |
| 67 | 101208079 | NishantGoyal | 10.0 | 4 |
| 68 | 101208080 | NishantKabra | 12.0 | 4 |
| 69 | 101208081 | NiteeshDua | 14.0 | 5 |
| 70 | 101208082 | Nitin Mahajan | 13.0 | 5 |
| 71 | 101208083 | Nitish Gupta | 13.0 | 5 |
| 72 | 101208084 | Omang | 10.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 13.0 | 5 |
| 74 | 101208086 | Pranav Lakhina | 12.0 | 4 |
| 75 | 101208088 | Pulkit Gupta | 12.0 | 4 |
| 76 | 101208089 | Puneet Arora | 9.0 | 4 |
| 77 | 101208090 | PurushottamMeena | 9.0 | 4 |
| 78 | 101208091 | Rahul Agarwal | 11.0 | 4 |
| 79 | 101208092 | Rahul Goyal | 9.0 | 4 |
| 80 | 101208093 | RajatParmar | 11.0 | 4 |
| 81 | 101208094 | Rajat Sharma | 11.0 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 9.0 | 4 |
| 83 | 101208096 | Ravinder Singh | 9.0 | 4 |

| | | | | |
|-----|-----------|--------------------|------|---|
| 84 | 101208097 | Ritvik Singh | 9.0 | 4 |
| 85 | 101208101 | Sagar Saini | 9.0 | 4 |
| 86 | 101208102 | Sahil Arora | 9.0 | 4 |
| 87 | 101208104 | SanchitSachdeva | 12.0 | 4 |
| 88 | 101208106 | SarthakMattas | 12.0 | 4 |
| 89 | 101208107 | Saurav Sharma | 12.0 | 4 |
| 90 | 101208108 | ShaileshPeriwal | 12.0 | 4 |
| 91 | 101208110 | Shashank Jain | 11.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 12.0 | 4 |
| 93 | 101208112 | Shourya Singh | 11.0 | 4 |
| 94 | 101208113 | Shray Mehta | 11.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 12.0 | 4 |
| 96 | 101208115 | Shubham Bansal | 12.0 | 4 |
| 97 | 101208116 | Shubham Chaudhary | 12.0 | 4 |
| 98 | 101208117 | ShubhamSaha | 13.0 | 5 |
| 99 | 101208118 | ShubhamSen | 8.0 | 3 |
| 100 | 101208120 | Sugam Arora | 8.0 | 3 |
| 101 | 101208121 | Sukhdev Singh | 8.0 | 3 |
| 102 | 101208123 | Sunil Singh | 8.0 | 3 |
| 103 | 101208125 | Tanveer Mehta | 12.0 | 4 |
| 104 | 101208126 | Tejinder Pal Singh | 13.0 | 5 |
| 105 | 101208129 | UllasChugh | 13.0 | 5 |
| 106 | 101208131 | VarinderSingla | 13.0 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 13.0 | 5 |
| 108 | 101208133 | VinayGarg | 13.0 | 5 |
| 109 | 101208134 | VineshGarg | 13.0 | 5 |
| 110 | 101208136 | VivekGoyal | 13.0 | 5 |
| 111 | 101208138 | YashKhemka | 12.0 | 4 |
| 112 | 101208139 | Yuvraj Singh | 13.0 | 5 |
| 113 | 101208140 | JiveshBedi | 10.0 | 4 |
| 114 | 101208142 | Vasu Sharma | 12.0 | 4 |
| 115 | 101388001 | Amit Tripathi | 12.0 | 4 |
| 116 | 101388002 | AnkitSetia | 12.0 | 4 |
| 117 | 101388003 | Jaswant Singh | 11.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 10.0 | 4 |
| 119 | 101388005 | Rahul Sharma | 10.0 | 4 |
| 120 | 101388006 | Rahul Verma | 13.0 | 5 |
| 121 | 101388007 | Rahul Verma | 14.0 | 5 |
| 122 | 101388008 | Rajan | 13.0 | 5 |
| 123 | 101388009 | Ramandeep Singh | 9.0 | 4 |
| 124 | 101388010 | Shivam Bhatia | 9.0 | 4 |
| 125 | 101388011 | Sukhvir Singh | 9.0 | 4 |
| 126 | 101388012 | Sunil Kumar | 12.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table G4.4: Average score of student performance in the course UME801for criteria G1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 19.8 | 77.0 | 3.2 | 0 | 0 | 4.16 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria G1 as given below in Table G4.5:

Table G4.5: Weighted Average Student class performance (course portfolio) for criteria G1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME691 | 43.6 | 54.5 | 1.9 | 0 | 0 | 4.42 | 4 |
| UME801 | 19.8 | 77 | 3.2 | 0 | 0 | 4.17 | 5 |
| Weighted average score | 30.38 | 67.00 | 2.62 | 0.00 | 0.00 | 4.28 | 9 |

b) Indirect measures for Performance criteria G1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table G4.6: Average score of student course survey for criteria G1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 4.00 |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 21.28 | 42.03 | 30.28 | 6.49 | 0.00 | 3.78 | 9.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table G4.7: Assessment for criteria G1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 32.26 | 6.45 | 0.00 | 0.00 | 4.55 |
| Alumni survey | 59.26 | 37.04 | 3.70 | 0.00 | 0.00 | 4.56 |
| Employer Survey | 66.67 | 25.00 | 5.56 | 0.00 | 0.00 | 4.50 |

c) Overall weighted average score of performance criterion ‘G1’

Finally overall weighted average score of performance criterion ‘G1’ is evaluated as given below in Table G4.8:

Table G4.8: Overall weighted average score of performance criterion ‘G1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 30.4 | 67.0 | 2.6 | 0.0 | 0.0 | 4.3 | 5.0 |
| Weighted average student course survey | 21.3 | 42.0 | 30.3 | 6.5 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 61.3 | 32.3 | 6.5 | 0.0 | 0.0 | 4.5 | 3.0 |
| Alumni survey | 59.3 | 37.0 | 3.7 | 0.0 | 0.0 | 4.6 | 3.0 |
| Employer survey | 66.7 | 25.0 | 5.6 | 0.0 | 0.0 | 4.5 | 3.0 |
| Overall weighted score | 44.4 | 43.7 | 10.1 | 1.4 | 0.0 | 4.3 | 18.0 |

Assessment of Outcome ‘G’ using performance criterion G2

Performance criteria ‘G2’: Deliver well organized, logical oral presentation, including good explanations when questioned.

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: Two courses namely Project Semester (UME691) and Mechanical System Design (UME801) were used to assess performance criteria G1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Project Semester (UME691)

The above performance criteria is used to measure the attainment of outcome ‘G’ by giving the following question (EvaluationNo.: Communication skills and Question answer during final evaluation of Project Semester in department) to the students.

Question:

Students are evaluated by a group of members for the evaluation of communication skills during presentation of the project report and his/her ability of answer the questions raised by the panel.

Student’s performance in the above question is given below in Table G4.13:(The criteria ‘G2’ is evaluated by the internal panel through the oral presentation by the students during their post training seminar)

Table G4.9: Student's performance targeting 'G2'; course: UME691

| S. No. | Roll No. of Students | G2 | Weight (Scale 1 to 5) |
|--------|----------------------|--------------------------|-----------------------|
| | | Communication Skill (10) | |
| 1 | 101308008 | 9 | 5 |
| 2 | 101308013 | 8 | 4 |
| 3 | 101308019 | 9 | 5 |
| 4 | 101308023 | 8 | 4 |
| 5 | 101308024 | 8 | 4 |
| 6 | 101308025 | 7 | 4 |
| 7 | 101308027 | 9 | 5 |
| 8 | 101308028 | 7 | 4 |
| 9 | 101308029 | 10 | 5 |
| 10 | 101308031 | 9 | 5 |
| 11 | 101308035 | 7 | 4 |
| 12 | 101308037 | 7 | 4 |
| 13 | 101308038 | 7 | 4 |
| 14 | 101308043 | 8 | 4 |
| 15 | 101308046 | 9 | 5 |
| 16 | 101308054 | 9 | 5 |
| 17 | 101308059 | 6 | 3 |
| 18 | 101308060 | 8 | 4 |
| 19 | 101308061 | 8 | 4 |
| 20 | 101308063 | 9 | 5 |
| 21 | 101308066 | 7 | 4 |
| 22 | 101308074 | 6 | 3 |
| 23 | 101308076 | 5 | 3 |
| 24 | 101308077 | 7 | 4 |
| 25 | 101308078 | 7 | 4 |
| 26 | 101308079 | 8 | 4 |
| 27 | 101308083 | 9 | 5 |
| 28 | 101308093 | 8 | 4 |
| 29 | 101308094 | 6 | 3 |
| 30 | 101308096 | 8 | 4 |
| 31 | 101308098 | 9 | 5 |
| 32 | 101308099 | 7 | 4 |
| 33 | 101308100 | 9 | 5 |
| 34 | 101308101 | 9 | 5 |
| 35 | 101308111 | 8 | 4 |
| 36 | 101308113 | 9 | 5 |
| 37 | 101308114 | 9 | 5 |
| 38 | 101308116 | 9 | 5 |
| 39 | 101308118 | 9 | 5 |

| | | | |
|----|-----------|----|---|
| 40 | 101308119 | 7 | 4 |
| 41 | 101308120 | 7 | 4 |
| 42 | 101308122 | 9 | 5 |
| 43 | 101308123 | 10 | 5 |
| 44 | 101308124 | 9 | 5 |
| 45 | 101308125 | 9 | 5 |
| 46 | 101309022 | 9 | 5 |
| 47 | 101488005 | 10 | 5 |
| 48 | 101488011 | 6 | 3 |
| 49 | 101488012 | 10 | 5 |
| 50 | 101488013 | 8 | 4 |
| 51 | 101488015 | 8 | 4 |
| 52 | 101488017 | 8 | 4 |
| 53 | 101488018 | 7 | 4 |
| 54 | 101489001 | 9 | 5 |
| 55 | 101489002 | 8 | 4 |

The overall performance of students in the above question is then summarized as given below

Table G4.10: Average score of student performance in the course UME691 for criteria G2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 43.6 | 47.3 | 9.1 | 0 | 0 | 4.35 |

(ii) **Course:** Mechanical System Design (UME801)

The above performance criteria is used to measure the attainment of outcome 'G' by giving the following question (From the final report and evaluation) to the students.

Question:

Final Evaluation: Designed and fabricated (showcase) product in working condition to be demonstrated before the evaluation committee. (30)

Student's performance in the above question is given below:

Table G4.11: Student's performance in question targeting 'G2'; course: UME801

| S.No. | Rollno. | Name | MARKS (30) | SCORE (1-5) |
|-------|-----------|------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 25.5 | 5 |
| 2 | 101208002 | Aditya Anand | 21.7 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 25.5 | 5 |
| 4 | 101208004 | AkankshVashistha | 21.8 | 4 |
| 5 | 101208005 | Akshay | 25.5 | 5 |
| 6 | 101208006 | AkshayKaura | 25.5 | 5 |
| 7 | 101208007 | AmanJamwal | 21.8 | 4 |

| | | | | |
|----|-----------|--------------------------|------|---|
| 8 | 101208008 | Aman Sharma | 21.8 | 4 |
| 9 | 101208009 | AmanVerma | 21.8 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 21.7 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 24.3 | 5 |
| 12 | 101208012 | Amol | 21.7 | 4 |
| 13 | 101208013 | Amrinder Singh | 24.3 | 5 |
| 14 | 101208016 | AnkurWasdev | 24.3 | 5 |
| 15 | 101208017 | AnshumanHanda | 24.3 | 5 |
| 16 | 101208019 | Anuj Kumar | 24.3 | 5 |
| 17 | 101208020 | AnuragPanthey | 25.5 | 5 |
| 18 | 101208022 | Arshdeep Singh | 21.8 | 4 |
| 19 | 101208023 | Arvind | 21.3 | 4 |
| 20 | 101208024 | ArvindMahey | 21.3 | 4 |
| 21 | 101208025 | Ashish Tandon | 21.3 | 4 |
| 22 | 101208026 | AshutoshPalta | 25.5 | 5 |
| 23 | 101208027 | AtulBatish | 21.7 | 4 |
| 24 | 101208028 | Aviral Prasad | 21.7 | 4 |
| 25 | 101208029 | AyushUniyal | 21.7 | 4 |
| 26 | 101208030 | Bhanu Sharma | 25.5 | 5 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 21.3 | 4 |
| 28 | 101208032 | Charanjeet Singh | 21.3 | 4 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 25.5 | 5 |
| 30 | 101208034 | Chirag Jain | 25.5 | 5 |
| 31 | 101208035 | Debopam Das | 21.7 | 4 |
| 32 | 101208036 | Deepak Singh | 21.7 | 4 |
| 33 | 101208037 | G S Tushar | 21.7 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 21.7 | 4 |
| 35 | 101208039 | Gaurav Garg | 21.7 | 4 |
| 36 | 101208040 | Gaurav Goyal | 21.3 | 4 |
| 37 | 101208042 | Gaurav Kakkar | 25.5 | 5 |
| 38 | 101208044 | Guriqbal Singh | 21.0 | 4 |
| 39 | 101208045 | Gurleen Singh | 21.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 21.0 | 4 |
| 41 | 101208048 | Harish Garg | 21.8 | 4 |
| 42 | 101208049 | Harsh Raheja | 21.8 | 4 |
| 43 | 101208051 | HimanshuGambhir | 26.5 | 5 |
| 44 | 101208052 | Ishita Jain | 22.5 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 22.5 | 4 |
| 46 | 101208054 | Jatin Mittal | 21.0 | 4 |
| 47 | 101208055 | Jatin Singh | 26.5 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 21.0 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 21.0 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 21.0 | 4 |
| 51 | 101208060 | KapilChaand | 22.5 | 4 |

| | | | | |
|----|-----------|------------------------|------|---|
| 52 | 101208061 | Karan Mehra | 22.5 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 22.5 | 4 |
| 54 | 101208063 | KartikSingla | 21.8 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 21.0 | 4 |
| 56 | 101208065 | KunalGarg | 21.0 | 4 |
| 57 | 101208066 | Kushagra | 22.3 | 4 |
| 58 | 101208068 | Manan Shah | 23.5 | 4 |
| 59 | 101208069 | ManavJuneja | 23.8 | 4 |
| 60 | 101208070 | Manjot Singh | 21.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 23.5 | 4 |
| 62 | 101208073 | Mrigank Gupta | 23.8 | 4 |
| 63 | 101208075 | Navraj Singh | 23.5 | 4 |
| 64 | 101208076 | Nikhil Sehdev | 21.7 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 22.3 | 4 |
| 66 | 101208078 | Nishant Bansal | 21.0 | 4 |
| 67 | 101208079 | NishantGoyal | 21.0 | 4 |
| 68 | 101208080 | NishantKabra | 22.3 | 4 |
| 69 | 101208081 | NiteeshDua | 26.5 | 5 |
| 70 | 101208082 | Nitin Mahajan | 23.8 | 4 |
| 71 | 101208083 | Nitish Gupta | 23.8 | 4 |
| 72 | 101208084 | Omang | 21.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 23.8 | 4 |
| 74 | 101208086 | Pranav Lakhina | 23.5 | 4 |
| 75 | 101208088 | Pulkit Gupta | 22.3 | 4 |
| 76 | 101208089 | Puneet Arora | 20.8 | 4 |
| 77 | 101208090 | PurushottamMeena | 20.8 | 4 |
| 78 | 101208091 | Rahul Agarwal | 24.2 | 5 |
| 79 | 101208092 | Rahul Goyal | 21.2 | 4 |
| 80 | 101208093 | RajatParmar | 24.2 | 5 |
| 81 | 101208094 | Rajat Sharma | 24.2 | 5 |
| 82 | 101208095 | Rajiv Chauhan | 21.2 | 4 |
| 83 | 101208096 | Ravinder Singh | 21.2 | 4 |
| 84 | 101208097 | Ritvik Singh | 20.8 | 4 |
| 85 | 101208101 | Sagar Saini | 20.8 | 4 |
| 86 | 101208102 | Sahil Arora | 20.8 | 4 |
| 87 | 101208104 | SanchitSachdeva | 24.3 | 5 |
| 88 | 101208106 | SarthakMattas | 24.3 | 5 |
| 89 | 101208107 | Saurav Sharma | 24.3 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 24.3 | 5 |
| 91 | 101208110 | Shashank Jain | 24.2 | 5 |
| 92 | 101208111 | Shashwat Seth | 24.3 | 5 |
| 93 | 101208112 | Shourya Singh | 24.2 | 5 |
| 94 | 101208113 | Shray Mehta | 24.2 | 5 |
| 95 | 101208114 | Shrey Kumar Dhiman | 21.8 | 4 |

| | | | | |
|-----|-----------|--------------------|------|---|
| 96 | 101208115 | Shubham Bansal | 21.8 | 4 |
| 97 | 101208116 | Shubham Chaudhary | 21.8 | 4 |
| 98 | 101208117 | ShubhamSaha | 23.2 | 4 |
| 99 | 101208118 | ShubhamSen | 7.0 | 1 |
| 100 | 101208120 | Sugam Arora | 16.5 | 3 |
| 101 | 101208121 | Sukhdev Singh | 16.5 | 3 |
| 102 | 101208123 | Sunil Singh | 16.5 | 3 |
| 103 | 101208125 | Tanveer Mehta | 21.8 | 4 |
| 104 | 101208126 | Tejinder Pal Singh | 24.8 | 5 |
| 105 | 101208129 | UllasChugh | 23.2 | 4 |
| 106 | 101208131 | VarinderSingla | 24.8 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 23.2 | 4 |
| 108 | 101208133 | VinayGarg | 24.8 | 5 |
| 109 | 101208134 | VineshGarg | 24.8 | 5 |
| 110 | 101208136 | VivekGoyal | 23.2 | 4 |
| 111 | 101208138 | YashKhemka | 21.8 | 4 |
| 112 | 101208139 | Yuvraj Singh | 23.2 | 4 |
| 113 | 101208140 | JiveshBedi | 21.3 | 4 |
| 114 | 101208142 | Vasu Sharma | 23.5 | 4 |
| 115 | 101388001 | Amit Tripathi | 21.7 | 4 |
| 116 | 101388002 | AnkitSetia | 21.7 | 4 |
| 117 | 101388003 | Jaswant Singh | 21.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 21.7 | 4 |
| 119 | 101388005 | Rahul Sharma | 21.3 | 4 |
| 120 | 101388006 | Rahul Verma | 24.8 | 5 |
| 121 | 101388007 | Rahul Verma | 26.5 | 5 |
| 122 | 101388008 | Rajan | 24.8 | 5 |
| 123 | 101388009 | Ramandeep Singh | 21.2 | 4 |
| 124 | 101388010 | Shivam Bhatia | 21.2 | 4 |
| 125 | 101388011 | Sukhvir Singh | 21.2 | 4 |
| 126 | 101388012 | Sunil Kumar | 22.3 | 4 |

The overall performance of students in the above question is then summarized as given below

Table G4.12: Average score of student performance in the course UME801for criteria G2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 28.6 | 68.3 | 2.4 | 0 | 0.8 | 4.24 |

Step 2:The above data is used to evaluate weighted average student class performance (course portfolio) for criteria G2 as given below in Table G4.13

Table G4.13: Weighted Average Student class performance (course portfolio) for criteria G2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME691 | 43.6 | 47.3 | 9.1 | 0 | 0 | 4.35 | 4 |
| UME801 | 28.6 | 68.3 | 2.4 | 0 | 0.8 | 4.24 | 5 |
| Weighted average score | 35.27 | 58.97 | 5.38 | 0.00 | 0.44 | 4.29 | 9 |

b.) Assessment Tool: Student Course Survey

Table G4.14: Average score of student course survey for criteria G2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 4.00 |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 21.28 | 42.03 | 30.28 | 6.49 | 0.00 | 3.78 | 9.00 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table G4.15: Assessment for criteria G2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 32.26 | 6.45 | 0.00 | 0.00 | 4.55 |
| Alumni survey | 59.26 | 37.04 | 3.70 | 0.00 | 0.00 | 4.56 |
| Employer Survey | 66.67 | 25.00 | 5.56 | 0.00 | 0.00 | 4.50 |

Finally overall weighted average score of performance criterion ‘G2’ is evaluated as given below in Table G4.16:

Table G4.16: Overall weighted average score of performance criterion ‘G2’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 35.3 | 59.0 | 5.4 | 0.0 | 0.4 | 4.3 | 5.0 |
| Weighted average student course survey | 21.3 | 42.0 | 30.3 | 6.5 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 61.3 | 32.3 | 6.5 | 0.0 | 0.0 | 4.5 | 3.0 |
| Alumni survey | 59.3 | 37.0 | 3.7 | 0.0 | 0.0 | 4.6 | 3.0 |
| Employer survey | 66.7 | 25.0 | 5.6 | 0.0 | 0.0 | 4.5 | 3.0 |
| Overall weighted score | 45.7 | 41.4 | 10.8 | 1.4 | 0.1 | 4.3 | 18.0 |

Overall assessment of program outcome G using scores of G1 and G2

In the above sections, each of the individual performance criteria G1 and G2 have been assessed. The performance for attainment of outcome G has been completed using the attainment values for G1 and G2 and is provided below:

Table G4.17 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome G.

Table G4.17: Overall score for outcome G at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| G1 | 44.37 | 43.67 | 10.08 | 1.44 | 0.00 | 4.30 | 4 |
| G2 | 45.73 | 41.43 | 10.84 | 1.44 | 0.12 | 4.30 | 5 |
| Overall score | 45.12 | 42.43 | 10.50 | 1.44 | 0.00 | 4.30 | 9 |

Track Record and assessment of attainment of program outcome ‘G’ over the last three academic years

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

The following table G4.18 presents the performance criteria-wise assessment score distribution for outcome ‘G’

Table G4.18: Performance criteria-wise assessment score distribution of outcome G

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| G | G1 | 3.99 | 3.93 | 4.30 |
| | G2 | 3.94 | 3.92 | 4.30 |

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

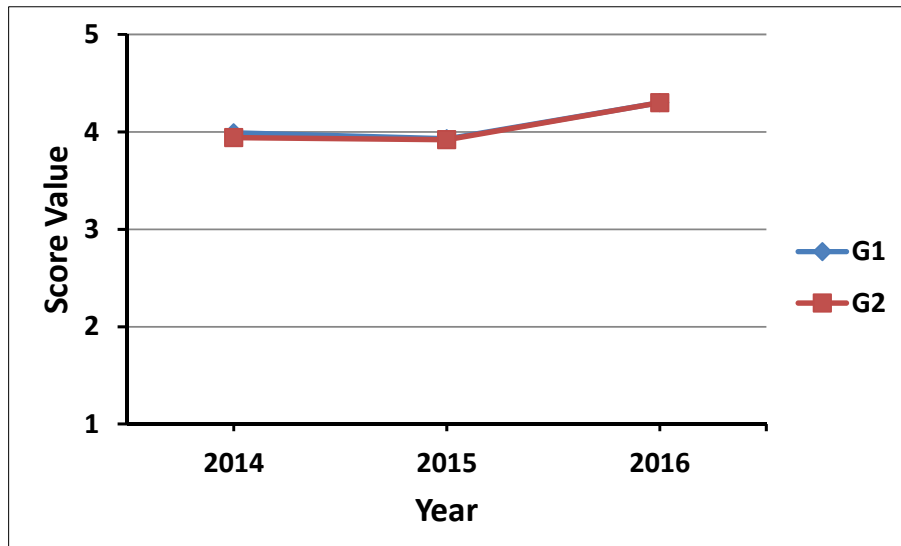


Figure G4.2: Performance criteria-wise assessment score distribution of outcome G

Level of attainment of program outcome ‘G’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table G4.19 presents the overall weighted score of outcome ‘G’ over the last three academic years.

Table G4.19: Overall weighted score of outcome ‘G’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 3.97 | good |
| 2015 | 3.93 | good |
| 2016 | 4.30 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘G’ over a period of last three years.

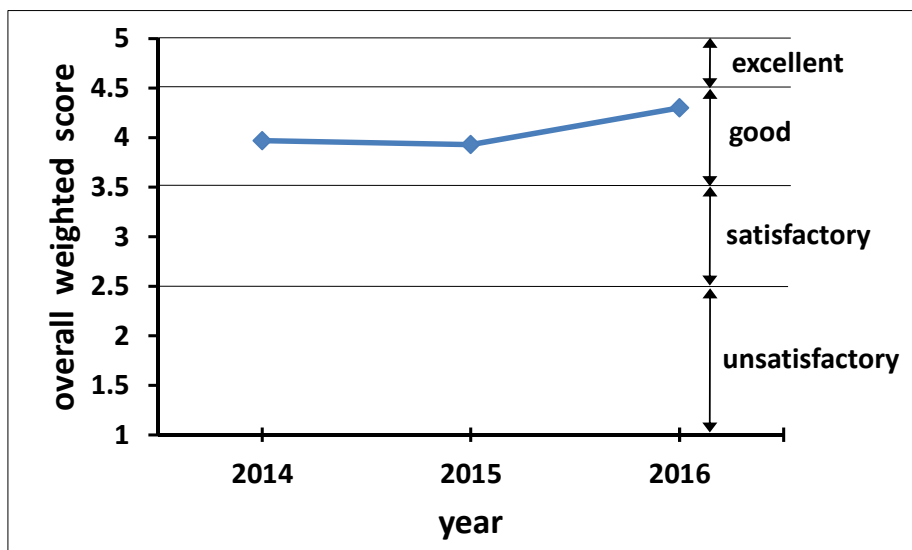


Figure G4.3: overall weighted score of outcome ‘G’ over a period of last three years

The following actions have been taken based on the analysis of Outcome G

| Weighted Score for Outcome G | Recommendation | Reason | Implemented from |
|------------------------------|---|---|-------------------------|
| 3.93 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students are able to communicate effectively. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'H'
(Year 2016)**

for the

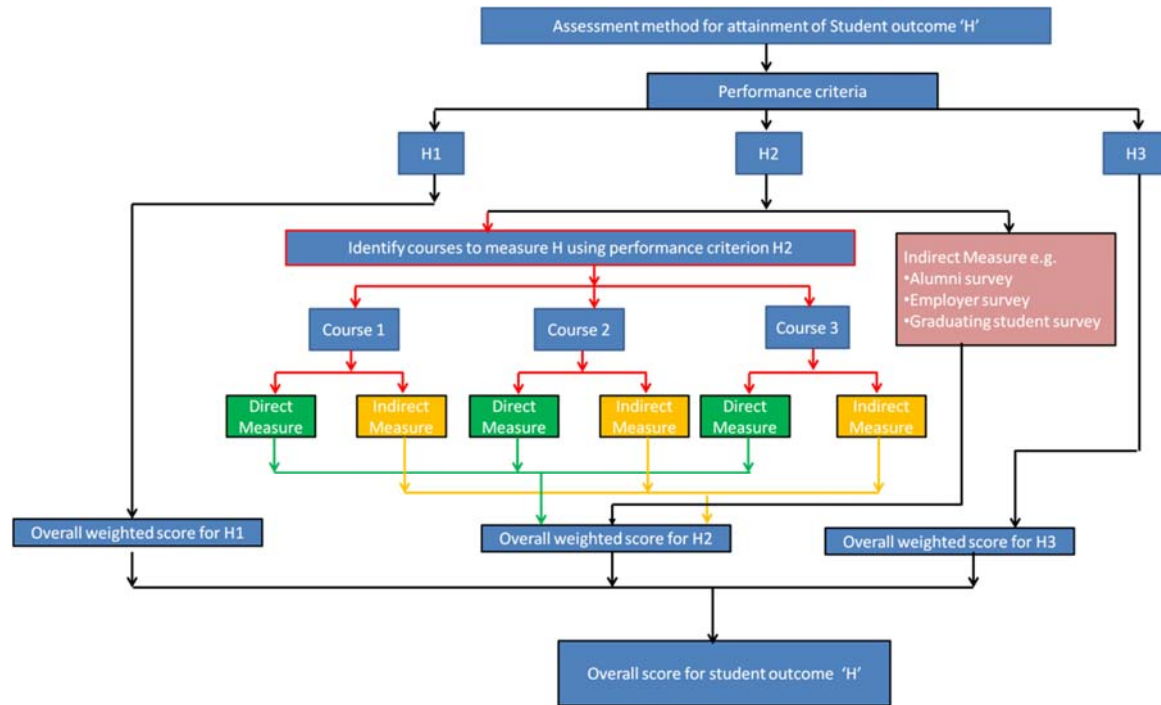
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome H

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'H'

Courses:

1. Engineering Economics (UHU081)
2. Energy & Environment(UEN003)
3. Mechanical System Design (UME801)

Outcome H has been assessed by Three performance criteria H1, H2 and H3. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these three performance criteria has been used to measure the overall measure of outcome H.

1) Assessment of Outcome 'H' using performance criterion H1

Performance criteria 'H1': Aware of societal and global changes that engineering innovations may cause.

a.) Assessment Tool: Student's performance using course portfolio

4. **Step 1:** Two courses namely Energy & Environment (UEN003) and Mechanical System Design (UME801) were used to assess performance criteria H1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Energy & Environment (UEN003)

Performance criteria 'H1': Aware of societal and global changes that engineering SOLUTIONS may cause.

The above performance criteria are used to measure the attainment of outcome 'H1' by evaluating the student based on the following question (Question No. 3a: How does improper waste disposal affect human health and ecosystem? during EST in 2016, weight age 10 marks)

Question No. 3a: How does improper waste disposal affect human health and ecosystem?

Student's performance in the above question is given below in Table H 4.1

Table H 4.1: Student's performance in question targeting 'H1'; Course: UEN003

| S.No. | Rollno. | Name | Marks (10) | SCORE (1-5) |
|-------|-----------|-----------------------|------------|-------------|
| 1 | 101402001 | Aanish Kumar Panduval | 5.5 | 3 |
| 2 | 101402004 | Abhinandan Bhardwaj | 6.0 | 4 |
| 3 | 101402005 | AbhishekGarg | 6.5 | 4 |
| 4 | 101402006 | Aditya Garg | 5.5 | 3 |
| 5 | 101402007 | Aditya Khajuria | 6.5 | 4 |
| 6 | 101402008 | Aditya Parsheera | 7.0 | 4 |
| 7 | 101402009 | Ajay Bansal | 6.5 | 4 |
| 8 | 101402010 | Alamjit Singh Sidhu | 6.5 | 4 |
| 9 | 101402011 | Aman Chauhan | 0.0 | 1 |
| 10 | 101402012 | Ankush Kumar | 5.5 | 3 |
| 11 | 101402013 | AnmolDhanoa | 0.0 | 1 |
| 12 | 101402014 | Anmoldeep Singh | 6.0 | 4 |
| 13 | 101402015 | Anshu Kumar | 5.5 | 3 |
| 14 | 101402016 | Anshul Seth | 7.0 | 4 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 15 | 101402017 | Arjun Singh | 5.5 | 3 |
| 16 | 101402018 | Armanat Singh Maur | 7.0 | 4 |
| 17 | 101402019 | Arpit Mittal | 5.5 | 3 |
| 18 | 101402020 | Ashish Gaurav | 0.0 | 1 |
| 19 | 101402021 | Ashish Sharma | 7.0 | 4 |
| 20 | 101402022 | AtharavVivek | 7.0 | 4 |
| 21 | 101402023 | Birandeep Singh Malhotra | 7.0 | 4 |
| 22 | 101402024 | BrarPushpwant Singh | 8.0 | 5 |
| 23 | 101402026 | Chirag Arora | 6.0 | 4 |
| 24 | 101402027 | Dennis Goyal | 6.0 | 4 |
| 25 | 101402028 | Devinder Kumar | 7.0 | 4 |
| 26 | 101402029 | Faisal Rashid Sheikh | 6.0 | 4 |
| 27 | 101402030 | Gagan Gupta | 6.0 | 4 |
| 28 | 101402031 | Gaurav Verma | 6.0 | 4 |
| 29 | 101402033 | Gurdarshan Singh | 6.0 | 4 |
| 30 | 101402034 | Gurmehar Singh Sidhu | 7.0 | 4 |
| 31 | 101402035 | Harcutejot Singh Wadhwa | 6.0 | 4 |
| 32 | 101402036 | Harjashan Singh | 7.0 | 4 |
| 33 | 101402037 | Harjot Singh Gill | 7.0 | 4 |
| 34 | 101402038 | Harman Jit Singh | 6.0 | 4 |
| 35 | 101402039 | Harnoor Singh Hanjraw | 6.0 | 4 |
| 36 | 101402040 | Harsh Agrawal | 6.5 | 4 |
| 37 | 101402041 | Harsh Puri | 7.0 | 4 |
| 38 | 101402042 | HimanshuGarg | 7.0 | 4 |
| 39 | 101402043 | Hrishabh Singh | 7.0 | 4 |
| 40 | 101402044 | Ishwinder Pal Singh | 6.0 | 4 |
| 41 | 101402045 | JatinGoyal | 8.0 | 5 |
| 42 | 101402046 | Jobanpreet Singh Batth | 7.0 | 4 |
| 43 | 101402047 | Karan Jain | 6.0 | 4 |
| 44 | 101402048 | Karan PartapRehan | 7.0 | 4 |
| 45 | 101402049 | KetanBhasin | 6.0 | 4 |
| 46 | 101402050 | Krishna Kumar | 7.0 | 4 |
| 47 | 101402051 | LovekeshGoyal | 7.0 | 4 |
| 48 | 101402052 | Mohit Mahajan | 7.0 | 4 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 49 | 101402053 | Manan | 6.5 | 4 |
| 50 | 101402054 | Manish Gupta | 6.5 | 4 |
| 51 | 101402055 | Manish Kumar | 6.5 | 4 |
| 52 | 101402056 | Mankaran Singh Kathuria | 7.0 | 4 |
| 53 | 101402057 | ManuragKhullar | 7.5 | 4 |
| 54 | 101402058 | Mehul Sharma | 7.0 | 4 |
| 55 | 101402059 | MillindSagar Kumar | 5.5 | 3 |
| 56 | 101402061 | Navdeep Singh | 7.0 | 4 |
| 57 | 101402062 | NavkiranBedi | 6.0 | 4 |
| 58 | 101402063 | Nikhil Kaushik | 5.0 | 3 |
| 59 | 101402064 | Nikhil Yadav | 0.0 | 1 |
| 60 | 101402065 | Nilesh Gupta | 6.5 | 4 |
| 61 | 101402066 | Nimish Sharma | 7.0 | 4 |
| 62 | 101402067 | Paras Gaba | 7.0 | 4 |
| 63 | 101402068 | ParthSehgal | 6.5 | 4 |
| 64 | 101402069 | Prince Garg | 6.5 | 4 |
| 65 | 101402070 | Priyank Jain | 7.0 | 4 |
| 66 | 101402071 | PuruPradumn Dixit | 6.0 | 4 |
| 67 | 101402072 | PurvieGarg | 7.0 | 4 |
| 68 | 101402073 | R.Karunvir Bhardwaj | 7.0 | 4 |
| 69 | 101402074 | Rahul Goyal | 7.5 | 4 |
| 70 | 101402075 | Rahul ShivajiNalwade | 7.0 | 4 |
| 71 | 101402076 | Rajan Kumar Choudhary | 6.5 | 4 |
| 72 | 101402077 | Rajdeep Singh | 6.5 | 4 |
| 73 | 101402078 | Ravi Dhull | 6.0 | 4 |
| 74 | 101402079 | RohitGoyal | 6.5 | 4 |
| 75 | 101402080 | Rohit Kumar Singh | 7.0 | 4 |
| 76 | 101402081 | Rupinder Pal Singh | 7.0 | 4 |
| 77 | 101402083 | Sagar Vats | 6.5 | 4 |
| 78 | 101402084 | Sahil Bansal | 6.5 | 4 |
| 79 | 101402086 | Sameer Chaudhari | 7.0 | 4 |
| 80 | 101402087 | Sanchit Gupta | 6.0 | 4 |
| 81 | 101402088 | SarthiGoel | 6.5 | 4 |
| 82 | 101402089 | Schajpal Singh | 7.5 | 4 |

| | | | | |
|-----|-----------|-----------------------|-----|---|
| 83 | 101402090 | Shaurya Mahajan | 0.0 | 1 |
| 84 | 101402091 | ShobhitMinglani | 6.5 | 4 |
| 85 | 101402092 | ShrutiNeol | 6.5 | 4 |
| 86 | 101402093 | Shubham Chauhan | 6.0 | 4 |
| 87 | 101402094 | ShubhamGarg | 5.0 | 3 |
| 88 | 101402095 | ShubhamGoel | 6.5 | 4 |
| 89 | 101402096 | ShubhamPipesh | 6.0 | 4 |
| 90 | 101402098 | Shubham Sharma | 6.5 | 4 |
| 91 | 101402099 | Shubham Singh | 7.0 | 4 |
| 92 | 101402100 | Simran | 7.5 | 4 |
| 93 | 101402101 | Simranjeet Singh | 7.0 | 4 |
| 94 | 101402102 | SourabhPatni | 6.5 | 4 |
| 95 | 101402103 | Sumeker | 7.0 | 4 |
| 96 | 101402104 | Sunjeet Singh | 6.5 | 4 |
| 97 | 101402106 | Varinder Singh Gakhar | 7.0 | 4 |
| 98 | 101402107 | Vikrant Bhardwaj | 5.0 | 3 |
| 99 | 101402108 | Vishal Kumar | 7.0 | 4 |
| 100 | 101402109 | Vishal Rana | 7.0 | 4 |
| 101 | 101402110 | Vishal Sharma | 6.0 | 4 |
| 102 | 101402111 | Vishal Singla | 6.0 | 4 |
| 103 | 101402112 | Vishal Verma | 5.5 | 3 |
| 104 | 101402113 | Vishav Bansal | 6.5 | 4 |
| 105 | 101402114 | Yadoo Mehta | 7.0 | 4 |
| 106 | 101402116 | Yatin Malhotra | 7.0 | 4 |
| 107 | 101402117 | YatinShivalik | 6.0 | 4 |
| 108 | 101402119 | GunjanKour | 5.5 | 3 |
| 109 | 101452001 | MohitKhurmi | 6.0 | 4 |
| 110 | 101452002 | Pankaj Jindal | 7.0 | 4 |
| 111 | 101452003 | AbhishekGoyal | 6.0 | 4 |
| 112 | 101452004 | Sanyam Bansal | 5.0 | 3 |
| 113 | 101452005 | Arshpreet Singh | 7.0 | 4 |
| 114 | 101452006 | Gurashish Singh | 7.0 | 4 |
| 115 | 101582001 | Aadesh | 7.0 | 4 |
| 116 | 101582002 | Aksh Bansal | 6.0 | 4 |

| | | | | |
|-----|-----------|----------------|-----|---|
| 117 | 101582003 | AmanSingla | 7.0 | 4 |
| 118 | 101582004 | Gokul Sharma | 7.0 | 4 |
| 119 | 101582005 | Guransh Singh | 6.5 | 4 |
| 120 | 101582006 | Kawarpal Singh | 6.0 | 4 |
| 121 | 101582007 | Mayank Sharma | 6.0 | 4 |
| 122 | 101582008 | NihalAgnihotri | 5.0 | 3 |
| 123 | 101582009 | Prince Chauhan | 6.0 | 4 |
| 124 | 101582010 | Pulkit | 6.0 | 4 |
| 125 | 101582011 | ShanuGarg | 5.0 | 3 |
| 126 | 101582012 | Tamanna | 5.0 | 3 |
| 127 | 101582013 | Umesh Kumar | 6.5 | 4 |

Table H 4.2: Average score of student performance in the course UEN 003 for criteria H1

| Course | % of students in each score | | | | | Average Score |
|---------|-----------------------------|------|------|---|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UEN 003 | 1.8 | 82.7 | 10.9 | 0 | 4.5 | 3.77 |

(ii) Course: Mechanical System Design (UME801)

The above performance criterion is used to measure the attainment of outcome 'H' by giving the following question (From the 1st Presentation organized by the Course co-ordinator) to the students.

Question:

- (a) List the societal and global changes that this project may cause. (5)

Student's performance in the above question is given below:

Table H 4.3: Student's performance in question targeting 'H1'; course: UME801

| S.No. | Roll no. | Name | MARKS (05) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 4.0 | 4 |
| 2 | 101208002 | Aditya Anand | 5.0 | 5 |
| 3 | 101208003 | Ajaywinder Singh | 4.0 | 4 |
| 4 | 101208004 | AkankshVashistha | 4.0 | 4 |
| 5 | 101208005 | Akshay | 4.0 | 4 |
| 6 | 101208006 | AkshayKaura | 4.0 | 4 |
| 7 | 101208007 | AmanJamwal | 4.0 | 4 |
| 8 | 101208008 | Aman Sharma | 4.0 | 4 |
| 9 | 101208009 | AmanVerma | 4.0 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 5.0 | 5 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 5.0 | 5 |
| 12 | 101208012 | Amol | 5.0 | 5 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 13 | 101208013 | Amrinder Singh | 5.0 | 5 |
| 14 | 101208016 | AnkurWasdev | 5.0 | 5 |
| 15 | 101208017 | AnshumanHanda | 5.0 | 5 |
| 16 | 101208019 | Anuj Kumar | 5.0 | 5 |
| 17 | 101208020 | AnuragPanthey | 4.0 | 4 |
| 18 | 101208022 | Arshdeep Singh | 4.0 | 4 |
| 19 | 101208023 | Arvind | 4.5 | 5 |
| 20 | 101208024 | ArvindMahey | 4.5 | 5 |
| 21 | 101208025 | Ashish Tandon | 4.5 | 5 |
| 22 | 101208026 | AshutoshPalta | 4.0 | 4 |
| 23 | 101208027 | AtulBatish | 5.0 | 5 |
| 24 | 101208028 | Aviral Prasad | 4.0 | 4 |
| 25 | 101208029 | AyushUniyal | 4.0 | 4 |
| 26 | 101208030 | Bhanu Sharma | 4.0 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 4.5 | 5 |
| 28 | 101208032 | Charanjeet Singh | 4.5 | 5 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 0.0 | 1 |
| 30 | 101208034 | Chirag Jain | 0.0 | 1 |
| 31 | 101208035 | Debopam Das | 5.0 | 5 |
| 32 | 101208036 | Deepak Singh | 4.0 | 4 |
| 33 | 101208037 | G S Tushar | 4.0 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 5.0 | 5 |
| 35 | 101208039 | Gaurav Garg | 5.0 | 5 |
| 36 | 101208040 | Gaurav Goyal | 4.5 | 5 |
| 37 | 101208042 | Gaurav Kakkar | 4.0 | 4 |
| 38 | 101208044 | Guriqbal Singh | 4.0 | 4 |
| 39 | 101208045 | Gurleen Singh | 4.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 4.0 | 4 |
| 41 | 101208048 | Harish Garg | 3.5 | 4 |
| 42 | 101208049 | Harsh Raheja | 3.5 | 4 |
| 43 | 101208051 | HimanshuGambhir | 5.0 | 5 |
| 44 | 101208052 | Ishita Jain | 4.5 | 5 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 4.5 | 5 |
| 46 | 101208054 | Jatin Mittal | 4.0 | 4 |
| 47 | 101208055 | Jatin Singh | 5.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 4.0 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 4.0 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 4.0 | 4 |
| 51 | 101208060 | KapilChaand | 4.5 | 5 |
| 52 | 101208061 | Karan Mehra | 4.5 | 5 |
| 53 | 101208062 | Karanbir Singh Sandhar | 3.0 | 4 |
| 54 | 101208063 | KartikSingla | 3.5 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 4.0 | 4 |
| 56 | 101208065 | KunalGarg | 3.0 | 4 |
| 57 | 101208066 | Kushagra | 3.0 | 4 |
| 58 | 101208068 | Manan Shah | 4.0 | 4 |

| | | | | |
|-----|-----------|------------------------|-----|---|
| 59 | 101208069 | ManavJuneja | 0.0 | 1 |
| 60 | 101208070 | Manjot Singh | 3.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 4.0 | 4 |
| 62 | 101208073 | Mrigank Gupta | 5.0 | 5 |
| 63 | 101208075 | Navraj Singh | 4.0 | 4 |
| 64 | 101208076 | Nikhil Sehdev | 4.0 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 0.0 | 1 |
| 66 | 101208078 | Nishant Bansal | 3.0 | 4 |
| 67 | 101208079 | NishantGoyal | 3.0 | 4 |
| 68 | 101208080 | NishantKabra | 3.0 | 4 |
| 69 | 101208081 | NiteeshDua | 5.0 | 5 |
| 70 | 101208082 | Nitin Mahajan | 5.0 | 5 |
| 71 | 101208083 | Nitish Gupta | 5.0 | 5 |
| 72 | 101208084 | Omang | 3.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 0.0 | 1 |
| 74 | 101208086 | Pranav Lakhina | 4.0 | 4 |
| 75 | 101208088 | Pulkit Gupta | 3.0 | 4 |
| 76 | 101208089 | Puneet Arora | 0.0 | 1 |
| 77 | 101208090 | PurushottamMeena | 0.0 | 1 |
| 78 | 101208091 | Rahul Agarwal | 0.0 | 1 |
| 79 | 101208092 | Rahul Goyal | 5.0 | 5 |
| 80 | 101208093 | RajatParmar | 0.0 | 1 |
| 81 | 101208094 | Rajat Sharma | 0.0 | 1 |
| 82 | 101208095 | Rajiv Chauhan | 5.0 | 5 |
| 83 | 101208096 | Ravinder Singh | 5.0 | 5 |
| 84 | 101208097 | Ritvik Singh | 5.0 | 5 |
| 85 | 101208101 | Sagar Saini | 0.0 | 1 |
| 86 | 101208102 | Sahil Arora | 5.0 | 5 |
| 87 | 101208104 | SanchitSachdeva | 5.0 | 5 |
| 88 | 101208106 | SarthakMattas | 5.0 | 5 |
| 89 | 101208107 | Saurav Sharma | 5.0 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 5.0 | 5 |
| 91 | 101208110 | Shashank Jain | 3.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 5.0 | 5 |
| 93 | 101208112 | Shourya Singh | 3.0 | 4 |
| 94 | 101208113 | Shray Mehta | 3.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 5.0 | 5 |
| 96 | 101208115 | Shubham Bansal | 5.0 | 5 |
| 97 | 101208116 | Shubham Chaudhary | 5.0 | 5 |
| 98 | 101208117 | ShubhamSaha | 5.0 | 5 |
| 99 | 101208118 | ShubhamSen | 0.0 | 1 |
| 100 | 101208120 | Sugam Arora | 3.0 | 4 |
| 101 | 101208121 | Sukhdev Singh | 3.0 | 4 |
| 102 | 101208123 | Sunil Singh | 3.0 | 4 |
| 103 | 101208125 | Tanveer Mehta | 5.0 | 5 |
| 104 | 101208126 | Tejinder Pal Singh | 4.5 | 5 |

| | | | | |
|-----|-----------|-------------------|-----|---|
| 105 | 101208129 | UllasChugh | 5.0 | 5 |
| 106 | 101208131 | VarinderSingla | 4.5 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 5.0 | 5 |
| 108 | 101208133 | VinayGarg | 4.5 | 5 |
| 109 | 101208134 | VineshGarg | 4.5 | 5 |
| 110 | 101208136 | VivekGoyal | 0.0 | 1 |
| 111 | 101208138 | YashKhemka | 5.0 | 5 |
| 112 | 101208139 | Yuvraj Singh | 5.0 | 5 |
| 113 | 101208140 | JiveshBedi | 4.5 | 5 |
| 114 | 101208142 | Vasu Sharma | 4.0 | 4 |
| 115 | 101388001 | Amit Tripathi | 5.0 | 5 |
| 116 | 101388002 | AnkitSetia | 5.0 | 5 |
| 117 | 101388003 | Jaswant Singh | 4.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 5.0 | 5 |
| 119 | 101388005 | Rahul Sharma | 4.5 | 5 |
| 120 | 101388006 | Rahul Verma | 4.5 | 5 |
| 121 | 101388007 | Rahul Verma | 0.0 | 1 |
| 122 | 101388008 | Rajan | 4.5 | 5 |
| 123 | 101388009 | Ramandeep Singh | 5.0 | 5 |
| 124 | 101388010 | Shivam Bhatia | 5.0 | 5 |
| 125 | 101388011 | Sukhvir Singh | 5.0 | 5 |
| 126 | 101388012 | Sunil Kumar | 3.0 | 4 |

Table H 4.4: Weighted Average Student Class Performance (course portfolio) for Attribute H1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|---|---|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 48.4 | 40.5 | 0 | 0 | 11.1 | 4.15 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria H1 as given below in Table H4.5:

Table H4.5: Weighted Average Student class performance (course portfolio) for criteria H1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UEN 003 | 1.8 | 82.7 | 10.9 | 0 | 4.5 | 3.77 | 4 |
| UME801 | 48.4 | 40.5 | 0 | 0 | 11.1 | 4.15 | 5 |
| Weighted average score | 27.69 | 59.26 | 4.84 | 0.00 | 8.17 | 3.98 | 9 |

b) Indirect measures for Performance criteria H1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table H4.6: Average score of student course survey for criteria H1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table H4.7: Assessment for criteria H1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 35.48 | 0.00 | 0.00 | 4.00 |
| Alumni survey | 33.33 | 59.26 | 7.41 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 61.11 | 22.22 | 13.89 | 0.00 | 0.00 | 4.36 |

c) Overall weighted average score of performance criterion ‘H1’

Finally overall weighted average score of performance criterion ‘H1’ is evaluated as given below in Table H4.8:

Table H4.8: Overall weighted average score of performance criterion ‘H1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 27.7 | 59.3 | 4.8 | 0.0 | 8.2 | 4.0 | 5.0 |
| Weighted average student course survey | 20.4 | 45.2 | 25.3 | 9.1 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 35.5 | 0.0 | 0.0 | 4.0 | 3.0 |
| Alumni survey | 33.3 | 59.3 | 7.4 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 61.1 | 22.2 | 13.9 | 0.0 | 0.0 | 4.4 | 3.0 |
| Overall weighted score | 33.9 | 44.9 | 16.4 | 2.0 | 2.3 | 4.0 | 18.0 |

Assessment of Outcome 'A' using performance criterion H2

Performance criteria 'H2': Examines economics tradeoffs in engineering systems.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Engineering Economics (UHU081) and Mechanical System Design Design (UME801) were used to assess performance criteria H2 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Engineering Economics (UHU081)

The above performance criteria are used to measure the attainment of outcome 'H2' by evaluating the student based on the following question (Question NO 6 in End Semester Exam in May 2016)

Question 6:

- (a) What is IRR and how is it calculated? Discuss the problem associated with IRR.
 (b) A company has to choose one of the following two mutually exclusive projects. Both the projects have been depreciated on a straight line basis. The firm cost of capital is 10% and tax rate is 35%..

After tax cash flows are:

| Projects | C0 | C1 | C2 | C3 | C4 | C5 |
|----------|--------|------|------|------|------|------|
| X | -20000 | 4200 | 4800 | 7000 | 8000 | 2000 |
| Y | -15000 | 4200 | 4500 | 4000 | 5000 | 1000 |

which project should the firm accept if the following criteria are used: (a) NPV & (b) IRR?

Student's performance in the above question is given below in Table H 4.9

Table H 4.9: Student's performance in question targeting 'H2'; Course: UHU081

| S.No. | Roll no. | Name | EST Q6 (a+b)=15 MARKS | SCORE (1-5) |
|-------|-----------|--------------------------|-----------------------|-------------|
| 1 | 101202001 | Anchal Sharma | 8 | 4 |
| 2 | 101202004 | Abhishek Bansal | 4 | 2 |
| 3 | 101202005 | Abhishek Jain | 4 | 2 |
| 4 | 101202006 | AbhishekSapahia | 7 | 4 |
| 5 | 101202007 | AjaiPartap Singh Dhillon | 8 | 4 |
| 6 | 101202008 | Amardheer Singh | 8 | 4 |
| 7 | 101202009 | AnkitKansal | 8.5 | 4 |
| 8 | 101202010 | Ankush Bansal | 7.5 | 4 |
| 9 | 101202011 | AnkushKatoch | 6 | 4 |
| 10 | 101202012 | Anmol Thakur | 5.5 | 4 |
| 11 | 101202013 | Anmoldeep Singh | 6.5 | 4 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 12 | 101202014 | AnujTilak | 10 | 5 |
| 13 | 101202015 | ArunMeena | 4 | 2 |
| 14 | 101202016 | Avninder Singh Cheema | 5 | 3 |
| 15 | 101202017 | Dharmansh Aggarwal | 6 | 4 |
| 16 | 101202018 | Dikshant Aggarwal | 7 | 4 |
| 17 | 101202019 | Divyam Gupta | 4 | 2 |
| 18 | 101202021 | GaurangGarg | 5.5 | 4 |
| 19 | 101202022 | Gaurav | 6 | 4 |
| 20 | 101202024 | Gurpreet Singh | 6 | 4 |
| 21 | 101202025 | Gursameer Singh | 4 | 2 |
| 22 | 101202026 | Harmanjeet Singh Kaler | 8 | 4 |
| 23 | 101202027 | Harshit Sharma | 6 | 4 |
| 24 | 101202029 | Ishaan Uniyal | 6 | 4 |
| 25 | 101202030 | Jaspreet Singh Wahi | 7 | 4 |
| 26 | 101202031 | Jasvendra Singh | 8 | 4 |
| 27 | 101202032 | Jatin Kumar | 5 | 3 |
| 28 | 101202033 | Karan Kamboj | 8 | 4 |
| 29 | 101202034 | Karanbir Singh Thind | 5 | 3 |
| 30 | 101202035 | Karanveer Singh Bhatia | 8 | 4 |
| 31 | 101202038 | Meera | 9 | 4 |
| 32 | 101202039 | MiNalSingla | 7 | 4 |
| 33 | 101202040 | Mohit Kumar Dhiman | 5 | 3 |
| 34 | 101202042 | Mukesh Gera | 6 | 4 |
| 35 | 101202043 | Navanjot Singh Chhatwal | 7 | 4 |
| 36 | 101202044 | Navdeep | 5 | 3 |
| 37 | 101202045 | Neha | 8 | 4 |
| 38 | 101202046 | Nikhil Goyal | 8 | 4 |
| 39 | 101202047 | Nikhil Nagpal | 8 | 4 |
| 40 | 101202048 | Nishant | 8 | 4 |
| 41 | 101202049 | Nishant | 8 | 4 |
| 42 | 101202051 | Prabhvir Singh Dhillon | 8 | 4 |
| 43 | 101202053 | PrashantSachdeva | 5 | 3 |
| 44 | 101202054 | Rachit Mohan | 9 | 4 |
| 45 | 101202055 | RaghavKainth | 5 | 3 |
| 46 | 101202056 | Rahul Kathuria | 8 | 4 |

| | | | | |
|----|-----------|----------------------|------|---|
| 47 | 101202058 | Rohan Singh Sankhwar | 9 | 4 |
| 48 | 101202059 | Rohin | 6 | 4 |
| 49 | 101202060 | Rupinder Pal | 9 | 4 |
| 50 | 101202061 | Sandeep Singh Gill | 8 | 4 |
| 51 | 101202062 | Sarang Gill | 8 | 4 |
| 52 | 101202063 | SauravSingla | 8 | 4 |
| 53 | 101202064 | Shikhar Sharma | 8 | 4 |
| 54 | 101202066 | ShubhamTripathi | 8 | 4 |
| 55 | 101202067 | Simardeep Kaur | 8 | 4 |
| 56 | 101202068 | Sonaal Gupta | 8 | 4 |
| 57 | 101202070 | Surya Pratap Singh | 4 | 2 |
| 58 | 101202071 | SushantWalia | 9 | 4 |
| 59 | 101202072 | Tejinder Singh | 9 | 4 |
| 60 | 101202073 | Umang Srivastava | 4 | 2 |
| 61 | 101202074 | Varun Modi | 5 | 3 |
| 62 | 101202075 | Vishal Tyagi | 4 | 2 |
| 63 | 101202076 | VisheshVikram Singh | 6 | 4 |
| 64 | 101202077 | Yashika Gupta | 5 | 3 |
| 65 | 101252001 | AnkurShiromani | 3 | 2 |
| 66 | 101252002 | Lalitesh | 7 | 4 |
| 67 | 101252003 | Bhavya | 9 | 4 |
| 68 | 101252004 | TusharGoel | 7 | 4 |
| 69 | 101252005 | SiddhantTomar | 9 | 4 |
| 70 | 101252006 | Khushwant Singh | 6 | 4 |
| 71 | 101252007 | Akhil Sharma | 4 | 2 |
| 72 | 101252008 | Akash Kumar Singh | 6 | 4 |
| 73 | 101252009 | Akshay Jain | 4 | 2 |
| 74 | 101252010 | Pankush | 8 | 4 |
| 75 | 101252011 | Dhamu Kumar Kushwaha | 8.5 | 4 |
| 76 | 101382001 | Ajay Kumar | 6 | 4 |
| 77 | 101382002 | ArijitBhattacharjee | 6 | 4 |
| 78 | 101382003 | Ashish Premi | 4 | 2 |
| 79 | 101382004 | Khushpreet Singh | 12.0 | 5 |
| 80 | 101382005 | Love Jindal | 9.0 | 4 |
| 81 | 101382006 | MohitGarg | 8.0 | 4 |

| | | | | |
|----|-----------|---------------|-----|---|
| 82 | 101382007 | Prince Jindal | 9.0 | 4 |
| 83 | 101382008 | Vishal Jindal | 7.0 | 4 |
| 84 | 101102058 | Rohan Mittal | 6.5 | 4 |

Table H 4.10: Average score of student performance in the course UHU 081 for criteria H2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UHU081 | 2.4 | 72.6 | 10.7 | 14.3 | 0 | 3.63 |

(ii) Course: Mechanical system Design (UME801)

The above performance criteria is used to measure the attainment of outcome 'H' by giving the following question ((From the 2nd Presentation organized by the Course co-ordinator)) to the students.

Question:

- (a) What are the economics tradeoffs in your engineering design? What would be the cost if they were not made? (5)

Student's performance in the above question is given below:

Table H 4.11: Student's performance in question targeting 'H2'; course: UME801

| S.No. | Rollno. | Name | MARKS (05) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 3.5 | 4 |
| 2 | 101208002 | Aditya Anand | 3.0 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 3.5 | 4 |
| 4 | 101208004 | AkankshVashistha | 4.0 | 4 |
| 5 | 101208005 | Akshay | 3.5 | 4 |
| 6 | 101208006 | AkshayKaura | 3.5 | 4 |
| 7 | 101208007 | AmanJamwal | 4.0 | 4 |
| 8 | 101208008 | Aman Sharma | 4.0 | 4 |
| 9 | 101208009 | AmanVerma | 4.0 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 4.0 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 3.0 | 4 |
| 12 | 101208012 | Amol | 4.0 | 4 |
| 13 | 101208013 | Amrinder Singh | 3.0 | 4 |
| 14 | 101208016 | AnkurWasdev | 3.0 | 4 |
| 15 | 101208017 | AnshumanHanda | 3.0 | 4 |
| 16 | 101208019 | Anuj Kumar | 3.0 | 4 |
| 17 | 101208020 | AnuragPanthey | 0.0 | 1 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 18 | 101208022 | Arshdeep Singh | 4.0 | 4 |
| 19 | 101208023 | Arvind | 4.5 | 5 |
| 20 | 101208024 | ArvindMahey | 4.5 | 5 |
| 21 | 101208025 | Ashish Tandon | 4.5 | 5 |
| 22 | 101208026 | AshutoshPalta | 3.5 | 4 |
| 23 | 101208027 | AtulBatish | 4.5 | 5 |
| 24 | 101208028 | Aviral Prasad | 3.5 | 4 |
| 25 | 101208029 | AyushUniyal | 3.5 | 4 |
| 26 | 101208030 | Bhanu Sharma | 3.5 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 0.0 | 1 |
| 28 | 101208032 | Charanjeet Singh | 4.5 | 5 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 3.5 | 4 |
| 30 | 101208034 | Chirag Jain | 3.5 | 4 |
| 31 | 101208035 | Debopam Das | 4.5 | 5 |
| 32 | 101208036 | Deepak Singh | 0.0 | 1 |
| 33 | 101208037 | G S Tushar | 3.5 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 4.5 | 5 |
| 35 | 101208039 | Gaurav Garg | 4.5 | 5 |
| 36 | 101208040 | Gaurav Goyal | 4.5 | 5 |
| 37 | 101208042 | Gaurav Kakkar | 3.5 | 4 |
| 38 | 101208044 | Guriqbal Singh | 2.0 | 3 |
| 39 | 101208045 | Gurleen Singh | 3.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 3.0 | 4 |
| 41 | 101208048 | Harish Garg | 4.0 | 4 |
| 42 | 101208049 | Harsh Raheja | 4.0 | 4 |
| 43 | 101208051 | HimanshuGambhir | 5.0 | 5 |
| 44 | 101208052 | Ishita Jain | 4.0 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 3.0 | 4 |
| 46 | 101208054 | Jatin Mittal | 2.0 | 3 |
| 47 | 101208055 | Jatin Singh | 5.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 2.0 | 3 |
| 49 | 101208057 | K Naga PhaniBhaskar | 2.0 | 3 |
| 50 | 101208058 | Kamal Preet Singh | 3.0 | 4 |
| 51 | 101208060 | KapilChaand | 4.0 | 4 |
| 52 | 101208061 | Karan Mehra | 4.0 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 3.0 | 4 |
| 54 | 101208063 | KartikSingla | 4.0 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 2.0 | 3 |
| 56 | 101208065 | KunalGarg | 2.5 | 3 |
| 57 | 101208066 | Kushagra | 4.0 | 4 |

| | | | | |
|----|-----------|------------------------|-----|---|
| 58 | 101208068 | Manan Shah | 3.0 | 4 |
| 59 | 101208069 | ManavJuneja | 4.0 | 4 |
| 60 | 101208070 | Manjot Singh | 2.5 | 3 |
| 61 | 101208072 | Mayank Joshi | 3.0 | 4 |
| 62 | 101208073 | Mrigank Gupta | 4.0 | 4 |
| 63 | 101208075 | Navraj Singh | 3.0 | 4 |
| 64 | 101208076 | Nikhil Sehdev | 3.5 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 4.0 | 4 |
| 66 | 101208078 | Nishant Bansal | 2.5 | 3 |
| 67 | 101208079 | NishantGoyal | 2.5 | 3 |
| 68 | 101208080 | NishantKabra | 4.0 | 4 |
| 69 | 101208081 | NiteeshDua | 5.0 | 5 |
| 70 | 101208082 | Nitin Mahajan | 4.0 | 4 |
| 71 | 101208083 | Nitish Gupta | 4.0 | 4 |
| 72 | 101208084 | Omang | 2.5 | 3 |
| 73 | 101208085 | Prafulla Chaudhary | 4.0 | 4 |
| 74 | 101208086 | Pranav Lakhina | 3.0 | 4 |
| 75 | 101208088 | Pulkit Gupta | 4.0 | 4 |
| 76 | 101208089 | Puneet Arora | 4.5 | 5 |
| 77 | 101208090 | PurushottamMeena | 4.5 | 5 |
| 78 | 101208091 | Rahul Agarwal | 3.0 | 4 |
| 79 | 101208092 | Rahul Goyal | 0.0 | 1 |
| 80 | 101208093 | RajatParmar | 3.0 | 4 |
| 81 | 101208094 | Rajat Sharma | 3.0 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 0.0 | 1 |
| 83 | 101208096 | Ravinder Singh | 4.5 | 5 |
| 84 | 101208097 | Ritvik Singh | 4.5 | 5 |
| 85 | 101208101 | Sagar Saini | 4.5 | 5 |
| 86 | 101208102 | Sahil Arora | 4.5 | 5 |
| 87 | 101208104 | SanchitSachdeva | 5.0 | 5 |
| 88 | 101208106 | SarthakMattas | 5.0 | 5 |
| 89 | 101208107 | Saurav Sharma | 5.0 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 5.0 | 5 |
| 91 | 101208110 | Shashank Jain | 3.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 5.0 | 5 |
| 93 | 101208112 | Shourya Singh | 3.0 | 4 |
| 94 | 101208113 | Shray Mehta | 3.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 5.0 | 5 |
| 96 | 101208115 | Shubham Bansal | 5.0 | 5 |
| 97 | 101208116 | Shubham Chaudhary | 5.0 | 5 |

| | | | | |
|-----|-----------|--------------------|-----|---|
| 98 | 101208117 | ShubhamSaha | 5.0 | 5 |
| 99 | 101208118 | ShubhamSen | 3.0 | 4 |
| 100 | 101208120 | Sugam Arora | 3.0 | 4 |
| 101 | 101208121 | Sukhdev Singh | 3.0 | 4 |
| 102 | 101208123 | Sunil Singh | 3.0 | 4 |
| 103 | 101208125 | Tanveer Mehta | 5.0 | 5 |
| 104 | 101208126 | Tejinder Pal Singh | 4.5 | 5 |
| 105 | 101208129 | UllasChugh | 5.0 | 5 |
| 106 | 101208131 | VarinderSingla | 4.5 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 5.0 | 5 |
| 108 | 101208133 | VinayGarg | 4.5 | 5 |
| 109 | 101208134 | VineshGarg | 4.5 | 5 |
| 110 | 101208136 | VivekGoyal | 5.0 | 5 |
| 111 | 101208138 | YashKhemka | 5.0 | 5 |
| 112 | 101208139 | Yuvraj Singh | 5.0 | 5 |
| 113 | 101208140 | JiveshBedi | 4.5 | 5 |
| 114 | 101208142 | Vasu Sharma | 0.0 | 1 |
| 115 | 101388001 | Amit Tripathi | 4.0 | 4 |
| 116 | 101388002 | AnkitSetia | 4.0 | 4 |
| 117 | 101388003 | Jaswant Singh | 3.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 4.5 | 5 |
| 119 | 101388005 | Rahul Sharma | 4.5 | 5 |
| 120 | 101388006 | Rahul Verma | 4.5 | 5 |
| 121 | 101388007 | Rahul Verma | 5.0 | 5 |
| 122 | 101388008 | Rajan | 4.5 | 5 |
| 123 | 101388009 | Ramandeep Singh | 0.0 | 1 |
| 124 | 101388010 | Shivam Bhatia | 4.5 | 5 |
| 125 | 101388011 | Sukhvir Singh | 4.5 | 5 |
| 126 | 101388012 | Sunil Kumar | 0.0 | 1 |

Table H 4.12: Weighted Average Student Class Performance (course portfolio) for Attribute H2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|----|-----|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 35.7 | 50 | 7.9 | 0.0 | 6.3 | 4.08* |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria H2 as given below in Table H4.13:

Table H4.13: Weighted Average Student class performance (course portfolio) for criteria H2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UHU081 | 2.4 | 72.6 | 10.7 | 14.3 | 0 | 3.63 | 4 |
| UME801 | 35.7 | 50 | 7.9 | 0 | 6.3 | 4.09 | 4 |
| Weighted average score | 19.05 | 61.30 | 9.30 | 7.15 | 3.15 | 3.86 | 8 |

b.) Assessment Tool: Student Course Survey

Table H4.14: Average score of student course survey for criteria H2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |
| Weighted average score | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table H4.15: Assessment for criteria H2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 35.48 | 0.00 | 0.00 | 4.00 |
| Alumni survey | 33.33 | 59.26 | 7.41 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 61.11 | 22.22 | 13.89 | 0.00 | 0.00 | 4.36 |

Finally overall weighted average score of performance criterion ‘H2’ is evaluated as given below in Table H4.16:

Table H4.16: Overall weighted average score of performance criterion ‘H2’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 19.1 | 61.3 | 9.3 | 7.2 | 3.2 | 3.9 | 5.0 |
| Weighted average student course survey | 20.4 | 45.2 | 25.3 | 9.1 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 35.5 | 0.0 | 0.0 | 4.0 | 3.0 |
| Alumni survey | 33.3 | 59.3 | 7.4 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 61.1 | 22.2 | 13.9 | 0.0 | 0.0 | 4.4 | 3.0 |
| Overall weighted score | 31.5 | 45.5 | 17.7 | 4.0 | 0.9 | 4.0 | 18.0 |

Assessment of Outcome 'H' using performance criterion H3

Performance criteria 'H3': Evaluates engineering solutions that consider environmental factors.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: One course namely Mechanical System Design (UME801) was used to assess performance criteria H3 as a direct measure. The analysis for each of these courses is provided below:

(I) Course: Mechanical System Design (UME801)

The above performance criteria is used to measure the attainment of outcome 'H' by giving the following question ((From the 1st Presentation organized by the Course co-ordinator)) to the students.

Question:

- (a) Evaluate the environmental factors in the engineering design of this project. (5)

Student's performance in the above question is given below:

Table H 4.17: Student's performance in question targeting 'H3'; course: UME801

| S.No. | Roll no. | Name | MARKS (05) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 4.0 | 4 |
| 2 | 101208002 | Aditya Anand | 5.0 | 5 |
| 3 | 101208003 | Ajaywinder Singh | 4.0 | 4 |
| 4 | 101208004 | AkankshVashistha | 4.0 | 4 |
| 5 | 101208005 | Akshay | 4.0 | 4 |
| 6 | 101208006 | AkshayKaura | 4.0 | 4 |
| 7 | 101208007 | AmanJamwal | 4.0 | 4 |
| 8 | 101208008 | Aman Sharma | 4.0 | 4 |
| 9 | 101208009 | AmanVerma | 4.0 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 5.0 | 5 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 5.0 | 5 |
| 12 | 101208012 | Amol | 5.0 | 5 |
| 13 | 101208013 | Amrinder Singh | 5.0 | 5 |
| 14 | 101208016 | AnkurWasdev | 5.0 | 5 |
| 15 | 101208017 | AnshumanHanda | 5.0 | 5 |
| 16 | 101208019 | Anuj Kumar | 5.0 | 5 |
| 17 | 101208020 | AnuragPanthey | 4.0 | 4 |
| 18 | 101208022 | Arshdeep Singh | 4.0 | 4 |
| 19 | 101208023 | Arvind | 4.5 | 5 |
| 20 | 101208024 | ArvindMahey | 4.5 | 5 |
| 21 | 101208025 | Ashish Tandon | 4.5 | 5 |
| 22 | 101208026 | AshutoshPalta | 4.0 | 4 |
| 23 | 101208027 | AtulBatish | 5.0 | 5 |
| 24 | 101208028 | Aviral Prasad | 4.0 | 4 |

| | | | | |
|----|-----------|--------------------------|-----|---|
| 25 | 101208029 | AyushUniyal | 4.0 | 4 |
| 26 | 101208030 | Bhanu Sharma | 4.0 | 4 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 4.5 | 5 |
| 28 | 101208032 | Charanjeet Singh | 4.5 | 5 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 0.0 | 1 |
| 30 | 101208034 | Chirag Jain | 0.0 | 1 |
| 31 | 101208035 | Debopam Das | 5.0 | 5 |
| 32 | 101208036 | Deepak Singh | 4.0 | 4 |
| 33 | 101208037 | G S Tushar | 4.0 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 5.0 | 5 |
| 35 | 101208039 | Gaurav Garg | 5.0 | 5 |
| 36 | 101208040 | Gaurav Goyal | 4.5 | 5 |
| 37 | 101208042 | Gaurav Kakkar | 4.0 | 4 |
| 38 | 101208044 | Guriqbal Singh | 4.0 | 4 |
| 39 | 101208045 | Gurleen Singh | 4.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 4.0 | 4 |
| 41 | 101208048 | Harish Garg | 3.5 | 4 |
| 42 | 101208049 | Harsh Raheja | 3.5 | 4 |
| 43 | 101208051 | HimanshuGambhir | 5.0 | 5 |
| 44 | 101208052 | Ishita Jain | 4.5 | 5 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 4.5 | 5 |
| 46 | 101208054 | Jatin Mittal | 4.0 | 4 |
| 47 | 101208055 | Jatin Singh | 5.0 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 4.0 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 4.0 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 4.0 | 4 |
| 51 | 101208060 | KapilChaand | 4.5 | 5 |
| 52 | 101208061 | Karan Mehra | 4.5 | 5 |
| 53 | 101208062 | Karanbir Singh Sandhar | 3.0 | 4 |
| 54 | 101208063 | KartikSingla | 3.5 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 4.0 | 4 |
| 56 | 101208065 | KunalGarg | 3.0 | 4 |
| 57 | 101208066 | Kushagra | 3.0 | 4 |
| 58 | 101208068 | Manan Shah | 4.0 | 4 |
| 59 | 101208069 | ManavJuneja | 0.0 | 1 |
| 60 | 101208070 | Manjot Singh | 3.0 | 4 |
| 61 | 101208072 | Mayank Joshi | 4.0 | 4 |
| 62 | 101208073 | Mrigank Gupta | 5.0 | 5 |
| 63 | 101208075 | Navraj Singh | 4.0 | 4 |
| 64 | 101208076 | Nikhil Sehdev | 4.0 | 4 |

| | | | | |
|-----|-----------|------------------------|-----|---|
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 0.0 | 1 |
| 66 | 101208078 | Nishant Bansal | 3.0 | 4 |
| 67 | 101208079 | NishantGoyal | 3.0 | 4 |
| 68 | 101208080 | NishantKabra | 3.0 | 4 |
| 69 | 101208081 | NiteeshDua | 5.0 | 5 |
| 70 | 101208082 | Nitin Mahajan | 5.0 | 5 |
| 71 | 101208083 | Nitish Gupta | 5.0 | 5 |
| 72 | 101208084 | Omang | 3.0 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 0.0 | 1 |
| 74 | 101208086 | Pranav Lakhina | 4.0 | 4 |
| 75 | 101208088 | Pulkit Gupta | 3.0 | 4 |
| 76 | 101208089 | Puneet Arora | 0.0 | 1 |
| 77 | 101208090 | PurushottamMeena | 0.0 | 1 |
| 78 | 101208091 | Rahul Agarwal | 0.0 | 1 |
| 79 | 101208092 | Rahul Goyal | 5.0 | 5 |
| 80 | 101208093 | RajatParmar | 0.0 | 1 |
| 81 | 101208094 | Rajat Sharma | 0.0 | 1 |
| 82 | 101208095 | Rajiv Chauhan | 5.0 | 5 |
| 83 | 101208096 | Ravinder Singh | 5.0 | 5 |
| 84 | 101208097 | Ritvik Singh | 5.0 | 5 |
| 85 | 101208101 | Sagar Saini | 0.0 | 1 |
| 86 | 101208102 | Sahil Arora | 5.0 | 5 |
| 87 | 101208104 | SanchitSachdeva | 5.0 | 5 |
| 88 | 101208106 | SarthakMattas | 5.0 | 5 |
| 89 | 101208107 | Saurav Sharma | 5.0 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 5.0 | 5 |
| 91 | 101208110 | Shashank Jain | 3.0 | 4 |
| 92 | 101208111 | Shashwat Seth | 5.0 | 5 |
| 93 | 101208112 | Shourya Singh | 3.0 | 4 |
| 94 | 101208113 | Shray Mehta | 3.0 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 5.0 | 5 |
| 96 | 101208115 | Shubham Bansal | 5.0 | 5 |
| 97 | 101208116 | Shubham Chaudhary | 5.0 | 5 |
| 98 | 101208117 | ShubhamSaha | 5.0 | 5 |
| 99 | 101208118 | ShubhamSen | 0.0 | 1 |
| 100 | 101208120 | Sugam Arora | 3.0 | 4 |
| 101 | 101208121 | Sukhdev Singh | 3.0 | 4 |
| 102 | 101208123 | Sunil Singh | 3.0 | 4 |
| 103 | 101208125 | Tanveer Mehta | 5.0 | 5 |
| 104 | 101208126 | Tejinder Pal Singh | 4.5 | 5 |

| | | | | |
|-----|-----------|-------------------|-----|---|
| 105 | 101208129 | UllasChugh | 5.0 | 5 |
| 106 | 101208131 | VarinderSingla | 4.5 | 5 |
| 107 | 101208132 | Vikas Kumar Singh | 5.0 | 5 |
| 108 | 101208133 | VinayGarg | 4.5 | 5 |
| 109 | 101208134 | VineshGarg | 4.5 | 5 |
| 110 | 101208136 | VivekGoyal | 0.0 | 1 |
| 111 | 101208138 | YashKhemka | 5.0 | 5 |
| 112 | 101208139 | Yuvraj Singh | 5.0 | 5 |
| 113 | 101208140 | JiveshBedi | 4.5 | 5 |
| 114 | 101208142 | Vasu Sharma | 4.0 | 4 |
| 115 | 101388001 | Amit Tripathi | 5.0 | 5 |
| 116 | 101388002 | AnkitSetia | 5.0 | 5 |
| 117 | 101388003 | Jaswant Singh | 4.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 5.0 | 5 |
| 119 | 101388005 | Rahul Sharma | 4.5 | 5 |
| 120 | 101388006 | Rahul Verma | 4.5 | 5 |
| 121 | 101388007 | Rahul Verma | 0.0 | 1 |
| 122 | 101388008 | Rajan | 4.5 | 5 |
| 123 | 101388009 | Ramandeep Singh | 5.0 | 5 |
| 124 | 101388010 | Shivam Bhatia | 5.0 | 5 |
| 125 | 101388011 | Sukhvir Singh | 5.0 | 5 |
| 126 | 101388012 | Sunil Kumar | 3.0 | 4 |

Table H 4.18: Weighted Average Student Class Performance (course portfolio) for Attribute H3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|---|---|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 48.40 | 40.5 | 0 | 0 | 11.1 | 4.15 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria H3 as given below in Table H4.19:

Table H4.19: Weighted Average Student class performance (course portfolio) for criteria H3

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|------|------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 48.4 | 40.5 | 0 | 0 | 11.1 | 4.15 | 4 |
| Weighted average score | 48.40 | 40.50 | 0.00 | 0.00 | 11.10 | 4.15 | 4 |

b.) Assessment Tool: Student Course Survey**Table H4.20: Average score of student course survey for criteria H3**

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |
| Weighted average score | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 4.00 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey**Table H4.21: Assessment for criteria A3 using Graduating student survey, alumni survey and employer survey tool**

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 35.48 | 29.03 | 35.48 | 0.00 | 0.00 | 4.00 |
| Alumni survey | 33.33 | 59.26 | 7.41 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 61.11 | 22.22 | 13.89 | 0.00 | 0.00 | 4.36 |

Finally overall weighted average score of performance criterion 'H3' is evaluated as given below in Table H4.22:

Table H4.22: Overall weighted average score of performance criterion 'H3'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|---|-----------------------------|------|------|-----|------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 48.4 | 40.5 | 0.0 | 0.0 | 11.1 | 4.2 | 5.0 |
| Weighted average student course survey | 20.4 | 45.2 | 25.3 | 9.1 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 35.5 | 29.0 | 35.5 | 0.0 | 0.0 | 4.0 | 3.0 |
| Alumni survey | 33.3 | 59.3 | 7.4 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 61.1 | 22.2 | 13.9 | 0.0 | 0.0 | 4.4 | 3.0 |
| Overall weighted score | 39.6 | 39.7 | 15.1 | 2.0 | 3.1 | 4.1 | 18.0 |

Overall assessment of program outcome H using scores of H1, H2 and H3

In the above sections, each of the individual performance criteria H1, H2 and H3 have been assessed. The performance for attainment of outcome H has been completed using the attainment values for H1, H2 and H3 and is provided below:

Table H4.23 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome H.

Table H4.23: Overall score for outcome H at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| H1 | 33.88 | 44.93 | 16.44 | 2.03 | 2.27 | 4.05 | 5 |
| H2 | 31.48 | 45.50 | 17.68 | 4.01 | 0.88 | 4.01 | 5 |
| H3 | 39.63 | 39.72 | 15.09 | 2.03 | 3.08 | 4.09 | 4 |
| Overall score | 34.66 | 43.64 | 16.50 | 2.74 | 1.06 | 4.05 | 14 |

Track Record and assessment of attainment of program outcome ‘H’ over the last three academic years

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

The following table H4.24 presents the performance criteria-wise assessment score distribution for outcome ‘H’

Table H4.24: Performance criteria-wise assessment score distribution of outcome H

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| H | H1 | 4.13 | 3.73 | 4.05 |
| | H2 | 4.18 | 3.89 | 4.01 |
| | H3 | 3.91 | 3.79 | 4.09 |

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

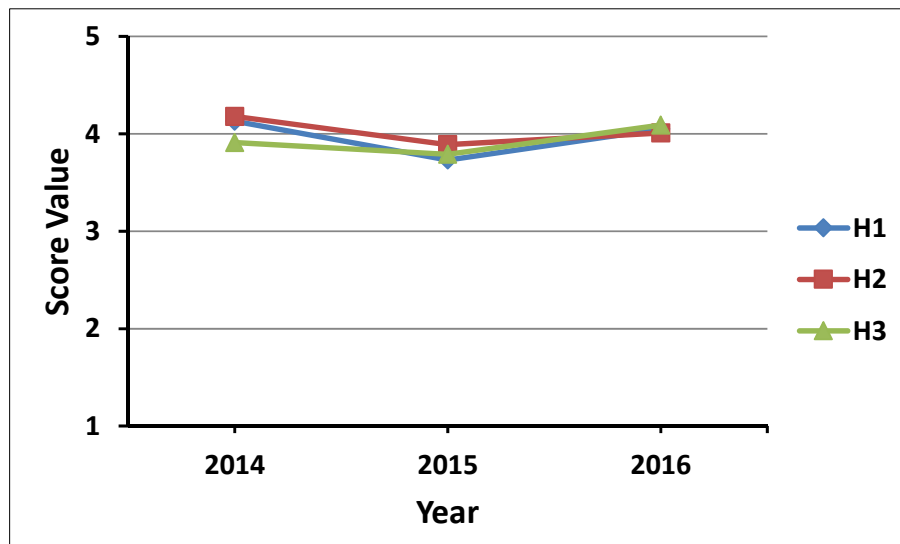


Figure H4.2: Performance criteria-wise assessment score distribution of outcome H

Level of attainment of program outcome ‘H’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table H4.25 presents the overall weighted score of outcome ‘H’ over the last three academic years

Table H4.25: Overall weighted score of outcome ‘H’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.07 | good |
| 2015 | 3.80 | good |
| 2016 | 4.05 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘H’ over a period of last three years.

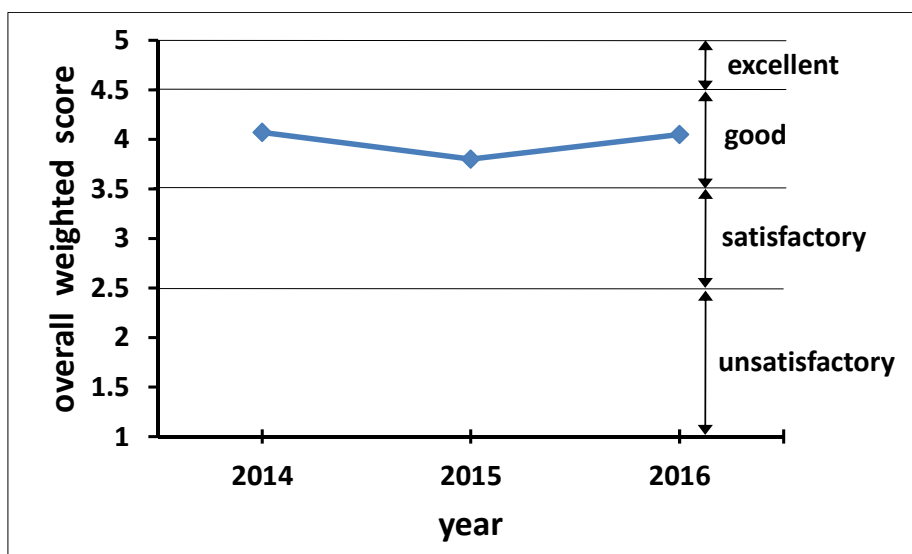


Figure H4.3: overall weighted score of outcome ‘H’ over a period of last three years

The following actions have been taken based on the analysis of Outcome H

| Weighted Score for Outcome H | Recommendation | Reason | Implemented from |
|------------------------------|---|--------------------------------|-------------------------|
| 3.80 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students can make innovations. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'I'
(Year 2016)**

for the

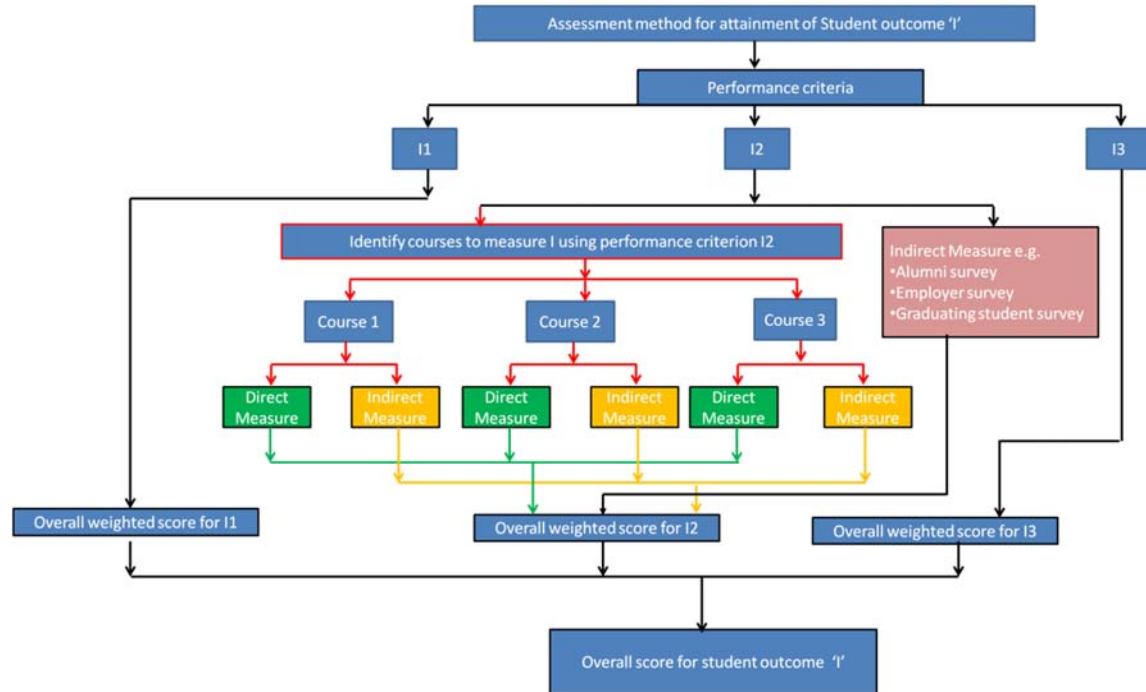
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome A

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'I'

Courses:

1. Project Semester (UME691)
2. Mechanical System Design (UME801)

Outcome I has been assessed by three performance criteria I1, I2 and I3. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these three performance criteria has been used to measure the overall measure of outcome I.

1) Assessment of Outcome 'I' using performance criterion I1

Performance criteria 'I1': Able to use resources to learn new materials not taught in class.

a.) Assessment Tool: Student's performance using course portfolio

Step I: Two courses namely Project Semester (UME691) and Mechanical System Design (UME801) were used to assess performance criteria I1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Project Semester (UME691)

(The criteria 'I1' is evaluated from the student report card submitted by their respective industry mentor by Q. No. B(vi))

Q B(vi): The performance of student measured through project report and defence

Table I4.1: Student's performance targeting 'I1'; course: UME691

| S. No. | Roll No. of Students | I 1 | Weight (Scale 1 to 5) |
|--------|----------------------|-----------------------------|-----------------------|
| | | (Q. No. B(vi)) (5 Marks) | |
| 1 | 101308008 | 5 | 5 |
| 2 | 101308013 | 5 | 5 |
| 3 | 101308019 | 5 | 5 |
| 4 | 101308023 | 5 | 5 |
| 5 | 101308024 | 5 | 5 |
| 6 | 101308025 | 5 | 5 |
| 7 | 101308026 | 5 | 5 |
| 8 | 101308027 | 5 | 5 |
| 9 | 101308028 | 5 | 5 |
| 10 | 101308029 | 5 | 5 |
| 11 | 101308031 | 5 | 5 |
| 12 | 101308035 | 5 | 5 |
| 13 | 101308037 | 5 | 5 |
| 14 | 101308038 | 5 | 5 |
| 15 | 101308043 | 5 | 5 |
| 16 | 101308046 | 5 | 5 |
| 17 | 101308054 | 5 | 5 |
| 18 | 101308059 | 4 | 4 |
| 19 | 101308060 | 3 | 3 |
| 20 | 101308061 | 5 | 5 |
| 21 | 101308063 | 5 | 5 |
| 22 | 101308066 | 5 | 5 |
| 23 | 101308067 | 5 | 5 |
| 24 | 101308074 | 4 | 4 |
| 25 | 101308076 | 5 | 5 |
| 26 | 101308077 | 4 | 4 |

| | | | |
|----|-----------|---|---|
| 27 | 101308078 | 5 | 5 |
| 28 | 101308079 | 3 | 3 |
| 29 | 101308083 | 5 | 5 |
| 30 | 101308085 | 5 | 5 |
| 31 | 101308093 | 4 | 4 |
| 32 | 101308094 | 5 | 5 |
| 33 | 101308096 | 5 | 5 |
| 34 | 101308098 | 4 | 4 |
| 35 | 101308099 | 5 | 5 |
| 36 | 101308100 | 4 | 4 |
| 37 | 101308101 | 5 | 5 |
| 38 | 101308111 | 4 | 4 |
| 39 | 101308113 | 5 | 5 |
| 40 | 101308114 | 4 | 4 |
| 41 | 101308116 | 5 | 5 |
| 42 | 101308118 | 3 | 3 |
| 43 | 101308119 | 5 | 5 |
| 44 | 101308120 | 4 | 4 |
| 45 | 101308122 | 5 | 5 |
| 46 | 101308123 | 5 | 5 |
| 47 | 101308124 | 5 | 5 |
| 48 | 101308125 | 5 | 5 |
| 49 | 101309007 | 5 | 5 |
| 50 | 101309022 | 4 | 4 |
| 51 | 101488005 | 5 | 5 |
| 52 | 101488011 | 5 | 5 |
| 53 | 101488012 | 5 | 5 |
| 54 | 101488013 | 5 | 5 |
| 55 | 101488015 | 5 | 5 |
| 56 | 101488017 | 5 | 5 |
| 57 | 101488018 | 5 | 5 |
| 58 | 101489001 | 5 | 5 |
| 59 | 101489002 | 5 | 5 |
| 60 | 101489003 | 4 | 4 |

The overall performance of students in the above question is then summarized as given below

Table I4.2: Average score of student performance in the course UME691for criteria I1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 76.67 | 18.33 | 5 | 0 | 0 | 4.72 |

(ii) Course: Mechanical system design (UME801)

The above performance criteria is used to measure the attainment of outcome 'I' by giving the following question (From the final evaluation, May 2016) to the students.

Question:

Final Evaluation: Daily Diary, Showcase of Designed and fabricated product, Detailed printed report, Assembly and detailed production drawings. (65)

Student's performance in the above question is given below:

Table I4.3: Student's performance in question targeting 'I1'; course: UME801

| S.No. | Rollno. | Name | MARKS (65) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 54.4 | 5 |
| 2 | 101208002 | Aditya Anand | 41.2 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 54.4 | 5 |
| 4 | 101208004 | AkankshVashistha | 40.2 | 4 |
| 5 | 101208005 | Akshay | 54.4 | 5 |
| 6 | 101208006 | AkshayKaura | 54.4 | 5 |
| 7 | 101208007 | AmanJamwal | 40.2 | 4 |
| 8 | 101208008 | Aman Sharma | 40.2 | 4 |
| 9 | 101208009 | AmanVerma | 40.2 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 41.2 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 49.6 | 5 |
| 12 | 101208012 | Amol | 41.2 | 4 |
| 13 | 101208013 | Amrinder Singh | 49.6 | 5 |
| 14 | 101208016 | AnkurWasdev | 49.6 | 5 |
| 15 | 101208017 | AnshumanHanda | 49.6 | 5 |
| 16 | 101208019 | Anuj Kumar | 49.6 | 5 |
| 17 | 101208020 | AnuragPanthey | 54.4 | 5 |
| 18 | 101208022 | Arshdeep Singh | 40.2 | 4 |
| 19 | 101208023 | Arvind | 42.3 | 4 |
| 20 | 101208024 | ArvindMahey | 36.3 | 4 |
| 21 | 101208025 | Ashish Tandon | 36.6 | 4 |
| 22 | 101208026 | AshutoshPalta | 49.6 | 5 |
| 23 | 101208027 | AtulBatish | 37.7 | 4 |
| 24 | 101208028 | Aviral Prasad | 42.4 | 4 |
| 25 | 101208029 | AyushUniyal | 42.4 | 4 |
| 26 | 101208030 | Bhanu Sharma | 50.1 | 5 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 42.1 | 4 |
| 28 | 101208032 | Charanjeet Singh | 42.1 | 4 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 49.6 | 5 |
| 30 | 101208034 | Chirag Jain | 49.6 | 5 |
| 31 | 101208035 | Debopam Das | 37.7 | 4 |

| | | | | |
|----|-----------|------------------------|------|---|
| 32 | 101208036 | Deepak Singh | 42.4 | 4 |
| 33 | 101208037 | G S Tushar | 42.7 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 37.4 | 4 |
| 35 | 101208039 | Gaurav Garg | 37.9 | 4 |
| 36 | 101208040 | Gaurav Goyal | 42.1 | 4 |
| 37 | 101208042 | Gaurav Kakkar | 49.6 | 5 |
| 38 | 101208044 | Guriqbal Singh | 39.3 | 4 |
| 39 | 101208045 | Gurleen Singh | 39.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 39.0 | 4 |
| 41 | 101208048 | Harish Garg | 42.7 | 4 |
| 42 | 101208049 | Harsh Raheja | 42.7 | 4 |
| 43 | 101208051 | HimanshuGambhir | 50.1 | 5 |
| 44 | 101208052 | Ishita Jain | 43.6 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 43.6 | 4 |
| 46 | 101208054 | Jatin Mittal | 39.3 | 4 |
| 47 | 101208055 | Jatin Singh | 50.1 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 39.3 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 39.3 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 39.0 | 4 |
| 51 | 101208060 | KapilChaand | 43.6 | 4 |
| 52 | 101208061 | Karan Mehra | 43.6 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 43.6 | 4 |
| 54 | 101208063 | KartikSingla | 42.7 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 39.3 | 4 |
| 56 | 101208065 | KunalGarg | 35.8 | 4 |
| 57 | 101208066 | Kushagra | 43.8 | 4 |
| 58 | 101208068 | Manan Shah | 49.1 | 5 |
| 59 | 101208069 | ManavJuneja | 40.2 | 4 |
| 60 | 101208070 | Manjot Singh | 35.8 | 4 |
| 61 | 101208072 | Mayank Joshi | 49.1 | 5 |
| 62 | 101208073 | Mrigank Gupta | 40.2 | 4 |
| 63 | 101208075 | Navraj Singh | 49.1 | 5 |
| 64 | 101208076 | Nikhil Sehdev | 42.4 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 43.8 | 4 |
| 66 | 101208078 | Nishant Bansal | 35.8 | 4 |
| 67 | 101208079 | NishantGoyal | 35.8 | 4 |
| 68 | 101208080 | NishantKabra | 43.8 | 4 |
| 69 | 101208081 | NiteeshDua | 50.1 | 5 |
| 70 | 101208082 | Nitin Mahajan | 40.2 | 4 |
| 71 | 101208083 | Nitish Gupta | 40.2 | 4 |
| 72 | 101208084 | Omang | 35.8 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 40.2 | 4 |
| 74 | 101208086 | Pranav Lakhina | 49.1 | 5 |
| 75 | 101208088 | Pulkit Gupta | 43.8 | 4 |

| | | | | |
|-----|-----------|--------------------|------|---|
| 76 | 101208089 | Puneet Arora | 39.5 | 4 |
| 77 | 101208090 | PurushottamMeena | 39.5 | 4 |
| 78 | 101208091 | Rahul Agarwal | 42.8 | 4 |
| 79 | 101208092 | Rahul Goyal | 37.0 | 4 |
| 80 | 101208093 | RajatParmar | 42.8 | 4 |
| 81 | 101208094 | Rajat Sharma | 42.8 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 37.0 | 4 |
| 83 | 101208096 | Ravinder Singh | 37.0 | 4 |
| 84 | 101208097 | Ritvik Singh | 39.5 | 4 |
| 85 | 101208101 | Sagar Saini | 39.5 | 4 |
| 86 | 101208102 | Sahil Arora | 39.5 | 4 |
| 87 | 101208104 | SanchitSachdeva | 45.1 | 5 |
| 88 | 101208106 | SarthakMattas | 45.1 | 5 |
| 89 | 101208107 | Saurav Sharma | 45.1 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 45.1 | 5 |
| 91 | 101208110 | Shashank Jain | 42.8 | 4 |
| 92 | 101208111 | Shashwat Seth | 45.1 | 5 |
| 93 | 101208112 | Shourya Singh | 42.8 | 4 |
| 94 | 101208113 | Shray Mehta | 42.8 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 40.5 | 4 |
| 96 | 101208115 | Shubham Bansal | 40.7 | 4 |
| 97 | 101208116 | Shubham Chaudhary | 40.5 | 4 |
| 98 | 101208117 | ShubhamSaha | 48.0 | 5 |
| 99 | 101208118 | ShubhamSen | 31.0 | 2 |
| 100 | 101208120 | Sugam Arora | 33.4 | 3 |
| 101 | 101208121 | Sukhdev Singh | 33.4 | 3 |
| 102 | 101208123 | Sunil Singh | 33.4 | 3 |
| 103 | 101208125 | Tanveer Mehta | 40.7 | 4 |
| 104 | 101208126 | Tejinder Pal Singh | 42.0 | 4 |
| 105 | 101208129 | UllasChugh | 48.3 | 5 |
| 106 | 101208131 | VarinderSingla | 42.0 | 4 |
| 107 | 101208132 | Vikas Kumar Singh | 48.0 | 5 |
| 108 | 101208133 | VinayGarg | 42.0 | 4 |
| 109 | 101208134 | VineshGarg | 42.0 | 4 |
| 110 | 101208136 | VivekGoyal | 46.0 | 5 |
| 111 | 101208138 | YashKhemka | 40.5 | 4 |
| 112 | 101208139 | Yuvraj Singh | 48.3 | 5 |
| 113 | 101208140 | JiveshBedi | 36.3 | 4 |
| 114 | 101208142 | Vasu Sharma | 49.1 | 5 |
| 115 | 101388001 | Amit Tripathi | 41.2 | 4 |
| 116 | 101388002 | AnkitSetia | 41.2 | 4 |
| 117 | 101388003 | Jaswant Singh | 39.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 37.7 | 4 |
| 119 | 101388005 | Rahul Sharma | 36.3 | 4 |

| | | | | |
|-----|-----------|-----------------|------|---|
| 120 | 101388006 | Rahul Verma | 42.0 | 4 |
| 121 | 101388007 | Rahul Verma | 50.1 | 5 |
| 122 | 101388008 | Rajan | 42.0 | 4 |
| 123 | 101388009 | Ramandeep Singh | 37.0 | 4 |
| 124 | 101388010 | Shivam Bhatia | 37.0 | 4 |
| 125 | 101388011 | Sukhvir Singh | 37.0 | 4 |
| 126 | 101388012 | Sunil Kumar | 43.8 | 4 |

Table I4.4: Weighted Average Student Class Performance (course portfolio) for Attribute I1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0.0 | 4.23 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria I1 as given below in Table I4.5:

Table I4.5: Weighted Average Student class performance (course portfolio) for criteria I1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0 | 4.23 | 5 |
| UME691 | 76.67 | 18.33 | 5 | 0 | 0 | 4.72 | 5 |
| Weighted average score | 51.84 | 44.07 | 3.70 | 0.40 | 0.00 | 4.47 | 10 |

b) Indirect measures for Performance criteria I1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table I4.6: Average score of student course survey for criteria I1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 5.00 |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 21.39 | 41.63 | 30.90 | 6.16 | 0.00 | 3.78 | 10.00 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table I4.7: Assessment for criteria I1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 41.94 | 35.48 | 19.35 | 3.23 | 0.00 | 4.16 |
| Alumni survey | 62.96 | 25.93 | 11.11 | 0.00 | 0.00 | 4.52 |
| Employer Survey | 58.33 | 38.89 | 2.78 | 0.00 | 0.00 | 4.56 |

c) Overall weighted average score of performance criterion 'I1'

Finally overall weighted average score of performance criterion 'I1' is evaluated as given below in Table I4.8:

Table I4.8: Overall weighted average score of performance criterion 'I1'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 51.8 | 44.1 | 3.7 | 0.4 | 0.0 | 4.5 | 5.0 |
| Weighted average student course survey | 21.4 | 41.6 | 30.9 | 6.2 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 41.9 | 35.5 | 19.4 | 3.2 | 0.0 | 4.2 | 3.0 |
| Alumni survey | 63.0 | 25.9 | 11.1 | 0.0 | 0.0 | 4.5 | 3.0 |
| Employer survey | 58.3 | 38.9 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 46.4 | 38.2 | 13.4 | 2.0 | 0.0 | 4.3 | 18.0 |

Assessment of Outcome 'I' using performance criterion I2

Performance criteria 'I2': Ability to list sources for continuing education opportunities.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Project Semester (UME691) and Mechanical System design (UME801) were used to assess performance criteria I2 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Project Semester (UME691)

(The criteria 'I2' is evaluated from the student report card submitted by their respective industry mentor by Q. No. B(iv))

Q B(iv): Information collection update: This refers to (a) Literature survey (b) Guidance from others in industry and institute.

Table I4.9: Student's performance targeting 'I2'; course: UME691

| S. No. | Roll No. of Students | I 2 | Weight (Scale 1 to 5) |
|--------|----------------------|-----------------------------|-----------------------|
| | | (Q. No. B(iv)) (5 Marks) | |
| 1 | 101308008 | 5 | 5 |
| 2 | 101308013 | 5 | 5 |
| 3 | 101308019 | 4 | 4 |
| 4 | 101308023 | 5 | 5 |
| 5 | 101308024 | 5 | 5 |
| 6 | 101308025 | 5 | 5 |
| 7 | 101308026 | 5 | 5 |
| 8 | 101308027 | 5 | 5 |
| 9 | 101308028 | 5 | 5 |
| 10 | 101308029 | 5 | 5 |
| 11 | 101308031 | 5 | 5 |
| 12 | 101308035 | 5 | 5 |
| 13 | 101308037 | 5 | 5 |
| 14 | 101308038 | 5 | 5 |
| 15 | 101308043 | 5 | 5 |
| 16 | 101308046 | 5 | 5 |
| 17 | 101308054 | 5 | 5 |
| 18 | 101308059 | 5 | 5 |
| 19 | 101308060 | 5 | 5 |
| 20 | 101308061 | 5 | 5 |
| 21 | 101308063 | 5 | 5 |
| 22 | 101308066 | 5 | 5 |
| 23 | 101308067 | 5 | 5 |
| 24 | 101308074 | 4 | 4 |
| 25 | 101308076 | 5 | 5 |
| 26 | 101308077 | 5 | 5 |
| 27 | 101308078 | 5 | 5 |
| 28 | 101308079 | 5 | 5 |
| 29 | 101308083 | 5 | 5 |
| 30 | 101308085 | 5 | 5 |
| 31 | 101308093 | 5 | 5 |
| 32 | 101308094 | 5 | 5 |
| 33 | 101308096 | 5 | 5 |
| 34 | 101308098 | 5 | 5 |
| 35 | 101308099 | 5 | 5 |
| 36 | 101308100 | 5 | 5 |
| 37 | 101308101 | 5 | 5 |
| 38 | 101308111 | 5 | 5 |
| 39 | 101308113 | 5 | 5 |

| | | | |
|----|-----------|---|---|
| 40 | 101308114 | 5 | 5 |
| 41 | 101308116 | 4 | 4 |
| 42 | 101308118 | 4 | 4 |
| 43 | 101308119 | 4 | 4 |
| 44 | 101308120 | 5 | 5 |
| 45 | 101308122 | 5 | 5 |
| 46 | 101308123 | 5 | 5 |
| 47 | 101308124 | 5 | 5 |
| 48 | 101308125 | 5 | 5 |
| 49 | 101309007 | 5 | 5 |
| 50 | 101309022 | 5 | 5 |
| 51 | 101488005 | 5 | 5 |
| 52 | 101488011 | 5 | 5 |
| 53 | 101488012 | 5 | 5 |
| 54 | 101488013 | 5 | 5 |
| 55 | 101488015 | 5 | 5 |
| 56 | 101488017 | 5 | 5 |
| 57 | 101488018 | 5 | 5 |
| 58 | 101489001 | 5 | 5 |
| 59 | 101489002 | 4 | 4 |
| 60 | 101489003 | 5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table I4.10: Average score of student performance in the course UME691for criteria I2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|----|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 90 | 10 | 3 | 0 | 0 | 4.90 |

(ii) Course: Mechanical System Design (UME801)

The above performance criteria is used to measure the attainment of outcome ‘I’ by giving the following question (From the final evaluation, May 2016) to the students.

Question:

Final Evaluation: Daily Diary, Showcase of Designed and fabricated product, Detailed printed report, Assembly and detailed production drawings. (65)

Student’s performance in the above question is given below:

Table I4.11 : Student’s performance in question targeting ‘I2’; course: UME801

| S.No. | Rollno. | Name | MARKS (65) | SCORE (1-5) |
|-------|-----------|------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 54.4 | 5 |
| 2 | 101208002 | Aditya Anand | 41.2 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 54.4 | 5 |

| | | | | |
|----|-----------|--------------------------|------|---|
| 4 | 101208004 | AkankshVashistha | 40.2 | 4 |
| 5 | 101208005 | Akshay | 54.4 | 5 |
| 6 | 101208006 | AkshayKaura | 54.4 | 5 |
| 7 | 101208007 | AmanJamwal | 40.2 | 4 |
| 8 | 101208008 | Aman Sharma | 40.2 | 4 |
| 9 | 101208009 | AmanVerma | 40.2 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 41.2 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 49.6 | 5 |
| 12 | 101208012 | Amol | 41.2 | 4 |
| 13 | 101208013 | Amrinder Singh | 49.6 | 5 |
| 14 | 101208016 | AnkurWasdev | 49.6 | 5 |
| 15 | 101208017 | AnshumanHanda | 49.6 | 5 |
| 16 | 101208019 | Anuj Kumar | 49.6 | 5 |
| 17 | 101208020 | AnuragPanthey | 54.4 | 5 |
| 18 | 101208022 | Arshdeep Singh | 40.2 | 4 |
| 19 | 101208023 | Arvind | 42.3 | 4 |
| 20 | 101208024 | ArvindMahey | 36.3 | 4 |
| 21 | 101208025 | Ashish Tandon | 36.6 | 4 |
| 22 | 101208026 | AshutoshPalta | 49.6 | 5 |
| 23 | 101208027 | AtulBatish | 37.7 | 4 |
| 24 | 101208028 | Aviral Prasad | 42.4 | 4 |
| 25 | 101208029 | AyushUniyal | 42.4 | 4 |
| 26 | 101208030 | Bhanu Sharma | 50.1 | 5 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 42.1 | 4 |
| 28 | 101208032 | Charanjeet Singh | 42.1 | 4 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 49.6 | 5 |
| 30 | 101208034 | Chirag Jain | 49.6 | 5 |
| 31 | 101208035 | Debopam Das | 37.7 | 4 |
| 32 | 101208036 | Deepak Singh | 42.4 | 4 |
| 33 | 101208037 | G S Tushar | 42.7 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 37.4 | 4 |
| 35 | 101208039 | Gaurav Garg | 37.9 | 4 |
| 36 | 101208040 | Gaurav Goyal | 42.1 | 4 |
| 37 | 101208042 | Gaurav Kakkar | 49.6 | 5 |
| 38 | 101208044 | Guriqbal Singh | 39.3 | 4 |
| 39 | 101208045 | Gurleen Singh | 39.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 39.0 | 4 |
| 41 | 101208048 | Harish Garg | 42.7 | 4 |
| 42 | 101208049 | Harsh Raheja | 42.7 | 4 |
| 43 | 101208051 | HimanshuGambhir | 50.1 | 5 |
| 44 | 101208052 | Ishita Jain | 43.6 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 43.6 | 4 |
| 46 | 101208054 | Jatin Mittal | 39.3 | 4 |
| 47 | 101208055 | Jatin Singh | 50.1 | 5 |

| | | | | |
|----|-----------|------------------------|------|---|
| 48 | 101208056 | Jugraj Singh Sandhu | 39.3 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 39.3 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 39.0 | 4 |
| 51 | 101208060 | KapilChaand | 43.6 | 4 |
| 52 | 101208061 | Karan Mehra | 43.6 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 43.6 | 4 |
| 54 | 101208063 | KartikSingla | 42.7 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 39.3 | 4 |
| 56 | 101208065 | KunalGarg | 35.8 | 4 |
| 57 | 101208066 | Kushagra | 43.8 | 4 |
| 58 | 101208068 | Manan Shah | 49.1 | 5 |
| 59 | 101208069 | ManavJuneja | 40.2 | 4 |
| 60 | 101208070 | Manjot Singh | 35.8 | 4 |
| 61 | 101208072 | Mayank Joshi | 49.1 | 5 |
| 62 | 101208073 | Mrigank Gupta | 40.2 | 4 |
| 63 | 101208075 | Navraj Singh | 49.1 | 5 |
| 64 | 101208076 | Nikhil Sehdev | 42.4 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 43.8 | 4 |
| 66 | 101208078 | Nishant Bansal | 35.8 | 4 |
| 67 | 101208079 | NishantGoyal | 35.8 | 4 |
| 68 | 101208080 | NishantKabra | 43.8 | 4 |
| 69 | 101208081 | NiteeshDua | 50.1 | 5 |
| 70 | 101208082 | Nitin Mahajan | 40.2 | 4 |
| 71 | 101208083 | Nitish Gupta | 40.2 | 4 |
| 72 | 101208084 | Omang | 35.8 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 40.2 | 4 |
| 74 | 101208086 | Pranav Lakhina | 49.1 | 5 |
| 75 | 101208088 | Pulkit Gupta | 43.8 | 4 |
| 76 | 101208089 | Puneet Arora | 39.5 | 4 |
| 77 | 101208090 | PurushottamMeena | 39.5 | 4 |
| 78 | 101208091 | Rahul Agarwal | 42.8 | 4 |
| 79 | 101208092 | Rahul Goyal | 37.0 | 4 |
| 80 | 101208093 | RajatParmar | 42.8 | 4 |
| 81 | 101208094 | Rajat Sharma | 42.8 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 37.0 | 4 |
| 83 | 101208096 | Ravinder Singh | 37.0 | 4 |
| 84 | 101208097 | Ritvik Singh | 39.5 | 4 |
| 85 | 101208101 | Sagar Saini | 39.5 | 4 |
| 86 | 101208102 | Sahil Arora | 39.5 | 4 |
| 87 | 101208104 | SanchitSachdeva | 45.1 | 5 |
| 88 | 101208106 | SarthakMattas | 45.1 | 5 |
| 89 | 101208107 | Saurav Sharma | 45.1 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 45.1 | 5 |
| 91 | 101208110 | Shashank Jain | 42.8 | 4 |

| | | | | |
|-----|-----------|--------------------|------|---|
| 92 | 101208111 | Shashwat Seth | 45.1 | 5 |
| 93 | 101208112 | Shourya Singh | 42.8 | 4 |
| 94 | 101208113 | Shray Mehta | 42.8 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 40.5 | 4 |
| 96 | 101208115 | Shubham Bansal | 40.7 | 4 |
| 97 | 101208116 | Shubham Chaudhary | 40.5 | 4 |
| 98 | 101208117 | ShubhamSaha | 48.0 | 5 |
| 99 | 101208118 | ShubhamSen | 31.0 | 2 |
| 100 | 101208120 | Sugam Arora | 33.4 | 3 |
| 101 | 101208121 | Sukhdev Singh | 33.4 | 3 |
| 102 | 101208123 | Sunil Singh | 33.4 | 3 |
| 103 | 101208125 | Tanveer Mehta | 40.7 | 4 |
| 104 | 101208126 | Tejinder Pal Singh | 42.0 | 4 |
| 105 | 101208129 | UllasChugh | 48.3 | 5 |
| 106 | 101208131 | VarinderSingla | 42.0 | 4 |
| 107 | 101208132 | Vikas Kumar Singh | 48.0 | 5 |
| 108 | 101208133 | VinayGarg | 42.0 | 4 |
| 109 | 101208134 | VineshGarg | 42.0 | 4 |
| 110 | 101208136 | VivekGoyal | 46.0 | 5 |
| 111 | 101208138 | YashKhemka | 40.5 | 4 |
| 112 | 101208139 | Yuvraj Singh | 48.3 | 5 |
| 113 | 101208140 | JiveshBedi | 36.3 | 4 |
| 114 | 101208142 | Vasu Sharma | 49.1 | 5 |
| 115 | 101388001 | Amit Tripathi | 41.2 | 4 |
| 116 | 101388002 | AnkitSetia | 41.2 | 4 |
| 117 | 101388003 | Jaswant Singh | 39.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 37.7 | 4 |
| 119 | 101388005 | Rahul Sharma | 36.3 | 4 |
| 120 | 101388006 | Rahul Verma | 42.0 | 4 |
| 121 | 101388007 | Rahul Verma | 50.1 | 5 |
| 122 | 101388008 | Rajan | 42.0 | 4 |
| 123 | 101388009 | Ramandeep Singh | 37.0 | 4 |
| 124 | 101388010 | Shivam Bhatia | 37.0 | 4 |
| 125 | 101388011 | Sukhvir Singh | 37.0 | 4 |
| 126 | 101388012 | Sunil Kumar | 43.8 | 4 |

Table I4.12: Weighted Average Student Class Performance (course portfolio) for Attribute I2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0.0 | 4.23* |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria I2 as given below in Table I4.13:

Table I4.13: Weighted Average Student class performance (course portfolio) for criteria I2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0 | 4.23 | 5 |
| UME691 | 90 | 10 | 3 | 0 | 0 | 4.99 | 5 |
| Weighted average score | 58.50 | 39.90 | 2.70 | 0.40 | 0.00 | 4.61 | 10 |

b.) Assessment Tool: Student Course Survey

Table I4.14: Average score of student course survey for criteria I2

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 5.00 |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 21.39 | 41.63 | 30.90 | 6.16 | 0.00 | 3.78 | 10.00 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table I4.15: Assessment for criteria I2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 41.94 | 35.48 | 19.35 | 3.23 | 0.00 | 4.16 |
| Alumni survey | 62.96 | 25.93 | 11.11 | 0.00 | 0.00 | 4.52 |
| Employer Survey | 58.33 | 38.89 | 2.78 | 0.00 | 0.00 | 4.56 |

Finally overall weighted average score of performance criterion 'I2' is evaluated as given below in Table I4.16:

Table I4.16: Overall weighted average score of performance criterion 'I2'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 58.5 | 39.9 | 2.7 | 0.4 | 0.0 | 4.6 | 5.0 |
| Weighted average student course survey | 21.4 | 41.6 | 30.9 | 6.2 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 41.9 | 35.5 | 19.4 | 3.2 | 0.0 | 4.2 | 3.0 |
| Alumni survey | 63.0 | 25.9 | 11.1 | 0.0 | 0.0 | 4.5 | 3.0 |
| Employer survey | 58.3 | 38.9 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 48.2 | 37.0 | 13.2 | 2.0 | 0.0 | 4.3 | 18.0 |

Assessment of Outcome 'I' using performance criterion I3

Performance criteria 'I3': Applying scientific and/or engineering principles towards solving engineering problems.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Project Semester (UME691) and Mechanical System Design (UME801) were used to assess performance criteria I3 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Project Semester (UME691)

(The criteria 'I3' is evaluated from the student report card submitted by their respective industry mentor by Q. No. A(vi))

Q A(vi): Application skills (refers to the ability to apply knowledge to the real life situations)

Table I4.17: Student's performance targeting 'I3'; course: UME691

| S. No. | Roll No. of Students | I3 | Weight (Scale 1 to 5) |
|--------|----------------------|-----------------------------|-----------------------|
| | | (Q. No. A(vi)) (5 Marks) | |
| 1 | 101308008 | 5 | 5 |
| 2 | 101308013 | 4 | 4 |
| 3 | 101308019 | 4 | 4 |
| 4 | 101308023 | 5 | 5 |
| 5 | 101308024 | 5 | 5 |
| 6 | 101308025 | 5 | 5 |
| 7 | 101308026 | 5 | 5 |
| 8 | 101308027 | 5 | 5 |
| 9 | 101308028 | 5 | 5 |

Attainment of Outcome I

| | | | |
|----|-----------|---|---|
| 10 | 101308029 | 5 | 5 |
| 11 | 101308031 | 5 | 5 |
| 12 | 101308035 | 5 | 5 |
| 13 | 101308037 | 4 | 4 |
| 14 | 101308038 | 5 | 5 |
| 15 | 101308043 | 5 | 5 |
| 16 | 101308046 | 5 | 5 |
| 17 | 101308054 | 5 | 5 |
| 18 | 101308059 | 5 | 5 |
| 19 | 101308060 | 5 | 5 |
| 20 | 101308061 | 5 | 5 |
| 21 | 101308063 | 5 | 5 |
| 22 | 101308066 | 5 | 5 |
| 23 | 101308067 | 5 | 5 |
| 24 | 101308074 | 3 | 3 |
| 25 | 101308076 | 5 | 5 |
| 26 | 101308077 | 4 | 4 |
| 27 | 101308078 | 5 | 5 |
| 28 | 101308079 | 5 | 5 |
| 29 | 101308083 | 5 | 5 |
| 30 | 101308085 | 5 | 5 |
| 31 | 101308093 | 5 | 5 |
| 32 | 101308094 | 5 | 5 |
| 33 | 101308096 | 5 | 5 |
| 34 | 101308098 | 5 | 5 |
| 35 | 101308099 | 4 | 4 |
| 36 | 101308100 | 5 | 5 |
| 37 | 101308101 | 5 | 5 |
| 38 | 101308111 | 5 | 5 |
| 39 | 101308113 | 5 | 5 |
| 40 | 101308114 | 5 | 5 |
| 41 | 101308116 | 5 | 5 |
| 42 | 101308118 | 5 | 5 |
| 43 | 101308119 | 5 | 5 |
| 44 | 101308120 | 4 | 4 |
| 45 | 101308122 | 5 | 5 |
| 46 | 101308123 | 4 | 4 |
| 47 | 101308124 | 5 | 5 |
| 48 | 101308125 | 5 | 5 |
| 49 | 101309007 | 5 | 5 |
| 50 | 101309022 | 5 | 5 |
| 51 | 101488005 | 5 | 5 |
| 52 | 101488011 | 5 | 5 |
| 53 | 101488012 | 5 | 5 |
| 54 | 101488013 | 5 | 5 |

| | | | |
|----|-----------|---|---|
| 55 | 101488015 | 5 | 5 |
| 56 | 101488017 | 5 | 5 |
| 57 | 101488018 | 4 | 4 |
| 58 | 101489001 | 5 | 5 |
| 59 | 101489002 | 5 | 5 |
| 60 | 101489003 | 5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table I4.18: Average score of student performance in the course UME691for criteria I3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME691 | 85 | 13.33 | 1.67 | 0 | 0 | 4.83 |

(II) Course: Mechanical System Design (UME801)

The above performance criteria is used to measure the attainment of outcome ‘I’ by giving the following question (From the final evaluation, May 2016) to the students.

Question:

Final Evaluation: Daily Diary, Showcase of Designed and fabricated product, Detailed printed report, Assembly and detailed production drawings. (65)

Student’s performance in the above question is given below:

Table I4.19: Student’s performance in question targeting ‘I3’; course: UME801

| S.No. | Roll no. | Name | MARKS (65) | SCORE (1-5) |
|-------|-----------|--------------------------|------------|-------------|
| 1 | 101208001 | Abhinandan Singh | 54.4 | 5 |
| 2 | 101208002 | Aditya Anand | 41.2 | 4 |
| 3 | 101208003 | Ajaywinder Singh | 54.4 | 5 |
| 4 | 101208004 | AkankshVashistha | 40.2 | 4 |
| 5 | 101208005 | Akshay | 54.4 | 5 |
| 6 | 101208006 | AkshayKaura | 54.4 | 5 |
| 7 | 101208007 | AmanJamwal | 40.2 | 4 |
| 8 | 101208008 | Aman Sharma | 40.2 | 4 |
| 9 | 101208009 | AmanVerma | 40.2 | 4 |
| 10 | 101208010 | Amandeep Singh Aulakh | 41.2 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 49.6 | 5 |
| 12 | 101208012 | Amol | 41.2 | 4 |
| 13 | 101208013 | Amrinder Singh | 49.6 | 5 |
| 14 | 101208016 | AnkurWasdev | 49.6 | 5 |
| 15 | 101208017 | AnshumanHanda | 49.6 | 5 |
| 16 | 101208019 | Anuj Kumar | 49.6 | 5 |
| 17 | 101208020 | AnuragPanthey | 54.4 | 5 |
| 18 | 101208022 | Arshdeep Singh | 40.2 | 4 |
| 19 | 101208023 | Arvind | 42.3 | 4 |

| | | | | |
|----|-----------|--------------------------|------|---|
| 20 | 101208024 | ArvindMahey | 36.3 | 4 |
| 21 | 101208025 | Ashish Tandon | 36.6 | 4 |
| 22 | 101208026 | AshutoshPalta | 49.6 | 5 |
| 23 | 101208027 | AtulBatish | 37.7 | 4 |
| 24 | 101208028 | Aviral Prasad | 42.4 | 4 |
| 25 | 101208029 | AyushUniyal | 42.4 | 4 |
| 26 | 101208030 | Bhanu Sharma | 50.1 | 5 |
| 27 | 101208031 | Brinderjeet Singh Dhanoa | 42.1 | 4 |
| 28 | 101208032 | Charanjeet Singh | 42.1 | 4 |
| 29 | 101208033 | ChinmoyJyotiSonowal | 49.6 | 5 |
| 30 | 101208034 | Chirag Jain | 49.6 | 5 |
| 31 | 101208035 | Debopam Das | 37.7 | 4 |
| 32 | 101208036 | Deepak Singh | 42.4 | 4 |
| 33 | 101208037 | G S Tushar | 42.7 | 4 |
| 34 | 101208038 | Gagandeep Singh Gujral | 37.4 | 4 |
| 35 | 101208039 | Gaurav Garg | 37.9 | 4 |
| 36 | 101208040 | Gaurav Goyal | 42.1 | 4 |
| 37 | 101208042 | Gaurav Kakkar | 49.6 | 5 |
| 38 | 101208044 | Guriqbal Singh | 39.3 | 4 |
| 39 | 101208045 | Gurleen Singh | 39.0 | 4 |
| 40 | 101208046 | Gurpreet Singh | 39.0 | 4 |
| 41 | 101208048 | Harish Garg | 42.7 | 4 |
| 42 | 101208049 | Harsh Raheja | 42.7 | 4 |
| 43 | 101208051 | HimanshuGambhir | 50.1 | 5 |
| 44 | 101208052 | Ishita Jain | 43.6 | 4 |
| 45 | 101208053 | Ishpuneet Singh Chawla | 43.6 | 4 |
| 46 | 101208054 | Jatin Mittal | 39.3 | 4 |
| 47 | 101208055 | Jatin Singh | 50.1 | 5 |
| 48 | 101208056 | Jugraj Singh Sandhu | 39.3 | 4 |
| 49 | 101208057 | K Naga PhaniBhaskar | 39.3 | 4 |
| 50 | 101208058 | Kamal Preet Singh | 39.0 | 4 |
| 51 | 101208060 | KapilChaand | 43.6 | 4 |
| 52 | 101208061 | Karan Mehra | 43.6 | 4 |
| 53 | 101208062 | Karanbir Singh Sandhar | 43.6 | 4 |
| 54 | 101208063 | KartikSingla | 42.7 | 4 |
| 55 | 101208064 | Kiranpreet Singh | 39.3 | 4 |
| 56 | 101208065 | KunalGarg | 35.8 | 4 |
| 57 | 101208066 | Kushagra | 43.8 | 4 |
| 58 | 101208068 | Manan Shah | 49.1 | 5 |
| 59 | 101208069 | ManavJuneja | 40.2 | 4 |
| 60 | 101208070 | Manjot Singh | 35.8 | 4 |
| 61 | 101208072 | Mayank Joshi | 49.1 | 5 |
| 62 | 101208073 | Mrigank Gupta | 40.2 | 4 |
| 63 | 101208075 | Navraj Singh | 49.1 | 5 |
| 64 | 101208076 | Nikhil Sehdev | 42.4 | 4 |
| 65 | 101208077 | Nikhilesh Kumar Nikhil | 43.8 | 4 |

| | | | | |
|-----|-----------|--------------------|------|---|
| 66 | 101208078 | Nishant Bansal | 35.8 | 4 |
| 67 | 101208079 | NishantGoyal | 35.8 | 4 |
| 68 | 101208080 | NishantKabra | 43.8 | 4 |
| 69 | 101208081 | NiteeshDua | 50.1 | 5 |
| 70 | 101208082 | Nitin Mahajan | 40.2 | 4 |
| 71 | 101208083 | Nitish Gupta | 40.2 | 4 |
| 72 | 101208084 | Omang | 35.8 | 4 |
| 73 | 101208085 | Prafulla Chaudhary | 40.2 | 4 |
| 74 | 101208086 | Pranav Lakhina | 49.1 | 5 |
| 75 | 101208088 | Pulkit Gupta | 43.8 | 4 |
| 76 | 101208089 | Puneet Arora | 39.5 | 4 |
| 77 | 101208090 | PurushottamMeena | 39.5 | 4 |
| 78 | 101208091 | Rahul Agarwal | 42.8 | 4 |
| 79 | 101208092 | Rahul Goyal | 37.0 | 4 |
| 80 | 101208093 | RajatParmar | 42.8 | 4 |
| 81 | 101208094 | Rajat Sharma | 42.8 | 4 |
| 82 | 101208095 | Rajiv Chauhan | 37.0 | 4 |
| 83 | 101208096 | Ravinder Singh | 37.0 | 4 |
| 84 | 101208097 | Ritvik Singh | 39.5 | 4 |
| 85 | 101208101 | Sagar Saini | 39.5 | 4 |
| 86 | 101208102 | Sahil Arora | 39.5 | 4 |
| 87 | 101208104 | SanchitSachdeva | 45.1 | 5 |
| 88 | 101208106 | SarthakMattas | 45.1 | 5 |
| 89 | 101208107 | Saurav Sharma | 45.1 | 5 |
| 90 | 101208108 | ShaileshPeriwal | 45.1 | 5 |
| 91 | 101208110 | Shashank Jain | 42.8 | 4 |
| 92 | 101208111 | Shashwat Seth | 45.1 | 5 |
| 93 | 101208112 | Shourya Singh | 42.8 | 4 |
| 94 | 101208113 | Shray Mehta | 42.8 | 4 |
| 95 | 101208114 | Shrey Kumar Dhiman | 40.5 | 4 |
| 96 | 101208115 | Shubham Bansal | 40.7 | 4 |
| 97 | 101208116 | Shubham Chaudhary | 40.5 | 4 |
| 98 | 101208117 | ShubhamSaha | 48.0 | 5 |
| 99 | 101208118 | ShubhamSen | 31.0 | 2 |
| 100 | 101208120 | Sugam Arora | 33.4 | 3 |
| 101 | 101208121 | Sukhdev Singh | 33.4 | 3 |
| 102 | 101208123 | Sunil Singh | 33.4 | 3 |
| 103 | 101208125 | Tanveer Mehta | 40.7 | 4 |
| 104 | 101208126 | Tejinder Pal Singh | 42.0 | 4 |
| 105 | 101208129 | UllasChugh | 48.3 | 5 |
| 106 | 101208131 | VarinderSingla | 42.0 | 4 |
| 107 | 101208132 | Vikas Kumar Singh | 48.0 | 5 |
| 108 | 101208133 | VinayGarg | 42.0 | 4 |
| 109 | 101208134 | VineshGarg | 42.0 | 4 |
| 110 | 101208136 | VivekGoyal | 46.0 | 5 |
| 111 | 101208138 | YashKhemka | 40.5 | 4 |

| | | | | |
|-----|-----------|-----------------|------|---|
| 112 | 101208139 | Yuvraj Singh | 48.3 | 5 |
| 113 | 101208140 | JiveshBedi | 36.3 | 4 |
| 114 | 101208142 | Vasu Sharma | 49.1 | 5 |
| 115 | 101388001 | Amit Tripathi | 41.2 | 4 |
| 116 | 101388002 | AnkitSetia | 41.2 | 4 |
| 117 | 101388003 | Jaswant Singh | 39.0 | 4 |
| 118 | 101388004 | Pawan Kumar | 37.7 | 4 |
| 119 | 101388005 | Rahul Sharma | 36.3 | 4 |
| 120 | 101388006 | Rahul Verma | 42.0 | 4 |
| 121 | 101388007 | Rahul Verma | 50.1 | 5 |
| 122 | 101388008 | Rajan | 42.0 | 4 |
| 123 | 101388009 | Ramandeep Singh | 37.0 | 4 |
| 124 | 101388010 | Shivam Bhatia | 37.0 | 4 |
| 125 | 101388011 | Sukhvir Singh | 37.0 | 4 |
| 126 | 101388012 | Sunil Kumar | 43.8 | 4 |

Table I4.20: Weighted Average Student Class Performance (course portfolio) for Attribute I3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0.0 | 4.23 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria I3 as given below in Table 14.21:

Table I4.21: Weighted Average Student class performance (course portfolio) for criteria I3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME801 | 27 | 69.8 | 2.4 | 0.8 | 0 | 4.23 | 5 |
| UME691 | 85 | 13.33 | 1.67 | 0 | 0 | 4.83 | 5 |
| Weighted average score | 56.00 | 41.57 | 2.04 | 0.40 | 0.00 | 4.53 | 10 |

b.) Assessment Tool: Student Course Survey

Table I4.22: Average score of student course survey for criteria I3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME 691 | 22.39 | 38.02 | 36.45 | 3.19 | 0.00 | 3.80 | 5.00 |
| UME801 | 20.39 | 45.23 | 25.34 | 9.12 | 0.00 | 3.77 | 5.00 |
| Weighted average score | 21.39 | 41.63 | 30.90 | 6.16 | 0.00 | 3.78 | 10.00 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table I4.23: Assessment for criteria I3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 41.94 | 35.48 | 19.35 | 3.23 | 0.00 | 4.16 |
| Alumni survey | 62.96 | 25.93 | 11.11 | 0.00 | 0.00 | 4.52 |
| Employer Survey | 58.33 | 38.89 | 2.78 | 0.00 | 0.00 | 4.56 |

Finally overall weighted average score of performance criterion 'A3' is evaluated as given below in Table I4.24:

Table I4.24: Overall weighted average score of performance criterion 'I3'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 56.0 | 41.6 | 2.0 | 0.4 | 0.0 | 4.5 | 5.0 |
| Weighted average student course survey | 21.4 | 41.6 | 30.9 | 6.2 | 0.0 | 3.8 | 4.0 |
| Graduating student survey | 41.9 | 35.5 | 19.4 | 3.2 | 0.0 | 4.2 | 3.0 |
| Alumni survey | 63.0 | 25.9 | 11.1 | 0.0 | 0.0 | 4.5 | 3.0 |
| Employer survey | 58.3 | 38.9 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 47.5 | 37.5 | 13.0 | 2.0 | 0.0 | 4.3 | 18.0 |

Overall assessment of program outcome I using scores of I1, I2 and I3

In the above sections, each of the individual performance criteria I1, I2 and I3 have been assessed. The performance for attainment of outcome A has been completed using the attainment values for I1, I2 and I3 and is provided below:

Table A4.25 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome A.

Table I4.25: Overall score for outcome I at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| I1 | 46.36 | 38.21 | 13.43 | 2.02 | 0.00 | 4.29 | 5 |
| I2 | 48.21 | 37.05 | 13.16 | 2.02 | 0.00 | 4.33 | 5 |
| I3 | 47.51 | 37.51 | 12.97 | 2.02 | 0.00 | 4.31 | 4 |
| Overall score | 47.35 | 37.60 | 13.20 | 2.02 | 0.00 | 4.31 | 14 |

Track Record and assessment of attainment of program outcome ‘I’ over the last three academic years

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

The following table I4.26 presents the performance criteria-wise assessment score distribution for outcome ‘I’

Table I4.26: Performance criteria-wise assessment score distribution of outcome I

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| I | I1 | 4.12 | 4.06 | 4.29 |
| | I2 | 4.01 | 4.04 | 4.33 |
| | I3 | 4.1 | 4.06 | 4.31 |

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

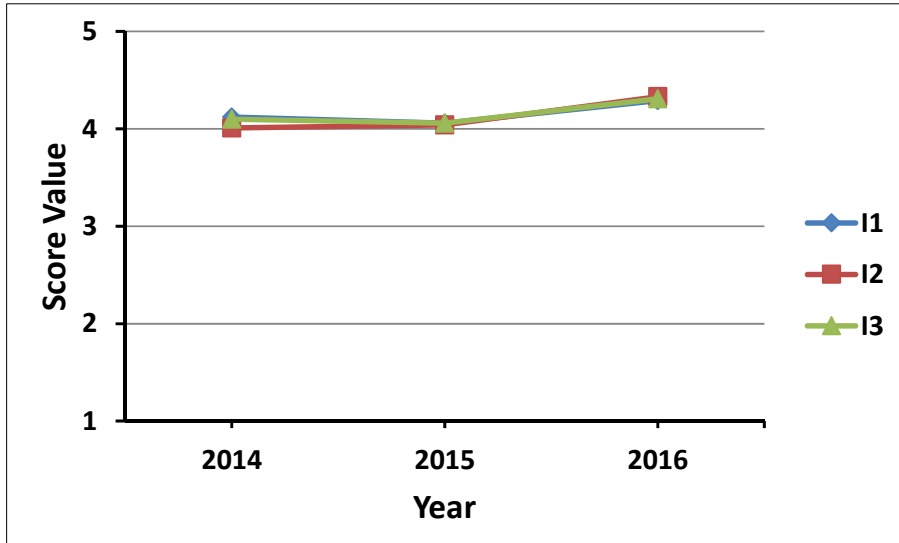


Figure I4.2: Performance criteria-wise assessment score distribution of outcome I

Level of attainment of program outcome ‘I’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table I4.27 presents the overall weighted score of outcome ‘I’ over the last three academic years.

Table I4.27: Overall weighted score of outcome ‘I’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.08 | good |
| 2015 | 4.05 | good |
| 2016 | 4.31 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘I’ over a period of last three years.

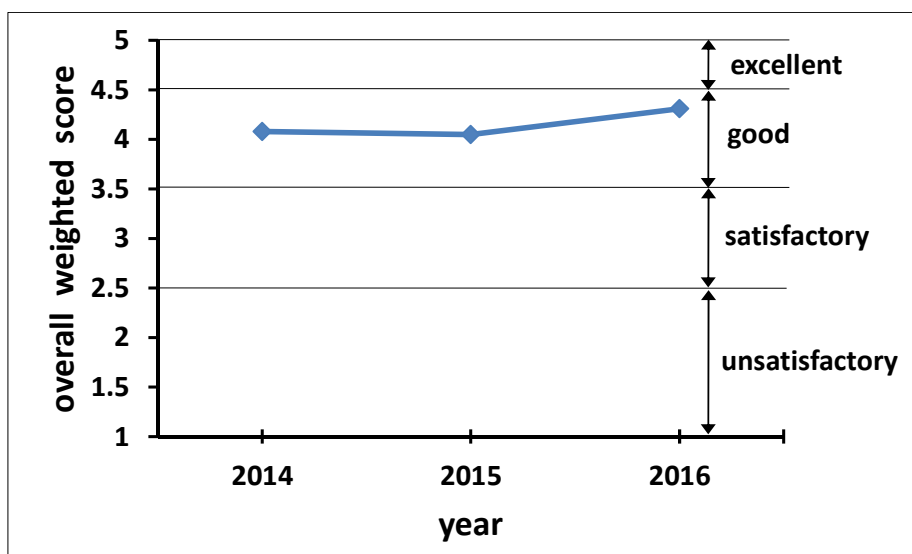


Figure I4.3: Overall weighted score of outcome ‘I’ over a period of last three years

The following actions have been taken based on the analysis of Outcome I

| Weighted Score for Outcome I | Recommendation | Reason | Implemented from |
|------------------------------|---|---|-------------------------|
| 4.05 | <ul style="list-style-type: none"> • Addition of Capstone project Part-I and II • Increase in credits of Capstone project | Students are able to learn beyond classroom teaching. | July, 2014 May, 2015 |

**Assessment of Attainment of Program Outcome
'J'
(Year 2016)**

for the

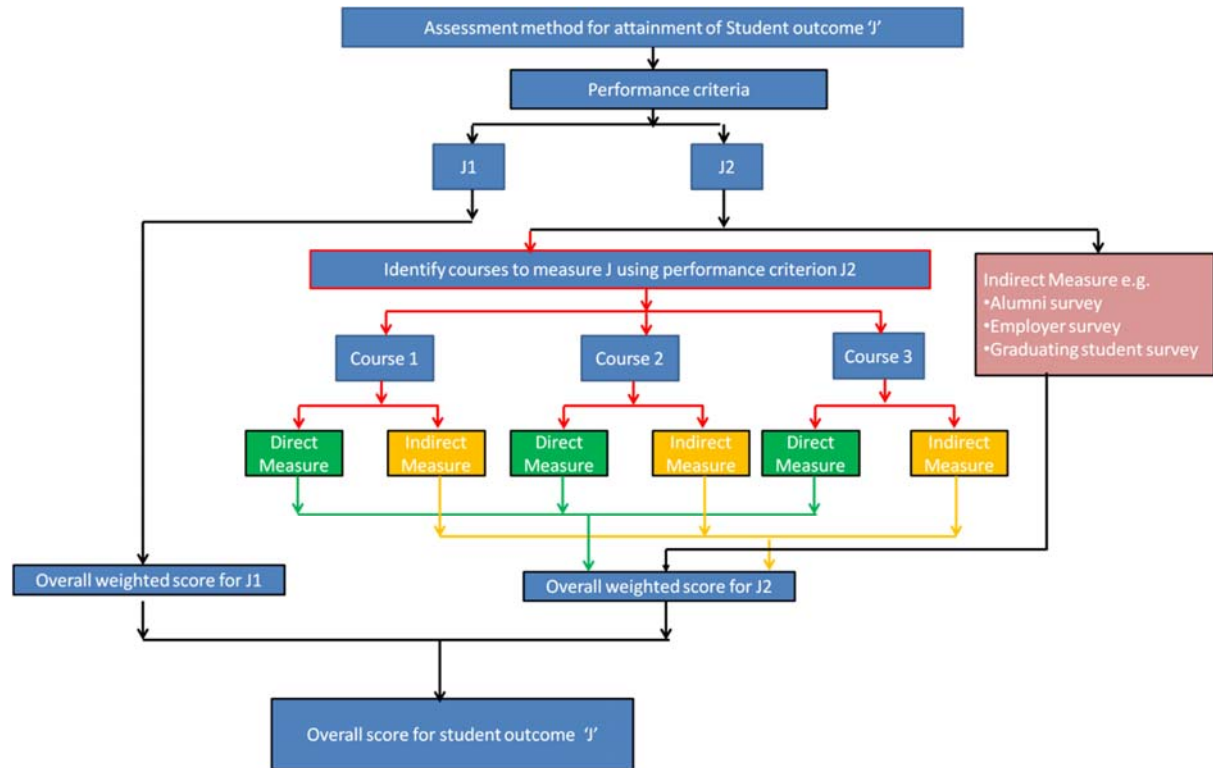
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome A

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'J'

Courses:

1. Power Plant Engineering (UME837)

Outcome J has been assessed by two performance criteria J1 and J2. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these two performance criteria has been used to measure the overall measure of outcome J.

1) Assessment of Outcome 'J' using performance criterion J1

Performance criteria 'J1': Describes the importance of contemporary issues.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: One course namely Power Plant Engineering (UME 837) was used to assess performance criteria J1 as a direct measure. The analysis for each of these courses is provided below:

(i) **Course:** Power Plant Engineering (UME 837)

Performance criteria 'J1': Describes the importance of contemporary issues.

The above performance criteria is used to measure the attainment of outcome 'J1' by giving the following question (Question No. 1: during EST in May2016, weightage 25 marks) to the students.

(You may find suitable question for this assessment from the measurement of CLOs submitted with the course file.)

Question: You have joined a design engineering company from July 2016. In the first week at office, your supervisor gives you a task of quickly designing a "cross country" (long distance) pipeline design. 1000 m³/hr of raw water is to be pumped from a river to a thermal power plant situated 25 km away. The pipe has to be buried (underground) and running through few barren lands and jungle. You can consider that the pressure losses due to the bends and verticals are negligible compared to the horizontal run. The velocity of water through the pipeline is to be limited to 1.5 to 2.5 m/s (as per the standard design practice). This design is required for a "pre-bid" purpose, hence you should be targeting for a reliable "engineering" estimate (rather than for fine accuracy). You have been provided with excerpts from IS: 3589, AWWA M11 (American Standard for cross country piping design) and Moody's diagram (see enclosed). You need to determine pipeline O.D (outer diameter), pipe thickness and pressure drop through the line. The cross country pipeline (one pipe) is to be designed against internal, external and handling loads (do not consider buckling load). Consider the following:

- Pipe material: Steel plate (Grade 65)
- The pipe uses Cement Mortar Lining and Cement Mortar Coating
- The pipe runs 6 ft underground and runs under few highways
- Consider coarse-grained soil with fines with 90% compaction level

It is suggested that first you should carefully go through the AWWA excerpts (to get a good hold of the design steps) before starting the calculation

Student's performance in the above question is given below:

Table J4.1: Student's performance in question targeting 'J1'; course: UME837

| S.No | Roll No and Name | Marks MM:(25) | Score Scale(1 to 5) |
|------|----------------------------|------------------|------------------------|
| 1 | 101208024 [ArvindMahej] | 15 | 3 |
| 2 | 101208035 [Debopam Das] | 20 | 4 |
| 3 | 101208046 [Gurpreet Singh] | 20 | 4 |
| 4 | 1012080654 [Jatin Mittal] | 20 | 4 |

| | | | |
|---|------------------------------|----|---|
| 5 | 101208061 [Karan Mehra] | 25 | 5 |
| 6 | 101208081 [NiteeshDua] | 25 | 5 |
| 7 | 101208104 [SanchitSachdeva] | 25 | 5 |
| 8 | 101208116 [ShubhamChaudhary] | 25 | 5 |

The overall performance of students in the above question is then summarized as given below

Table J4.2: Average score of student performance in the course UME837for criteria J1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME837 | 50 | 37.5 | 12.5 | 0 | 0 | 4.38 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria A1 as given below in Table J4.3:

Table J4.3: Weighted Average Student class performance (course portfolio) for criteria J1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME837 | 50 | 37.5 | 12.5 | 0 | 0 | 4.38 | 5 |
| Weighted average score | 50.00 | 37.50 | 12.50 | 0.00 | 0.00 | 4.38 | 5 |

b) Indirect measures for Performance criteria J1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table J4.4: Average score of student course survey for criteria J1

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME837 | 100 | 0 | 0 | 0 | 0 | 5.00 | 5 |
| Weighted average score | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table J4.5: Assessment for criteria J1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 29.03 | 35.48 | 32.26 | 3.23 | 0.00 | 3.90 |
| Alumni survey | 48.15 | 40.74 | 3.70 | 7.41 | 0.00 | 4.30 |
| Employer Survey | 50.00 | 38.89 | 8.33 | 0.00 | 0.00 | 4.31 |

c) Overall weighted average score of performance criterion ‘J1’

Finally overall weighted average score of performance criterion ‘J1’ is evaluated as given below in Table J4.6:

Table J4.6: Overall weighted average score of performance criterion ‘J1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|-------------|-------------|------------|------------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 50.0 | 37.5 | 12.5 | 0.0 | 0.0 | 4.4 | 5.0 |
| Weighted average student course survey | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 4.0 |
| Graduating student survey | 29.0 | 35.5 | 32.3 | 3.2 | 0.0 | 3.9 | 3.0 |
| Alumni survey | 48.1 | 40.7 | 3.7 | 7.4 | 0.0 | 4.3 | 3.0 |
| Employer survey | 50.0 | 38.9 | 8.3 | 0.0 | 0.0 | 4.3 | 3.0 |
| Overall weighted score | 57.3 | 29.6 | 10.9 | 1.8 | 0.0 | 4.4 | 18.0 |

Assessment of Outcome ‘J’ using performance criterion J2

Performance criteria ‘J2’: Describes the impact of engineering decisions on energy resources/ environment.

The above performance criteria is used to measure the attainment of outcome ‘J2’ by giving the following question (Question No. 5: during EST in May 2016, weightage 15marks) to the students.

Question: Compare (in tabular form) the different types of nuclear reactor used in nuclear power stations w.r.t their nuclear fuel, moderator and material for control rods.

Student’s performance in the above question is given below:

Table J4.7: Student’s performance in question targeting ‘J2’; course: UME837

| S.No | Roll No and Name | Marks MM:(15) | Score Scale(1 to 5) |
|------|------------------------------|---------------|---------------------|
| 1 | 101208024 [ArvindMahej] | 11 | 4 |
| 2 | 101208035 [Debopam Das] | 11 | 4 |
| 3 | 101208046 [Gurpreet Singh] | 13 | 5 |
| 4 | 1012080654 [Jatin Mittal] | 13 | 5 |
| 5 | 101208061 [Karan Mehra] | 13 | 5 |
| 6 | 101208081 [NiteeshDua] | 13 | 5 |
| 7 | 101208104 [SanchitSachdeva] | 11 | 4 |
| 8 | 101208116 [ShubhamChaudhary] | 13 | 5 |

The overall performance of students in the above question is then summarized as given below

Table J4.8: Average score of student performance in the course UME837for criteria J2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|---|---|---|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME837 | 62.5 | 37.5 | 0 | 0 | 0 | 4.63 |

*Step 2:*The above data is used to evaluate weighted average student class performance (course portfolio) for criteria J2 as given belowin Table J4.9:

Table J4.9: Weighted Average Student class performance (course portfolio) for criteria J2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME837 | 62.5 | 37.5 | 0 | 0 | 0 | 4.63 | 5 |
| Weighted average score | 62.50 | 37.50 | 0.00 | 0.00 | 0.00 | 4.63 | 5 |

b.) Assessment Tool: Student Course Survey

Table J4.10: Average score of student course survey for criteria J2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME837 | 100 | 0 | 0 | 0 | 0 | 5.00 | 5 |
| Weighted average score | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and EmployerSurvey

Table J4.11: Assessment for criteria J2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|-------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 29.03 | 35.48 | 32.26 | 3.23 | 0.00 | 3.90 |
| Alumni survey | 48.15 | 40.74 | 3.70 | 7.41 | 0.00 | 4.30 |
| Employer Survey | 50.00 | 38.89 | 8.33 | 0.00 | 0.00 | 4.31 |

Finally overall weighted average score of performance criterion ‘J2’ is evaluated as given below in Table J4.12:

Table J4.12: Overall weighted average score of performance criterion ‘J2’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 62.5 | 37.5 | 0.0 | 0.0 | 0.0 | 4.6 | 5.0 |
| Weighted average student course survey | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 4.0 |
| Graduating student survey | 29.0 | 35.5 | 32.3 | 3.2 | 0.0 | 3.9 | 3.0 |
| Alumni survey | 48.1 | 40.7 | 3.7 | 7.4 | 0.0 | 4.3 | 3.0 |
| Employer survey | 50.0 | 38.9 | 8.3 | 0.0 | 0.0 | 4.3 | 3.0 |
| Overall weighted score | 60.8 | 29.6 | 7.4 | 1.8 | 0.0 | 4.5 | 18.0 |

Overall assessment of program outcome J using scores of J1, and J2

In the above sections, each of the individual performance criteria J1 and J2 have been assessed. The performance for attainment of outcome J has been completed using the attainment values for J1 and J2 and is provided below:

Table J4.13 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome J.

Table J4.13: Overall score for outcome J at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| J1 | 57.31 | 29.60 | 10.85 | 1.77 | 0.00 | 4.41 | 5 |
| J2 | 60.78 | 29.60 | 7.38 | 1.77 | 0.00 | 4.48 | 5 |
| Overall score | 59.04 | 29.60 | 9.12 | 1.77 | 0.00 | 4.45 | 10 |

Track Record and assessment of attainment of program outcome ‘J’ over the last three academic years

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

The following table J4.14 presents the performance criteria-wise assessment score distribution for outcome ‘J’.

Table J4.14: Performance criteria-wise assessment score distribution of outcome J

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| J | J1 | 3.84 | 3.85 | 4.41 |
| | J2 | 4.00 | 3.76 | 4.48 |

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

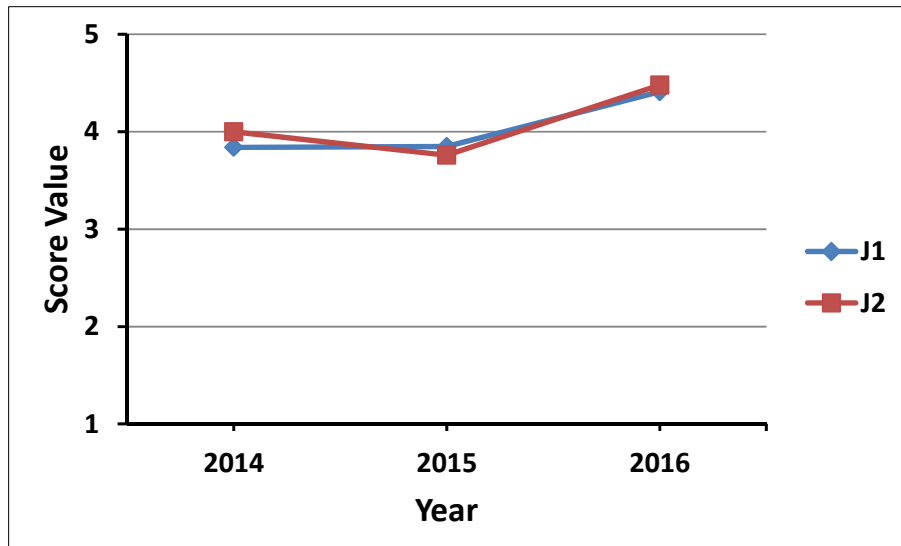


Figure J4.2: Performance criteria-wise assessment score distribution of outcome J

Level of attainment of program outcome ‘J’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table J4.15 presents the overall weighted score of outcome ‘J’ over the last three academic years.

Table J4.15: Overall weighted score of outcome ‘J’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 3.93 | good |
| 2015 | 3.80 | good |
| 2016 | 4.45 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘J’ over a period of last three years.

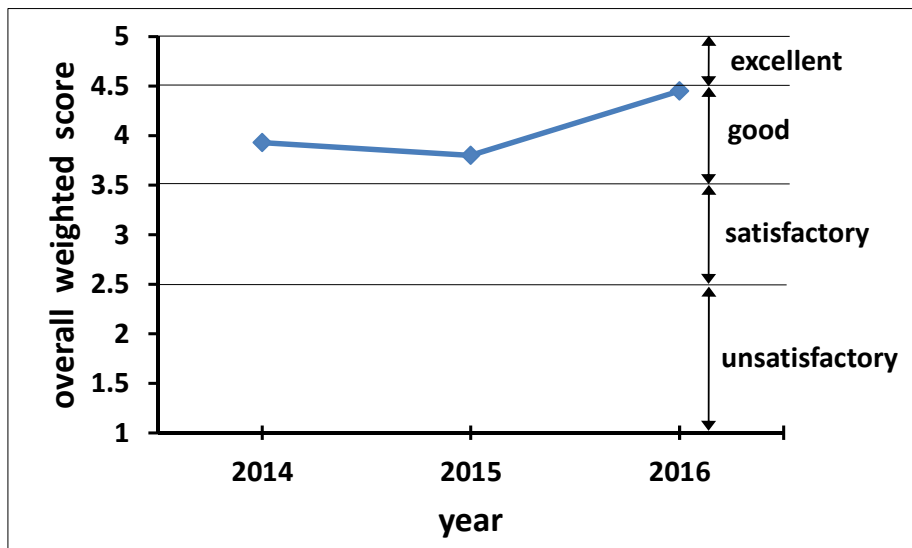


Figure J4.3: overall weighted score of outcome ‘J’ over a period of last three years

The following actions have been taken based on the analysis of Outcome J

| Weighted Score for Outcome J | Recommendation | Reason | Implemented from |
|------------------------------|---|---|------------------|
| 3.80 | <ul style="list-style-type: none"> • Addition of an elective course on Renewable Energy Systems. | Students are able to learn on energy resources. | July, 2014 |

**Assessment of Attainment of Program Outcome
'K'
(Year 2016)**

for the

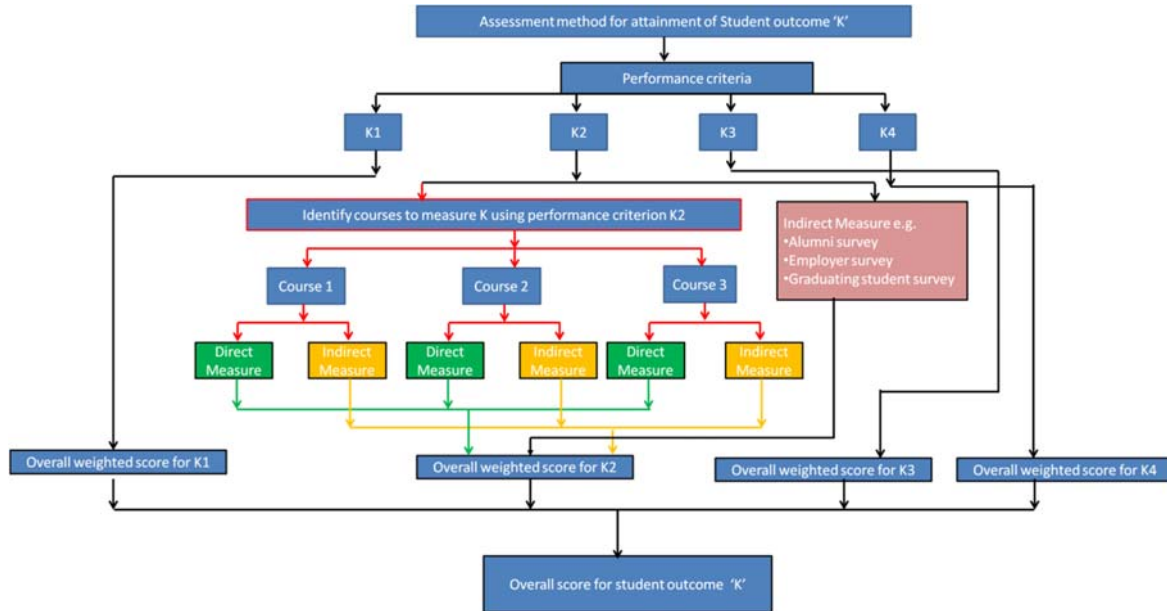
*Bachelor of Engineering
in
Mechanical Engineering*



**Thapar University
Patiala (Punjab) - 147004
INDIA**

Attainment of Outcome K

The attainment of each outcome has been measured using a standard procedure explained in the Self Assessment Report for the program. A flow chart depicting the step by step methodology used to measure each attainment is provided below for ready reference.



The following courses have been considered for the assessment of program outcome 'K'

Courses:

1. Computer Aided Manufacturing(UME702)
2. Mechatronics(UME802)
3. Fluid Machinery (UME 703)
4. Computer Aided Geometric Modeling & Analysis (UME 406)

Outcome K has been assessed by four performance criteria K1, K2, K3 and K4. The sections below provide data for separate assessments for each of these performance criteria and in the end the results for these four performance criteria has been used to measure the overall measure of outcome K.

1) Assessment of Outcome 'K' using performance criterion K1

Performance criteria 'K1': K1. Able to operate engineering equipments

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Fluid Machinery (UME 703) and Computer Aided Manufacturing (UME702) were used to assess performance criteria K1 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Fluid Machinery (UME 703)

Performance criteria 'K1': Able to operate engineering equipments

The above performance criterion is used to measure the attainment of outcome 'K1' by conducting viva-voce examination for the experimental work conducted in the laboratory (Viva before EST in November, 2016, weightage 5 marks).

Student's performance in the viva examination is given below:

Table K4.1: Student's performance in question targeting 'K1'; course: UME703

| S. No. | Roll No. | Marks (MM: 05) | Score (Scale 1 to 5) |
|--------|-----------|-------------------|-------------------------|
| 1 | 101308001 | 4.5 | 05 |
| 2 | 101308003 | 5 | 05 |
| 3 | 101308004 | 3.5 | 03 |
| 4 | 101308006 | 4.5 | 05 |
| 5 | 101308007 | 3.5 | 03 |
| 6 | 101308008 | 3.5 | 03 |
| 7 | 101308009 | 4 | 04 |
| 8 | 101308010 | 3 | 03 |
| 9 | 101308011 | 4.5 | 05 |
| 10 | 101308012 | 4.5 | 05 |
| 11 | 101308013 | 5 | 05 |
| 12 | 101308014 | 4 | 04 |
| 13 | 101308016 | 4.5 | 05 |
| 14 | 101308017 | 4.5 | 05 |
| 15 | 101308018 | 4 | 04 |
| 16 | 101308019 | 3.5 | 03 |
| 17 | 101308020 | 5 | 05 |
| 18 | 101308021 | 5 | 05 |
| 19 | 101308023 | 4 | 04 |
| 20 | 101308024 | 3.5 | 03 |
| 21 | 101308025 | 3.5 | 03 |

Attainment of Outcome K

| | | | |
|----|-----------|-----|----|
| 22 | 101308026 | 4 | 04 |
| 23 | 101308027 | 3.5 | 03 |
| 24 | 101308028 | 3.5 | 03 |
| 25 | 101308029 | 4 | 04 |
| 26 | 101308031 | 3.5 | 03 |
| 27 | 101308032 | 4 | 04 |
| 28 | 101308034 | 3.5 | 03 |
| 29 | 101308035 | 4 | 04 |
| 30 | 101308036 | 4 | 04 |
| 31 | 101308037 | 3.5 | 03 |
| 32 | 101308038 | 3.5 | 03 |
| 33 | 101308039 | 3.5 | 03 |
| 34 | 101308040 | 2.5 | 02 |
| 35 | 101308042 | 4 | 04 |
| 36 | 101308043 | 4.5 | 05 |
| 37 | 101308044 | 3.5 | 03 |
| 38 | 101308045 | 4 | 04 |
| 39 | 101308046 | 3.5 | 03 |
| 40 | 101308047 | 5 | 05 |
| 41 | 101308048 | 3 | 02 |
| 42 | 101308050 | 3 | 02 |
| 43 | 101308051 | 3.5 | 03 |
| 44 | 101308052 | 4 | 04 |
| 45 | 101308053 | 3 | 02 |
| 46 | 101308054 | 3.5 | 03 |
| 47 | 101308055 | 3 | 02 |
| 48 | 101308057 | 4.5 | 05 |
| 49 | 101308060 | 2.5 | 02 |
| 50 | 101308061 | 4 | 04 |
| 51 | 101308063 | 4.5 | 05 |
| 52 | 101308064 | 3 | 02 |
| 53 | 101308065 | 4 | 04 |
| 54 | 101308066 | 4 | 04 |
| 55 | 101308068 | 3.5 | 03 |
| 56 | 101308072 | 4 | 04 |
| 57 | 101308073 | 4.5 | 05 |
| 58 | 101308076 | 3.5 | 03 |
| 59 | 101308100 | 4.5 | 05 |
| 60 | 101488001 | 2 | 01 |

The overall performance of students for the above criterion is summarized as given below

Table K4.2: Average score of student performance in the course UME 703 for criteria K1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|-------|-------|-------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME703 | 26.67 | 26.66 | 33.33 | 11.66 | 1.67 | 3.65 |

(ii) **Course:** Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome 'K1' by giving the following question (Question No. 4: during MST in September 2016, weightage 10 marks) to the students.

Question:

4.(a) Differentiate between G82 and G83 commands as used in CNC milling machine with the help of a neat sketch. Also discuss the role of G98 and G99 codes in above given commands. 5

(b) Discuss the necessity of tool radius and tool length compensation in milling machine. Write the commands used for activating these compensations in the program. 5

Is it necessary to cancel the tool radius compensation command? Justify your answer with a suitable sequence of operations.

Student's performance in the above question is given below:

Table K4.3: Student's performance in question targeting 'K1'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | AnkitSehgal | 8.0 | 4 |
| 2 | 101308033 | Ekansh Kumar Srivastava | -1.0 | 0 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | -1.0 | 0 |
| 4 | 101308067 | Ketan Chauhan | 0.0 | 1 |
| 5 | 101308069 | Kirat Singh Basur | 6.0 | 3 |
| 6 | 101308070 | Kshitij Sharma | 7.0 | 3 |
| 7 | 101308071 | Lokendra Kumar | 5.0 | 2 |
| 8 | 101308074 | Manik Saharan | -1.0 | 0 |
| 9 | 101308075 | Manish Pandoh | 8.0 | 4 |
| 10 | 101308077 | ManutkarshKirpal | 9.5 | 5 |
| 11 | 101308078 | Nidan Prakash | 7.5 | 4 |
| 12 | 101308079 | Nikhil Aggarwal | 10.0 | 5 |
| 13 | 101308080 | Nikhil Ganta | 10.0 | 5 |
| 14 | 101308082 | Paramjot Singh | 3.0 | 1 |
| 15 | 101308083 | Paras | 9.0 | 5 |
| 16 | 101308085 | PrabhmanVir | 0.0 | 1 |

| S. No. | Roll No. | Name of student | Marks (MM: 10) | Score (Scale 1 to 5) |
|--------|-----------|----------------------------|----------------|----------------------|
| 17 | 101308088 | Pulkit Kapoor | 9.0 | 5 |
| 18 | 101308089 | Puneet Singh | 3.0 | 1 |
| 19 | 101308090 | Rajat Gupta | 3.5 | 2 |
| 20 | 101308091 | Ramnish Kumar | 8.5 | 4 |
| 21 | 101308093 | Rohan Kaushal | 9.0 | 5 |
| 22 | 101308094 | SagarSingla | -1.0 | 0 |
| 23 | 101308096 | Sahil Sharma | 10.0 | 5 |
| 24 | 101308097 | Samdeep Singh Sabharwal | -1.0 | 0 |
| 25 | 101308098 | Sameer Bhalla | 6.5 | 3 |
| 26 | 101308099 | Sartaj Singh | 8.0 | 4 |
| 27 | 101308101 | Shikhar Gaur | 8.5 | 4 |
| 28 | 101308102 | ShreyasBhayana | 10.0 | 5 |
| 29 | 101308103 | Shubham | 9.5 | 5 |
| 30 | 101308104 | ShubhamBhama | 10.0 | 5 |
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 10.0 | 5 |
| 33 | 101308108 | SiddharthGhiya | -1.0 | 0 |
| 34 | 101308109 | Siddharth Gupta | -1.0 | 0 |
| 35 | 101308110 | SiddharthVasu | 9.0 | 5 |
| 36 | 101308111 | Sidhant | 8.0 | 4 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 5.5 | 3 |
| 38 | 101308113 | SouravSingla | 5.5 | 3 |
| 39 | 101308114 | Tanjay Pathak | -1.0 | 0 |
| 40 | 101308115 | TanujLamba | 7.5 | 4 |
| 41 | 101308116 | UtsavMudgal | -1.0 | 0 |
| 42 | 101308117 | VaibhavPratap Singh Pundir | -1.0 | 0 |
| 43 | 101308118 | Varmeet Singh Gulati | 9.0 | 5 |
| 44 | 101308119 | VarunAtri | 10.0 | 5 |
| 45 | 101308120 | VedantMansotra | 6.5 | 3 |
| 46 | 101308121 | Vikrant Nanda | -1.0 | 0 |
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 7.0 | 3 |
| 49 | 101308124 | VivekPundir | 10.0 | 5 |
| 50 | 101308125 | Yashwardhan Sharma | 4.5 | 2 |
| 51 | 101488008 | Ishan | 9.0 | 5 |
| 52 | 101488012 | MohitGoyal | 9.5 | 5 |
| 53 | 101488013 | NavjotRihal | 7.0 | 3 |
| 54 | 101488014 | Nikhil Gupta | 9.0 | 5 |
| 55 | 101488015 | Sankit | -1.0 | 0 |
| 56 | 101488016 | SarangVashisht | 8.0 | 4 |
| 57 | 101488017 | Varun Bansal | 6.0 | 3 |
| 58 | 101488018 | Vishnu Kalra | 8.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table K4.4: Average score of student performance in the course UME702for criteria K1

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 40.9 | 22.7 | 20.5 | 6.8 | 9.1 | 3.8 |

Step 2: The above data is used to evaluate weighted average student class performance (course portfolio) for criteria K1 as given below in Table K4.5:

Table K4.5: Weighted Average Student class performance (course portfolio) for criteria K1

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|-------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 40.9 | 22.7 | 20.5 | 6.8 | 9.1 | 3.80 | 5 |
| UME703 | 26.67 | 26.66 | 33.33 | 11.66 | 1.67 | 3.65 | 5 |
| Weighted average score | 33.79 | 24.68 | 26.92 | 9.23 | 5.39 | 3.72 | 10 |

b) Indirect measures for Performance criteria K1 (Surveys)

i.) Assessment Tool: Student Course Survey

Table K4.6: Average score of student course survey for criteria K1

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| UME703 | 28.86 | 35.67 | 36.23 | 0 | 0 | 3.96 | 5 |
| Weighted average score | 33.27 | 39.90 | 26.4 | 0.68 | 0.00 | 4.08 | 10 |

ii.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table K4.7: Assessment for criteria K1 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 29.63 | 66.67 | 3.70 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 69.44 | 25.00 | 2.78 | 0.00 | 0.00 | 4.56 |

c) Overall weighted average score of performance criterion ‘K1’

Finally overall weighted average score of performance criterion ‘K1’ is evaluated as given below in

Table K4.8:

Table K4.8: Overall weighted average score of performance criterion ‘K1’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 33.8 | 24.7 | 26.9 | 9.2 | 5.4 | 3.7 | 5.0 |
| Weighted average student course survey | 33.3 | 39.9 | 26.8 | 0.7 | 0.0 | 4.1 | 4.0 |
| Graduating student survey | 61.3 | 35.5 | 3.2 | 0.0 | 0.0 | 4.6 | 3.0 |
| Alumni survey | 29.6 | 66.7 | 3.7 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 69.4 | 25.0 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 43.5 | 36.9 | 15.1 | 2.7 | 1.5 | 4.2 | 18.0 |

Assessment of Outcome ‘K’ using performance criterion K2

Performance criteria ‘K2’: Able to program machines.

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: Two courses namely Computer Aided Manufacturing(UME702) and Mechatronics (UME802) were used to assess performance criteria K2 as a direct measure. The analysis for each of these courses is provided below:

(i) Course: Computer Aided Manufacturing (UME702)

The above performance criteria is used to measure the attainment of outcome ‘K2’ by giving the following question (Question No. 1: during MST in September 2016, weightage 20 marks) to the students.

Question:

- Write a NC part program in ABSOLUTE MODE for a vertical milling center to machine the given part. The outer profile of 10 mm thickness is to be made using the subprogram, which is to be mirrored about X-axis, Y-axis and about XY-axis. The outer profile in the subprogram is to be started from point A.

Thereafter machine a rough and finished circular pocket of diameter 10 mm with center point at (60, 60) and depth of 6 mm using a second subprogram. Assume all the necessary parameters in the pocketing operation. Mirror this pocket about Y-axis to complete the component.

20

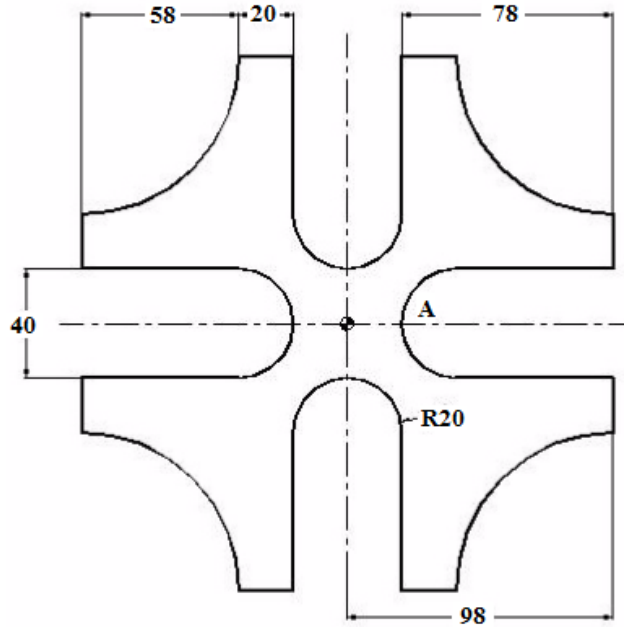
Use following machining data to compute spindle speed and feed rate:

Milling and pocketing: Cutting speed = 160 m/min and feed=0.30 mm/rev.

The milling center is equipped with an ATC holding the tools as per the following sequence.

Tool no. 1 (Milling cutter for profile cutting- Dia 4 mm),

Tool no. 2 (Pocketing cutter Dia- 5 mm; allowable %age cut width 80%).



Student's performance in the above question is given below:

Table K4.9: Student's performance in question targeting 'K2'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 20) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | AnkitSehgal | 12.0 | 4 |
| 2 | 101308033 | Ekansh Kumar Srivastava | -1.0 | 0 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | -1.0 | 0 |
| 4 | 101308067 | Ketan Chauhan | 0.0 | 1 |
| 5 | 101308069 | Kirat Singh Basur | 18.5 | 5 |
| 6 | 101308070 | Kshitij Sharma | 14.0 | 4 |
| 7 | 101308071 | Lokendra Kumar | 4.5 | 1 |
| 8 | 101308074 | Manik Saharan | -1.0 | 0 |
| 9 | 101308075 | Manish Pandoh | 17.0 | 5 |
| 10 | 101308077 | ManutkarshKirpal | 15.0 | 4 |
| 11 | 101308078 | Nidan Prakash | 13.0 | 4 |
| 12 | 101308079 | Nikhil Aggarwal | 17.0 | 5 |

| S. No. | Roll No. | Name of student | Marks (MM: 20) | Score (Scale 1 to 5) |
|--------|-----------|----------------------------|----------------|----------------------|
| 13 | 101308080 | Nikhil Ganta | 15.5 | 4 |
| 14 | 101308082 | Paramjot Singh | 2.0 | 1 |
| 15 | 101308083 | Paras | 18.5 | 5 |
| 16 | 101308085 | PrabhmanVir | 1.5 | 1 |
| 17 | 101308088 | Pulkit Kapoor | 16.5 | 4 |
| 18 | 101308089 | Puneet Singh | 9.0 | 3 |
| 19 | 101308090 | Rajat Gupta | 14.0 | 4 |
| 20 | 101308091 | Ramnish Kumar | 17.5 | 5 |
| 21 | 101308093 | Rohan Kaushal | 14.5 | 4 |
| 22 | 101308094 | SagarSingla | -1.0 | 0 |
| 23 | 101308096 | Sahil Sharma | 19.5 | 5 |
| 24 | 101308097 | Samdeep Singh Sabharwal | -1.0 | 0 |
| 25 | 101308098 | Sameer Bhalla | 18.5 | 5 |
| 26 | 101308099 | Sartaj Singh | 16.5 | 4 |
| 27 | 101308101 | Shikhar Gaur | 12.0 | 4 |
| 28 | 101308102 | ShreyasBhayana | 17.5 | 5 |
| 29 | 101308103 | Shubham | 18.5 | 5 |
| 30 | 101308104 | ShubhamBhama | 19.0 | 5 |
| 31 | 101308105 | Shubham Chaudhary | -1.0 | 0 |
| 32 | 101308106 | Shubham Gupta | 18.0 | 5 |
| 33 | 101308108 | SiddharthGhiya | -1.0 | 0 |
| 34 | 101308109 | Siddharth Gupta | -1.0 | 0 |
| 35 | 101308110 | SiddharthVasu | 0.0 | 1 |
| 36 | 101308111 | Sidhant | 15.0 | 4 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 14.5 | 4 |
| 38 | 101308113 | SouravSingla | 17.0 | 5 |
| 39 | 101308114 | Tanjay Pathak | -1.0 | 0 |
| 40 | 101308115 | TanujLamba | 17.0 | 5 |
| 41 | 101308116 | UtsavMudgal | -1.0 | 0 |
| 42 | 101308117 | VaibhavPratap Singh Pundir | 16.5 | 4 |
| 43 | 101308118 | Varmeet Singh Gulati | -1.0 | 0 |
| 44 | 101308119 | VarunAtri | 15.0 | 4 |
| 45 | 101308120 | VedantMansotra | 17.0 | 5 |
| 46 | 101308121 | Vikrant Nanda | -1.0 | 0 |
| 47 | 101308122 | Vishal Solanki | -1.0 | 0 |
| 48 | 101308123 | Vivek Mittal | 10.5 | 3 |
| 49 | 101308124 | VivekPundir | 17.5 | 5 |
| 50 | 101308125 | Yashwardhan Sharma | 13.5 | 4 |
| 51 | 101488008 | Ishan | 15.5 | 4 |
| 52 | 101488012 | MohitGoyal | 17.5 | 5 |
| 53 | 101488013 | NavjotRihal | 5.0 | 1 |
| 54 | 101488014 | Nikhil Gupta | 17.0 | 5 |
| 55 | 101488015 | Sankit | -1.0 | 0 |
| 56 | 101488016 | SarangVashisht | 16.0 | 4 |
| 57 | 101488017 | Varun Bansal | 13.0 | 4 |
| 58 | 101488018 | Vishnu Kalra | 15.0 | 4 |

The overall performance of students in the above question is then summarized as given below

Table K4.10: Average score of student performance in the course UME702for criteria K2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 38.6 | 43.2 | 4.5 | 0 | 13.6 | 3.93 |

(ii) Course: Mechatronics(UME802)

The above performance criteria is used to measure the attainment of outcome ‘K2’ by giving the following question (Question no 1 in EST exam in May 2016, weightage 20 marks) to the students.

Question:10 parts are drilled on a machine in one cycle as shown below. The program cycle is started by means of a push button S1. The proximity switch B7 signals “part in magazine”. A part is fed towards the machine by means of a cylinder 1A and clamped. It is then drilled via extension of cylinder 2A and subsequently ejected by means of an ejected cylinder 3A. The clamping cylinder 1A operates via a double solenoid valve with two coils 1Y1 (clamping) and 1Y2 (unclamping). Similarly, cylinders 2A and 3A are powered by solenoid valves with the coils 2Y1, 2Y2, 3Y1 and 3Y2 respectively. The cylinder positions are monitored by means of the proximity switches (B1 to B6).

- (a) Identify the number of I/Os (inputs/outputs) in terms of digital and analog.
- (b) Draw the electrical circuit connection diagram of the identified I/Os with PLC.
- (c) Formulate the PLC program into Ladder Logic language.

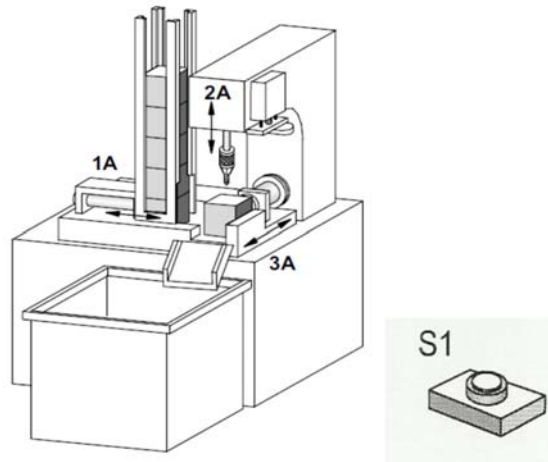


Figure 1

Student’s performance in the above question is given below:

Table K4.11: Student’s performance in question targeting ‘K2’; course: UME802

| S. No. | Roll No. | Name | Marks (MM: 20) | Score (Scale 1 to 5) |
|--------|-----------|------------------|----------------|----------------------|
| 1 | 101208001 | Abhinandan Singh | 11.0 | 5 |
| 2 | 101208002 | Aditya Anand | 12.0 | 5 |
| 3 | 101208003 | Ajaywinder Singh | 10.0 | 5 |
| 4 | 101208004 | AkankshVashistha | 9.0 | 4 |

| S. No. | Roll No. | Name | Marks (MM: 20) | Score (Scale 1 to 5) |
|--------|-----------|--------------------------|----------------|----------------------|
| 5 | 101208005 | Akshay | 8.0 | 4 |
| 6 | 101208006 | AkshayKaura | 10.0 | 5 |
| 7 | 101208007 | AmanJamwal | 12.0 | 5 |
| 8 | 101208008 | Aman Sharma | 4.0 | 3 |
| 9 | 101208009 | AmanVerma | 13.0 | 5 |
| 10 | 101208010 | Amandeep Singh Aulakh | 8.0 | 4 |
| 11 | 101208011 | Patel Amit Singh Jagdish | 2.0 | 2 |
| 12 | 101208012 | Amol | 2.0 | 2 |
| 13 | 101208013 | Amrinder Singh | 17.0 | 5 |
| 14 | 101208016 | AnkurWasdev | 10.0 | 5 |
| 15 | 101208017 | AnshumanHanda | 10.0 | 5 |
| 16 | 101208019 | Anuj Kumar | 8.0 | 4 |
| 17 | 101208020 | AnuragPanthey | 6.0 | 3 |
| 18 | 101208022 | Arshdeep Singh | 8.0 | 4 |
| 19 | 101208023 | Arvind | 8.0 | 4 |
| 20 | 101208024 | ArvindMahey | 4.0 | 3 |
| 23 | 101208025 | Ashish Tandon | 6.0 | 3 |
| 24 | 101208026 | AshutoshPalta | 2.0 | 2 |
| 25 | 101208027 | AtulBatish | 6.0 | 3 |
| 26 | 101208028 | Aviral Prasad | 2.0 | 2 |
| 27 | 101208029 | AyushUniyal | 6.0 | 3 |
| 28 | 101208030 | Bhanu Sharma | 5.0 | 3 |
| 29 | 101208031 | Brinderjeet Singh Dhanoa | 8.0 | 4 |
| 30 | 101208032 | Charanjeet Singh | 10.0 | 5 |
| 31 | 101208033 | ChinmoyJyotiSonowal | 8.0 | 4 |
| 32 | 101208034 | Chirag Jain | 10.0 | 5 |
| 33 | 101208035 | Debopam Das | 13.0 | 5 |
| 34 | 101208036 | Deepak Singh | 11.0 | 5 |
| 35 | 101208037 | G S Tushar | 11.0 | 5 |
| 36 | 101208038 | Gagandeep Singh Gujral | 0.0 | 1 |
| 37 | 101208039 | Gaurav Garg | 4.0 | 3 |
| 38 | 101208040 | Gaurav Goyal | 6.0 | 3 |
| 39 | 101208042 | Gaurav Kakkar | 7.0 | 4 |
| 40 | 101208044 | Guriqbal Singh | 0.0 | 1 |

| S. No. | Roll No. | Name | Marks (MM: 20) | Score (Scale 1 to 5) |
|--------|-----------|------------------------|----------------|----------------------|
| 41 | 101208045 | Gurleen Singh | 9.0 | 4 |
| 42 | 101208046 | Gurpreet Singh | 6.0 | 3 |
| 43 | 101208048 | Harish Garg | 7.0 | 4 |
| 44 | 101208049 | Harsh Raheja | 10.0 | 5 |
| 45 | 101208051 | HimanshuGambhir | 4.0 | 3 |
| 46 | 101208052 | Ishita Jain | 2.0 | 2 |
| 47 | 101208053 | Ishpuneet Singh Chawla | 0.0 | 1 |
| 48 | 101208054 | Jatin Mittal | 2.6 | 3 |
| 49 | 101208055 | Jatin Singh | 12.5 | 5 |
| 50 | 101208056 | Jugraj Singh Sandhu | 9.0 | 4 |
| 51 | 101208057 | K Naga PhaniBhaskar | 4.0 | 3 |
| 52 | 101208058 | Kamal Preet Singh | 2.0 | 2 |
| 53 | 101208060 | KapilChaand | 3.0 | 3 |
| 54 | 101208061 | Karan Mehra | 6.0 | 3 |
| 55 | 101208062 | Karanbir Singh Sandhar | 0.0 | 1 |
| 56 | 101208063 | KartikSingla | 0.0 | 1 |
| 57 | 101208064 | Kiranpreet Singh | 14.0 | 5 |
| 58 | 101208076 | Nikhil Sehdev | 17.0 | 5 |
| 59 | 101208081 | NiteeshDua | 4.0 | 3 |
| 60 | 101208140 | JiveshBedi | 9.0 | 4 |
| 61 | 101388001 | Amit Tripathi | 8.0 | 4 |
| 62 | 101388002 | AnkitSetia | 6.0 | 3 |
| 63 | 101388003 | Jaswant Singh | 8.0 | 4 |
| 64 | 101388004 | Pawan Kumar | 4.5 | 3 |

The overall performance of students in the above question is then summarized as given below

Table K4.12: Average score of student performance in the course UME802 for criteria K2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|------|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME802 | 28.1 | 23.4 | 29.7 | 10.9 | 7.8 | 3.53 |

Step 2:The above data is used to evaluate weighted average student class performance (course portfolio) for criteria K2 as given below in Table K4.13:

Table K4.13: Weighted Average Student class performance (course portfolio) for criteria K2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 38.6 | 43.2 | 4.5 | 0 | 13.6 | 3.93 | 4 |
| UME802 | 28.1 | 23.4 | 29.7 | 10.9 | 7.8 | 3.53 | 5 |
| Weighted average score | 32.77 | 32.20 | 18.50 | 6.06 | 10.38 | 3.71 | 9 |

b.) Assessment Tool: Student Course Survey

Table K4.14: Average score of student course survey for criteria K2

| Courses | % of students in each score | | | | | Average Score | Weight |
|------------------------|-----------------------------|-------|-------|-------|-------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 4 |
| UME802 | 18.23 | 22.86 | 31.68 | 11.11 | 16.12 | 3.16 | 5 |
| Weighted average score | 26.87 | 32.31 | 25.36 | 6.77 | 8.96 | 3.62 | 9 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table K4.15: Assessment for criteria K2 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|---------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 29.63 | 66.67 | 3.70 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 69.44 | 25.00 | 2.78 | 0.00 | 0.00 | 4.56 |

Finally overall weighted average score of performance criterion ‘K2’ is evaluated as given below in Table A4.16:

Table A4.16.: Overall weighted average score of performance criterion ‘K2’

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|--------------|--------------|-------------|-------------|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 32.77 | 32.20 | 18.50 | 6.06 | 10.38 | 3.71 | 5 |
| Weighted average student course survey | 26.87 | 32.31 | 25.36 | 6.77 | 8.96 | 3.62 | 4 |
| Graduating student survey | 61.29 | 35.48 | 3.22 | 0 | 0 | 4.58 | 3 |
| Alumni survey | 29.6 | 66.6 | 3.70 | 0 | 0 | 4.25 | 3 |
| Employer survey | 69.4 | 25 | 2.77 | 0 | 0 | 4.56 | 3 |
| Overall weighted score | 41.80 | 37.32 | 12.39 | 3.19 | 4.87 | 4.07 | 18 |

Assessment of Outcome ‘K’ using performance criterion K3

Performance criteria ‘K3’: Able to use solid modeling softwares for engineering applications

a.) Assessment Tool: Student’s performance using course portfolio

Step 1: One course namely Computer Aided Geometric Modeling & Analysis (UME 406) was used to assess performance criteria K3 as a direct measure. The analysis for each of these courses is provided below:

(I) Course: Computer Aided Geometric Modeling & Analysis (UME 406)

Performance criteria ‘K3’: Able to use solid modeling softwares for engineering applications.

The above performance criteria is used to measure the attainment of outcome ‘K3’ by giving the Project 1: Model, Assemble, Drawing to the students.

(You may find suitable question for this assessment from the measurement of CLOs submitted with the course file.)

Project Statement: Model, Assemble, Drawing

Model the parts of the Mangonel, Assemble the Mangonel and make the Part Drawings, put collage of all part 3D default views on one page in landscape view doc file saved as pdf, make orthographic drawing in ProE/Creo with views as given in reference pdf and saved as pdf and Assembly Drawings; three orthographic and one trimetric views, exploded view, drawings with BOM and balloons. All assembly and assembly sequence exploded and assembled views as given in pdf.

Student's performance in the above question is given below:

Table K4.17: Student's performance in question targeting 'K3'; course: UME406

| S.No. | Roll no. | Name | MST Q1-(a)(5) | SCORE (1-5) |
|-------|-----------|-------------------------|---------------|-------------|
| 1 | 101408001 | Aashish Kumar | 9 | 5 |
| 2 | 101408002 | AayushKhera | 8.5 | 4 |
| 3 | 101408003 | AbhishekBaruah | 7.5 | 4 |
| 4 | 101408004 | Abhishek Pandey | 9.5 | 5 |
| 5 | 101408005 | Abhishek Sharma | 9 | 5 |
| 6 | 101408006 | Abhishek Singh Nathawat | 8.5 | 4 |
| 7 | 101408007 | Abhishesh Aggarwal | 7.5 | 4 |
| 8 | 101408008 | AditGoel | 8 | 4 |
| 9 | 101408009 | Aditya Shubham | 8.5 | 4 |
| 10 | 101408010 | AerkDimri | 9 | 5 |
| 11 | 101408011 | AjiteshBindal | 8 | 4 |
| 12 | 101408012 | Akhilesh Sharma | 8 | 4 |
| 13 | 101408013 | Akin | 8.5 | 4 |
| 14 | 101408014 | Akshansh Jain | 8.5 | 4 |
| 15 | 101408015 | Akshay Bajaj | 8.5 | 4 |
| 16 | 101408016 | AmanSingla | 8.5 | 4 |
| 17 | 101408017 | Amar Raj Singh | 8 | 4 |
| 18 | 101408019 | AnandVardhan | 8.5 | 4 |
| 19 | 101408020 | Anil Barwar | 8 | 4 |
| 20 | 101588006 | Jashandeep Singh (L) | 8.5 | 4 |
| 21 | 101588013 | Shubham Sharma (L) | 8 | 4 |
| 22 | 101588015 | Tejinder Singh (L) | 8.5 | 4 |
| 23 | 101408021 | Ankit Kumar | 5 | 2 |
| 24 | 101408022 | AnkitVerma | 3 | 1 |
| 25 | 101408023 | AnkushNarula | 9.5 | 5 |
| 26 | 101408024 | Anurag Kumar | 4.5 | 1 |
| 27 | 101408025 | AnuragVerma | 10 | 5 |
| 28 | 101408026 | Arjun Raina | 6.5 | 3 |
| 29 | 101408028 | ArpitKandhari | 5.5 | 2 |
| 30 | 101408029 | Ashish Goyal | 10 | 5 |
| 31 | 101408030 | Ashok Ranwa | 6 | 3 |
| 32 | 101408031 | Ashwinder Singh | 9 | 5 |
| 33 | 101408032 | Atul | 8 | 4 |
| 34 | 101408033 | AvanshuShrivastav | 6.5 | 3 |
| 35 | 101408034 | Ayush Pandey | 9.5 | 5 |
| 36 | 101408035 | AyushRai | 7.5 | 4 |

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|----|-----------|----------------------------|-----|---|
| 37 | 101408036 | Channdeep | 8 | 4 |
| 38 | 101408037 | ChetanKatyayal | 7 | 4 |
| 39 | 101408038 | DakshGarg | 7 | 4 |
| 40 | 101408039 | Deepanshu Mohan | 6.5 | 3 |
| 41 | 101408040 | Devjot Singh Sewak | 8.5 | 4 |
| 42 | 101588001 | Arpanjot Singh (L) | 9 | 5 |
| 43 | 101588005 | HarshitKashyap (L) | 8.5 | 4 |
| 44 | 101588010 | Rachit Joshi (L) | 8 | 4 |
| 45 | 101309024 | Pushpraj Singh | 6.5 | 3 |
| 46 | 101408041 | Dheerendra Kumar Chaudhary | 7.5 | 4 |
| 47 | 101408042 | Dhruv Sharma | 6 | 3 |
| 48 | 101408043 | Divyesh Gupta | 9.5 | 5 |
| 49 | 101408044 | Ekamjot Singh | 9 | 5 |
| 50 | 101408045 | Gaurav Gupta | 8 | 4 |
| 51 | 101408046 | Gurasees Singh | 9.5 | 5 |
| 52 | 101408047 | Gurbaksh Singh | 8.5 | 4 |
| 53 | 101408048 | Gurneet Singh Aujla | 8 | 4 |
| 54 | 101408049 | HardikVashishtha | 8 | 4 |
| 55 | 101408050 | Harish Jala | 9.5 | 5 |
| 56 | 101408051 | Harjot Singh | 8.5 | 4 |
| 57 | 101408052 | Harmandeep Singh | 8.5 | 4 |
| 58 | 101408054 | Harmanpreet Singh | 0 | 1 |
| 59 | 101408055 | Harnoor Singh | 8.5 | 4 |
| 60 | 101408056 | Harpreet Singh | 8.5 | 4 |
| 61 | 101408057 | Himalaya NathChinoriya | 7.5 | 4 |
| 62 | 101408058 | Himanshu Raj | 8 | 4 |
| 63 | 101408059 | Ishaan Mangla | 8.5 | 4 |
| 64 | 101408060 | Ishjot Singh Jaggi | 8 | 4 |
| 65 | 101588011 | Rajinder Singh Sidhu (L) | 9 | 5 |
| 66 | 101588012 | RajitDevgan (L) | 8.5 | 4 |
| 67 | 101408061 | Jagdeep Singh | 8 | 4 |
| 68 | 101408062 | Jaskaran Singh | 7.2 | 4 |
| 69 | 101408063 | Jaskirat Singh | 7 | 4 |
| 70 | 101408064 | Jaspreet Singh Bhalla | 8.5 | 4 |
| 71 | 101408065 | Jaswinder Singh | 8.5 | 4 |
| 72 | 101408066 | Jatin Sharma | 7 | 4 |
| 73 | 101408067 | Kamal Jindal | 8.7 | 4 |
| 74 | 101408068 | Kanwarpal Singh Sohi | 8.7 | 4 |
| 75 | 101408069 | KaramjeetDhiman | 8.4 | 4 |
| 76 | 101408070 | Karan Bains | 9.2 | 5 |

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|-----|-----------|--------------------------|-----|---|
| 77 | 101408071 | Karan Goyal | 9.7 | 5 |
| 78 | 101408073 | Kchaustubh Sharma | 6.2 | 3 |
| 79 | 101408074 | KshitizRaturi | 6.5 | 3 |
| 80 | 101408075 | Kumar Akshaan | 6 | 3 |
| 81 | 101408076 | KunalGarg | 8.6 | 4 |
| 82 | 101408077 | Lokesh Bansal | 9.4 | 5 |
| 83 | 101408078 | Lovedeep Sharma | 8 | 4 |
| 84 | 101408079 | Lucky Ahuja | 8.8 | 4 |
| 85 | 101408080 | Mangal Singh | 7.5 | 4 |
| 86 | 101588002 | GovindAbhimanyuDhonk (L) | 8.5 | 4 |
| 87 | 101588004 | HardikBedi (L) | 9.5 | 5 |
| 88 | 101408081 | Manoj Goyal | 10 | 5 |
| 89 | 101408082 | Mayank Manish | 4 | 1 |
| 90 | 101408083 | Mayank Singh | 9.5 | 5 |
| 91 | 101408084 | Mir FaizanMushtaq | 10 | 5 |
| 92 | 101408085 | MokshPawar | 5 | 2 |
| 93 | 101408086 | Muaaz Ahmad | 10 | 5 |
| 94 | 101408087 | MukulBarpagga | 10 | 5 |
| 95 | 101408088 | Navyug Kumar | 7 | 4 |
| 96 | 101408089 | NimishGoyal | 9 | 5 |
| 97 | 101408090 | NishantSheoran | 8.5 | 4 |
| 98 | 101408091 | Nitin Gupta | 8.5 | 4 |
| 99 | 101408092 | Om Prakash | 8.5 | 4 |
| 100 | 101408093 | Parag Gupta | 10 | 5 |
| 101 | 101408094 | PiyushGoyal | 9 | 5 |
| 102 | 101408095 | Piyush Kumar | 8.5 | 4 |
| 103 | 101408096 | Pranjal Sharma | 9 | 5 |
| 104 | 101408097 | PrasoonKushwaha | 6.5 | 3 |
| 105 | 101408098 | PulkitGautam | 9 | 5 |
| 106 | 101408099 | PulkitMadan | 10 | 5 |
| 107 | 101588007 | Kulvir Singh (L) | 9 | 5 |
| 108 | 101588008 | Mohit Kumar (L) | 9.5 | 5 |
| 109 | 101408100 | Puneet Kumar | 9 | 5 |
| 110 | 101408101 | Rachit Jain | 9 | 5 |
| 111 | 101408102 | RaghavRalhan | 7 | 4 |
| 112 | 101408103 | Ramneek | 10 | 5 |
| 113 | 101408104 | Ramneek Singh Multani | 8 | 4 |
| 114 | 101408105 | Ravi Kumar Mittal | 10 | 5 |
| 115 | 101408106 | RishabBhatnagar | 10 | 5 |
| 116 | 101408107 | Rishabh Jain | 8 | 4 |

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|-----|-----------|-------------------------|-----|---|
| 117 | 101408108 | Rishav Kumar | 9 | 5 |
| 118 | 101408110 | Rohan Bisht | 5 | 2 |
| 119 | 101408111 | Sagandeep Singh | 9 | 5 |
| 120 | 101408112 | SagarLoomba | 6 | 3 |
| 121 | 101408113 | Sanchit Agarwal | 9 | 5 |
| 122 | 101408114 | Sarabdeep Singh Gambhir | 9 | 5 |
| 123 | 101408115 | ShanyaBhadauria | 10 | 5 |
| 124 | 101408116 | ShashankBindal | 9 | 5 |
| 125 | 101408117 | Shikhar Pandey | 0 | 1 |
| 126 | 101408118 | ShirishGoel | 9 | 5 |
| 127 | 101408119 | ShivankarPande | 4 | 1 |
| 128 | 101588003 | Gunjan Chauhan (L) | 9 | 5 |
| 129 | 101588014 | Suraj Kumar (L) | 0 | 1 |
| 130 | 101408120 | Shivendra Kumar | 8.5 | 4 |
| 131 | 101408121 | ShlokChanduka | 9.5 | 5 |
| 132 | 101408122 | Shubham Gupta | 9 | 5 |
| 133 | 101408123 | ShubhamSaxena | 9.5 | 5 |
| 134 | 101408124 | Shubham Sharma | 7 | 4 |
| 135 | 101408125 | SidharthHinger | 8.5 | 4 |
| 136 | 101408126 | Simranpreet Singh | 8.5 | 4 |
| 137 | 101408127 | SunpreetKochhar | 9 | 5 |
| 138 | 101408128 | TanmayMathur | 9 | 5 |
| 139 | 101408129 | Tanvir Sidhu | 8.5 | 4 |
| 140 | 101408130 | Tejkirat Singh Duggal | 9.5 | 5 |
| 141 | 101408131 | Thakur Singla | 10 | 5 |
| 142 | 101408132 | TishirChhaparia | 9 | 5 |
| 143 | 101408133 | VarunSoni | 5.5 | 2 |
| 144 | 101408134 | Vikramjeet Singh | 9.5 | 5 |
| 145 | 101408136 | VivekSingla | 8.5 | 4 |
| 146 | 101408137 | Yudhveer Singh Kainth | 9.5 | 5 |
| 147 | 101458001 | Devansh Jain | 5.5 | 2 |
| 148 | 101458002 | ShreyAsthana | 6 | 3 |
| 149 | 101458003 | Pranav Tiwari | 9 | 5 |
| 150 | 101458004 | Ravi Bishnoi | 9 | 5 |
| 151 | 101588009 | MukeshSaroj (L) | 8.5 | 4 |

The overall performance of students in the above question is then summarized as given below

Table K4.18: Average score of student performance in the course UME406 for criteria K3

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|---|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME406 | 37.7 | 45.7 | 7.9 | 4 | 4.6 | 4.08 |

*Step 2:*The above data is used to evaluate weighted average student class performance (course portfolio) for criteria K3 as given below in Table K4.19:

Table K4.19: Weighted Average Student class performance (course portfolio) for criteria K3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME406 | 37.7 | 45.7 | 7.9 | 4 | 4.6 | 4.08 | 5 |
| Weighted average score | 37.70 | 45.70 | 7.90 | 4.00 | 4.60 | 4.08 | 5 |

b.) Assessment Tool: Student Course Survey

Table K4.20: Average score of student course survey for criteria K3

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME406 | 29.69 | 37.67 | 26.57 | 2.89 | 2.89 | 3.88 | 5 |
| Weighted average score | 29.69 | 37.67 | 26.57 | 2.89 | 2.89 | 3.88 | 5 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table K4.21: Assessment for criteria K3 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 29.63 | 66.67 | 3.70 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 69.44 | 25.00 | 2.78 | 0.00 | 0.00 | 4.56 |

Finally overall weighted average score of performance criterion 'K3' is evaluated as given below in Table K4.22:

Table K4.22: Overall weighted average score of performance criterion 'K3'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 37.7 | 45.7 | 7.9 | 4.0 | 4.6 | 4.1 | 5.0 |
| Weighted average student course survey | 29.7 | 37.7 | 26.6 | 2.9 | 2.9 | 3.9 | 4.0 |
| Graduating student survey | 61.3 | 35.5 | 3.2 | 0.0 | 0.0 | 4.6 | 3.0 |
| Alumni survey | 29.6 | 66.7 | 3.7 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 69.4 | 25.0 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 43.8 | 42.3 | 9.7 | 1.8 | 1.9 | 4.2 | 18.0 |

Assessment of Outcome 'K' using performance criterion K4

Performance criteria 'K4': Able to analyze engineering problems using software tools.

a.) Assessment Tool: Student's performance using course portfolio

Step 1: Two courses namely Computer Aided Manufacturing (UME702) and Computer Aided Geometric Modeling & Analysis (UME 406) were used to assess performance criteria K4 as a direct measure. The analysis for each of these courses is provided below:

(I) Course: Computer Aided Manufacturing (UME702)

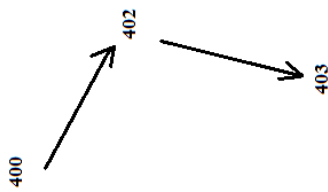
The above performance criteria is used to measure the attainment of outcome 'K4' by giving the assignments and lab quiz in laboratory to the students.

Question:

Write part programs for CNC turning and CNC milling machines.

Lab quiz

| | | |
|----|--|---|
| 1. | (G70 / G80 / G40) code is used for ending a canned cycle. | 1 |
| 2. | 'NT' command used in robot programming is equivalent to (G20 / G21 / G28) code used in manual part programming on a milling/lathe CNC machine. | 1 |
| 3. | Robotic Arm used in lab has how many degrees of freedom for positioning the wrist (3/4/5/6). | 1 |
| 4. | Parameter P in multi pass facing cycle is used to specify (Line no / Depth of cut /Finish allowance). | 1 |
| 5. | Parameter Q in multi pass turning cycle is used to specify (Line no / Depth of cut /Finish allowance). | 1 |

| | | |
|----|--|---|
| 6. | Figure below shows the points set by the user through the teach pendant on the robotic arm. Write the program for the movement of the robotic arm from point 400 to 403 with gripper closed on the locations.  | 2 |
| 7. | G00 X6 Z0 G01 U6 Z-20 Write the absolute coordinates of the tool tip after executing these commands assuming that your machine works in incremental diametrical form _____. | 1 |
| 8. | Write the full form of MDI command on CNC lathe machine | 1 |
| 9. | While running a part program on a CNC, which of the following mode is set active? (EDIT/ Auto / MDI / MPG) | 1 |

Student's performance in the above question is given below:

Table K4.23: Student's performance in question targeting 'K4'; course: UME702

| S. No. | Roll No. | Name of student | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|-------------------------|----------------|----------------------|
| 1 | 101308015 | AnkitSehgal | 3.0 | 1 |
| 2 | 101308033 | Ekansh Kumar Srivastava | 5.5 | 3 |
| 3 | 101308059 | Kanwar Pal Singh Gulati | 6.0 | 3 |
| 4 | 101308067 | Ketan Chauhan | 4.0 | 2 |
| 5 | 101308069 | Kirat Singh Basur | 5.8 | 3 |
| 6 | 101308070 | Kshitij Sharma | 11.0 | 4 |
| 7 | 101308071 | Lokendra Kumar | 5.5 | 3 |
| 8 | 101308074 | Manik Saharan | 4.5 | 2 |
| 9 | 101308075 | Manish Pandoh | 5.0 | 3 |
| 10 | 101308077 | ManutkarshKirpal | 7.5 | 3 |
| 11 | 101308078 | Nidan Prakash | 8.5 | 4 |
| 12 | 101308079 | Nikhil Aggarwal | 8.0 | 4 |
| 13 | 101308080 | Nikhil Ganta | 11.5 | 4 |
| 14 | 101308082 | Paramjot Singh | 10.0 | 4 |

| S. No. | Roll No. | Name of student | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|----------------------------|----------------|----------------------|
| 15 | 101308083 | Paras | 7.5 | 3 |
| 16 | 101308085 | PrabhmanVir | 13.5 | 5 |
| 17 | 101308088 | Pulkit Kapoor | 6.5 | 3 |
| 18 | 101308089 | Puneet Singh | 9.0 | 4 |
| 19 | 101308090 | Rajat Gupta | 7.0 | 3 |
| 20 | 101308091 | Ramnish Kumar | 6.0 | 3 |
| 21 | 101308093 | Rohan Kaushal | 7.5 | 3 |
| 22 | 101308094 | SagarSingla | 7.5 | 3 |
| 23 | 101308096 | Sahil Sharma | 10.0 | 4 |
| 24 | 101308097 | Samdeep Singh Sabharwal | 8.5 | 4 |
| 25 | 101308098 | Sameer Bhalla | 4.5 | 2 |
| 26 | 101308099 | Sartaj Singh | 12.5 | 5 |
| 27 | 101308101 | Shikhar Gaur | 11.0 | 4 |
| 28 | 101308102 | ShreyasBhayana | 9.5 | 4 |
| 29 | 101308103 | Shubham | 8.0 | 4 |
| 30 | 101308104 | ShubhamBhama | 7.5 | 3 |
| 31 | 101308105 | Shubham Chaudhary | 10.5 | 4 |
| 32 | 101308106 | Shubham Gupta | 10.0 | 4 |
| 33 | 101308108 | SiddharthGhiya | 7.5 | 3 |
| 34 | 101308109 | Siddharth Gupta | 10.0 | 4 |
| 35 | 101308110 | SiddharthVasu | 8.0 | 4 |
| 36 | 101308111 | Sidhant | 5.5 | 3 |
| 37 | 101308112 | Simrandeep Singh Bhullar | 9.0 | 4 |
| 38 | 101308113 | SouravSingla | 5.0 | 3 |
| 39 | 101308114 | Tanjay Pathak | 14.0 | 5 |
| 40 | 101308115 | TanujLamba | 7.0 | 3 |
| 41 | 101308116 | UtsavMudgal | 5.5 | 3 |
| 42 | 101308117 | VaibhavPratap Singh Pundir | 10.5 | 4 |
| 43 | 101308118 | Varmeet Singh Gulati | 6.5 | 3 |
| 44 | 101308119 | VarunAtri | 9.5 | 4 |
| 45 | 101308120 | VedantMansotra | 10.5 | 4 |
| 46 | 101308121 | Vikrant Nanda | 7.5 | 3 |
| 47 | 101308122 | Vishal Solanki | 7.5 | 3 |
| 48 | 101308123 | Vivek Mittal | 7.0 | 3 |

| S. No. | Roll No. | Name of student | Marks (MM: 15) | Score (Scale 1 to 5) |
|--------|-----------|--------------------|----------------|----------------------|
| 49 | 101308124 | VivekPundir | 9.5 | 4 |
| 50 | 101308125 | Yashwardhan Sharma | 5.0 | 3 |
| 51 | 101488008 | Ishan | 7.0 | 3 |
| 52 | 101488012 | MohitGoyal | 12.0 | 5 |
| 53 | 101488013 | NavjotRihal | 7.0 | 3 |
| 54 | 101488014 | Nikhil Gupta | 12.5 | 5 |
| 55 | 101488015 | Sankit | 7.5 | 3 |
| 56 | 101488016 | SarangVashisht | 7.0 | 3 |
| 57 | 101488017 | Varun Bansal | 7.5 | 3 |
| 58 | 101488018 | Vishnu Kalra | 8.5 | 4 |

The overall performance of students in the above question is then summarized as given below

Table K4.24: Average score of student performance in the course UME702for criteria K4

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|------|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME702 | 8.6 | 36.2 | 48.3 | 5.2 | 1.7 | 3.45 |

(II) Course: Computer Aided Geometric Modeling & Analysis (UME 406)

The above performance criteria is used to measure the attainment of outcome 'K4' by giving the Project 2: Static Stress Analysis (weightage: 10 marks) to the students.

Project 2: Static Stress Analysis

Perform static stress analysis of the Mangonel structure, steel trigger and the throwing arm when in loaded position (ready to fire). Take strength of wood as 100 MPa. The value of E for timber can be conservatively taken as 1×10^{10} N/m². Steel properties can be taken for the steel samples tested in SM lab in 1st year course. Perform one experiment per lab group for the wood properties. Determine the static force on the throwing arm using a spring balance from meteorology lab.

Student's performance in the above project is given below:

Table K4.25: Student's performance in question targeting 'K4'; course: UME406

| S. No. | Roll No. | Name of student | Marks (MM: 15) | Score |
|--------|-----------|-----------------|----------------|-------|
| 1 | 101408001 | Aashish Kumar | 7 | 4 |
| 2 | 101408002 | AayushKhera | 7.5 | 4 |
| 3 | 101408003 | AbhishekBaruah | 7.5 | 4 |
| 4 | 101408004 | Abhishek Pandey | 7.5 | 4 |

| | | | | |
|----|-----------|-------------------------|-----|---|
| 5 | 101408005 | Abhishek Sharma | 7.5 | 4 |
| 6 | 101408006 | Abhishek Singh Nathawat | 6.5 | 4 |
| 7 | 101408007 | Abhishesh Aggarwal | 7.5 | 4 |
| 8 | 101408008 | AditGoel | | 1 |
| 9 | 101408009 | Aditya Shubham | 0 | 1 |
| 10 | 101408010 | AerkDimri | 7.5 | 4 |
| 11 | 101408011 | AjiteshBindal | 7.5 | 4 |
| 12 | 101408012 | Akhilesh Sharma | 0 | 1 |
| 13 | 101408013 | Akin | 5 | 2 |
| 14 | 101408014 | Akshansh Jain | 7 | 4 |
| 15 | 101408015 | Akshay Bajaj | 7 | 4 |
| 16 | 101408016 | AmanSingla | 8.5 | 4 |
| 17 | 101408017 | Amar Raj Singh | 8 | 4 |
| 18 | 101408019 | AnandVardhan | 7.5 | 4 |
| 19 | 101408020 | Anil Barwar | 7.5 | 4 |
| 20 | 101588006 | Jashandeep Singh (L) | 8 | 4 |
| 21 | 101588013 | Shubham Sharma (L) | 7 | 4 |
| 22 | 101588015 | Tejinder Singh (L) | 7.5 | 4 |
| 23 | 101408021 | Ankit Kumar | 8.5 | 4 |
| 24 | 101408022 | AnkitVerma | 9 | 5 |
| 25 | 101408023 | AnkushNarula | 10 | 5 |
| 26 | 101408024 | Anurag Kumar | 8.5 | 4 |
| 27 | 101408025 | AnuragVerma | 10 | 5 |
| 28 | 101408026 | Arjun Raina | 9.5 | 5 |
| 29 | 101408028 | ArpitKandhari | 9.5 | 5 |
| 30 | 101408029 | Ashish Goyal | 10 | 5 |
| 31 | 101408030 | Ashok Ranwa | 8.5 | 4 |
| 32 | 101408031 | Ashwinder Singh | 9 | 5 |
| 33 | 101408032 | Atul | 9 | 5 |
| 34 | 101408033 | AvanshuShrivastav | 8 | 4 |
| 35 | 101408034 | Ayush Pandey | 8.5 | 4 |
| 36 | 101408035 | AyushRai | 9 | 5 |
| 37 | 101408036 | Channdeep | 9 | 5 |
| 38 | 101408037 | ChetanKatyayal | 8 | 4 |
| 39 | 101408038 | DakshGarg | 8.5 | 4 |
| 40 | 101408039 | Deepanshu Mohan | 9 | 5 |
| 41 | 101408040 | Devjot Singh Sewak | 3 | 1 |
| 42 | 101588001 | Arpanjot Singh (L) | 10 | 5 |
| 43 | 101588005 | HarshitKashyap (L) | 10 | 5 |
| 44 | 101588010 | Rachit Joshi (L) | 8.5 | 4 |

| | | | | |
|----|-----------|----------------------------|-----|---|
| 45 | 101309024 | Pushpraj Singh | 3 | 1 |
| 46 | 101408041 | Dheerendra Kumar Chaudhary | 8 | 4 |
| 47 | 101408042 | Dhruv Sharma | 8.5 | 4 |
| 48 | 101408043 | Divyesh Gupta | 0 | 1 |
| 49 | 101408044 | Ekamjot Singh | 8 | 4 |
| 50 | 101408045 | Gaurav Gupta | 8 | 4 |
| 51 | 101408046 | Gurasees Singh | 8.5 | 4 |
| 52 | 101408047 | Gurbaksh Singh | 8 | 4 |
| 53 | 101408048 | Gurneet Singh Aujla | 7 | 4 |
| 54 | 101408049 | HardikVashishtha | 6.5 | 4 |
| 55 | 101408050 | Harish Jala | 7.5 | 4 |
| 56 | 101408051 | Harjot Singh | 6.5 | 4 |
| 57 | 101408052 | Harmandeep Singh | 8.5 | 4 |
| 58 | 101408054 | Harmanpreet Singh | 0.5 | 1 |
| 59 | 101408055 | Harnoor Singh | 7 | 4 |
| 60 | 101408056 | Harpreet Singh | 6.5 | 4 |
| 61 | 101408057 | Himalaya NathChinoriya | 6.5 | 4 |
| 62 | 101408058 | Himanshu Raj | 7.5 | 4 |
| 63 | 101408059 | Ishaan Mangla | 8 | 4 |
| 64 | 101408060 | Ishjot Singh Jaggi | 7.5 | 4 |
| 65 | 101588011 | Rajinder Singh Sidhu (L) | 8 | 4 |
| 66 | 101588012 | RajitDevgan (L) | 8 | 4 |
| 67 | 101408061 | Jagdeep Singh | 9 | 5 |
| 68 | 101408062 | Jaskaran Singh | 9 | 5 |
| 69 | 101408063 | Jaskirat Singh | 6.2 | 3 |
| 70 | 101408064 | Jaspreet Singh Bhalla | 9.2 | 5 |
| 71 | 101408065 | Jaswinder Singh | 8.2 | 4 |
| 72 | 101408066 | Jatin Sharma | 8 | 4 |
| 73 | 101408067 | Kamal Jindal | 8.2 | 4 |
| 74 | 101408068 | Kanwarpal Singh Sohi | 8 | 4 |
| 75 | 101408069 | KaramjeetDhiman | 7.1 | 4 |
| 76 | 101408070 | Karan Bains | 9.7 | 5 |
| 77 | 101408071 | Karan Goyal | 10 | 5 |
| 78 | 101408073 | Kchaustubh Sharma | 6.5 | 4 |
| 79 | 101408074 | KshitizRaturi | 7.1 | 4 |
| 80 | 101408075 | Kumar Akshaan | 8 | 4 |
| 81 | 101408076 | KunalGarg | 8 | 4 |
| 82 | 101408077 | Lokesh Bansal | 10 | 5 |
| 83 | 101408078 | Lovedeep Sharma | 8.5 | 4 |
| 84 | 101408079 | Lucky Ahuja | 8.3 | 4 |

| | | | | |
|-----|-----------|--------------------------|-----|---|
| 85 | 101408080 | Mangal Singh | 7 | 4 |
| 86 | 101588002 | GovindAbhimanyuDhonk (L) | 9 | 5 |
| 87 | 101588004 | HardikBedi (L) | 9.5 | 5 |
| 88 | 101408081 | Manoj Goyal | 7.5 | 4 |
| 89 | 101408082 | Mayank Manish | 6.5 | 4 |
| 90 | 101408083 | Mayank Singh | 7.5 | 4 |
| 91 | 101408084 | Mir FaizanMushtaq | 7.5 | 4 |
| 92 | 101408085 | MokshPawar | 5.5 | 3 |
| 93 | 101408086 | Muaaz Ahmad | 7 | 4 |
| 94 | 101408087 | MukulBarpagga | 6.5 | 4 |
| 95 | 101408088 | Navyug Kumar | 6 | 3 |
| 96 | 101408089 | NimishGoyal | 5 | 2 |
| 97 | 101408090 | NishantSheoran | 8 | 4 |
| 98 | 101408091 | Nitin Gupta | 6 | 3 |
| 99 | 101408092 | Om Prakash | 8 | 4 |
| 100 | 101408093 | Parag Gupta | 7 | 4 |
| 101 | 101408094 | PiyushGoyal | 6.5 | 4 |
| 102 | 101408095 | Piyush Kumar | 3 | 1 |
| 103 | 101408096 | Pranjal Sharma | 7 | 4 |
| 104 | 101408097 | PrasoonKushwaha | 8.5 | 4 |
| 105 | 101408098 | PulkitGautam | 4.5 | 2 |
| 106 | 101408099 | PulkitMadan | 8 | 4 |
| 107 | 101588007 | Kulvir Singh (L) | 4 | 2 |
| 108 | 101588008 | Mohit Kumar (L) | 6.5 | 4 |
| 109 | 101408100 | Puneet Kumar | 8 | 4 |
| 110 | 101408101 | Rachit Jain | 9 | 5 |
| 111 | 101408102 | RaghavRalhan | 9 | 5 |
| 112 | 101408103 | Ramneek | 8 | 4 |
| 113 | 101408104 | Ramneek Singh Multani | 9 | 5 |
| 114 | 101408105 | Ravi Kumar Mittal | 9 | 5 |
| 115 | 101408106 | RishabBhatnagar | 7 | 4 |
| 116 | 101408107 | Rishabh Jain | 0 | 1 |
| 117 | 101408108 | Rishav Kumar | 8 | 4 |
| 118 | 101408110 | Rohan Bisht | 8 | 4 |
| 119 | 101408111 | Sagandeep Singh | 7 | 4 |
| 120 | 101408112 | SagarLoomba | 9 | 5 |
| 121 | 101408113 | Sanchit Agarwal | 9 | 5 |
| 122 | 101408114 | Sarabdeep Singh Gambhir | 8 | 4 |
| 123 | 101408115 | ShanyaBhadauria | 8 | 4 |
| 124 | 101408116 | ShashankBindal | 9 | 5 |

| | | | | |
|-----|-----------|-----------------------|-----|---|
| 125 | 101408117 | Shikhar Pandey | 0 | 1 |
| 126 | 101408118 | ShirishGoel | 9 | 5 |
| 127 | 101408119 | ShivankarPande | 7 | 4 |
| 128 | 101588003 | Gunjan Chauhan (L) | 7 | 4 |
| 129 | 101588014 | Suraj Kumar (L) | 0 | 1 |
| 130 | 101408120 | Shivendra Kumar | 9.5 | 5 |
| 131 | 101408121 | ShlokChanduka | 9.5 | 5 |
| 132 | 101408122 | Shubham Gupta | 9.5 | 5 |
| 133 | 101408123 | ShubhamSaxena | 9 | 5 |
| 134 | 101408124 | Shubham Sharma | 10 | 5 |
| 135 | 101408125 | SidharthHinger | 9.5 | 5 |
| 136 | 101408126 | Simranpreet Singh | 9.5 | 5 |
| 137 | 101408127 | SunpreetKochhar | 10 | 5 |
| 138 | 101408128 | TanmayMathur | 9 | 5 |
| 139 | 101408129 | Tanvir Sidhu | 9.5 | 5 |
| 140 | 101408130 | Tejkirat Singh Duggal | 9.5 | 5 |
| 141 | 101408131 | Thakur Singla | 10 | 5 |
| 142 | 101408132 | TishirChhparia | 9.5 | 5 |
| 143 | 101408133 | VarunSoni | 9.5 | 5 |
| 144 | 101408134 | Vikramjeet Singh | 9.5 | 5 |
| 145 | 101408136 | VivekSingla | 10 | 5 |
| 146 | 101408137 | Yudhveer Singh Kainth | 9.5 | 5 |
| 147 | 101458001 | Devansh Jain | 9 | 5 |
| 148 | 101458002 | ShreyAsthana | 9.5 | 5 |
| 149 | 101458003 | Pranav Tiwari | 9.5 | 5 |
| 150 | 101458004 | Ravi Bishnoi | 10 | 5 |
| 151 | 101588009 | MukeshSaroj (L) | 9.5 | 5 |

The overall performance of students in the above question is then summarized as given below

Table K4.26: Average score of student performance in the course UME406 for criteria A2

| Course | % of students in each score | | | | | Average Score |
|--------|-----------------------------|------|-----|-----|-----|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| UME406 | 33.8 | 53.6 | 2.6 | 2.6 | 7.3 | 4.04 |

Step 2:The above data is used to evaluate weighted average student class performance (course portfolio) for criteria K4 as given below in Table K4.27:

Table K4.27: Weighted Average Student class performance (course portfolio) for criteria K4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 8.6 | 36.2 | 48.3 | 5.2 | 1.7 | 3.45 | 5 |
| UME406 | 33.8 | 53.6 | 2.6 | 2.6 | 7.3 | 3.86 | 4 |
| Weighted average score | 19.80 | 43.93 | 27.99 | 4.04 | 4.19 | 3.63 | 9 |

b.) Assessment Tool: Student Course Survey

Table K4.28: Average score of student course survey for criteria K4

| Courses | % of students in each score | | | | | Average Score | Weight |
|-------------------------------|-----------------------------|-------|-------|------|------|---------------|--------|
| | 5 | 4 | 3 | 2 | 1 | | |
| UME702 | 37.68 | 44.12 | 17.45 | 1.35 | 0 | 4.20 | 5 |
| UME406 | 29.69 | 37.67 | 26.57 | 2.89 | 2.89 | 3.88 | 4 |
| Weighted average score | 34.13 | 41.25 | 21.50 | 2.03 | 1.28 | 4.06 | 9 |

c.) Assessment Tool: Graduating student survey, Alumni Survey and Employer Survey

Table K4.29: Assessment for criteria K4 using Graduating student survey, alumni survey and employer survey tool

| Assessment Tools | % of students in each score | | | | | Average score |
|----------------------------------|-----------------------------|-------|------|------|------|---------------|
| | 5 | 4 | 3 | 2 | 1 | |
| Graduating student survey | 61.29 | 35.48 | 3.23 | 0.00 | 0.00 | 4.58 |
| Alumni survey | 29.63 | 66.67 | 3.70 | 0.00 | 0.00 | 4.26 |
| Employer Survey | 69.44 | 25.00 | 2.78 | 0.00 | 0.00 | 4.56 |

Finally overall weighted average score of performance criterion 'K4' is evaluated as given below in Table K4.30:

Table K4.30: Overall weighted average score of performance criterion 'K4'

| Assessment tools | % of students in each score | | | | | Average weighted score | Assessment tool weight |
|--|-----------------------------|------|------|-----|-----|------------------------|------------------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| Weighted average student class performance | 19.8 | 43.9 | 28.0 | 4.0 | 4.2 | 3.6 | 5.0 |
| Weighted average student course survey | 34.1 | 41.3 | 21.5 | 2.0 | 1.3 | 4.1 | 4.0 |
| Graduating student survey | 61.3 | 35.5 | 3.2 | 0.0 | 0.0 | 4.6 | 3.0 |
| Alumni survey | 29.6 | 66.7 | 3.7 | 0.0 | 0.0 | 4.3 | 3.0 |
| Employer survey | 69.4 | 25.0 | 2.8 | 0.0 | 0.0 | 4.6 | 3.0 |
| Overall weighted score | 39.8 | 42.6 | 14.2 | 1.6 | 1.4 | 4.1 | 18.0 |

Overall assessment of program outcome K using scores of K1, K2, K3 and K4

In the above sections, each of the individual performance criteria K1, K2, K3 and K4 have been assessed. The performance for attainment of outcome K has been completed using the attainment values for K1, K2, K3 and K4 and is provided below:

Table K4.31 summarizes the scores of each of the four performance criteria and these scores have been used to assess an overall score for outcome K.

Table K4.31: Overall score for outcome K at the program level

| Performance criteria | % of students in each score | | | | | Overall weighted average score | Criteria weight |
|----------------------|-----------------------------|-------|-------|------|------|--------------------------------|-----------------|
| | 5 | 4 | 3 | 2 | 1 | | |
| K1 | 43.51 | 36.91 | 15.06 | 2.71 | 1.50 | 4.17 | 4 |
| K2 | 41.80 | 37.32 | 12.39 | 3.19 | 4.87 | 4.07 | 5 |
| K3 | 43.80 | 42.26 | 9.72 | 1.75 | 1.92 | 4.23 | 5 |
| K4 | 39.81 | 42.56 | 14.17 | 1.58 | 1.45 | 4.14 | 5 |
| Overall score | 42.16 | 39.91 | 12.72 | 2.29 | 2.33 | 4.15 | 19 |

Track Record and assessment of attainment of program outcome ‘K’ over the last three academic years

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

The following table K4.32 presents the performance criteria-wise assessment score distribution for outcome ‘K’.

Table K4.32: Performance criteria-wise assessment score distribution of outcome K

| Program outcomes and performance criteria | | Year | | |
|---|----|------|------|------|
| | | 2014 | 2015 | 2016 |
| K | K1 | 4.12 | 3.85 | 4.17 |
| | K2 | 3.94 | 4.01 | 4.07 |
| | K3 | 4.02 | 3.97 | 4.23 |
| | K4 | 4.16 | 4.05 | 4.14 |

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

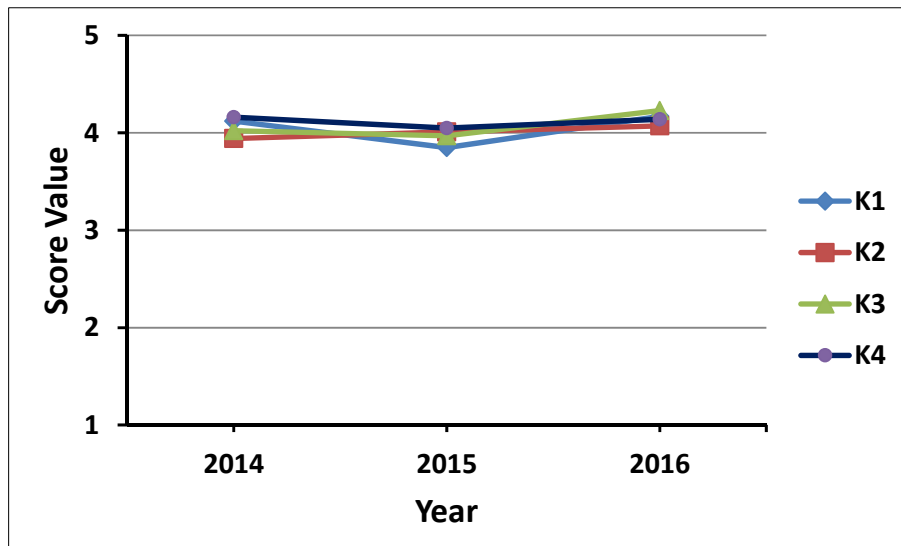


Figure K4.2: Performance criteria-wise assessment score distribution of outcome K

Level of attainment of program outcome ‘K’ 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 ≥ 4.5 on a scale of 1 to 5
- **Good:** Overall weighted score for the outcome between 3.5 to 4.5 on a scale of 1 to 5
- **Satisfactory:** Overall weighted score for the outcome between 2.5 to 3.5 on a scale of 1 to 5
- **Unsatisfactory:** Overall weighted score for the outcome ≤ 2.5 on a scale of 1 to 5

The following table K4.33 presents the overall weighted score of outcome ‘K’ over the last three academic years.

Table K4.33: Overall weighted score of outcome ‘K’ over a period of last three years

| Year | Overall weighted score | Level of attainment |
|------|------------------------|---------------------|
| 2014 | 4.06 | good |
| 2015 | 3.97 | good |
| 2016 | 4.15 | good |

The above data has been plotted to visualize the overall weighted score of outcome ‘K’ over a period of last three years.

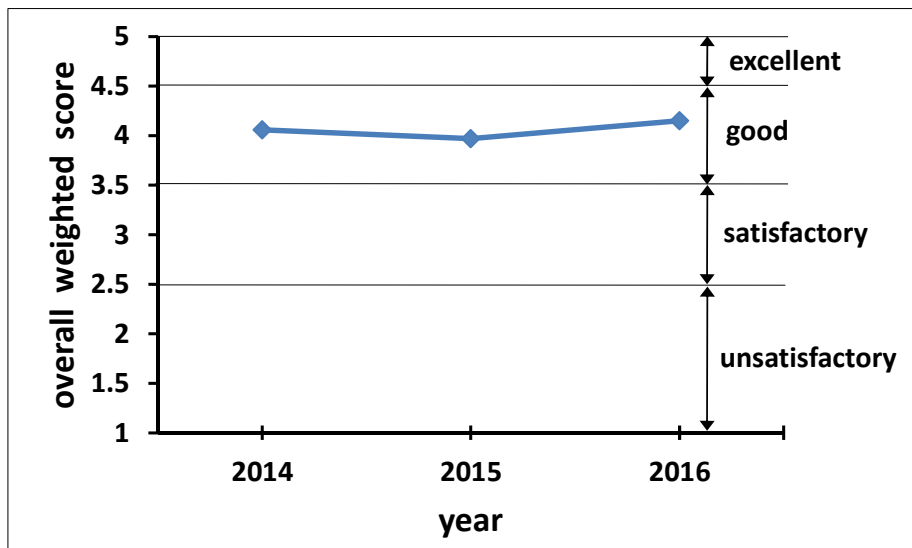


Figure K4.3: overall weighted score of outcome ‘K’ over a period of last three years

The following actions have been taken based on the analysis of Outcome K

| Weighted Score for Outcome K | Recommendation | Reason | Implemented from |
|------------------------------|--|---|------------------|
| 3.97 | <ul style="list-style-type: none"> • Introduction of AutoCAD: A sketching software in the subject of ‘Engineering Graphics’ | Students are able to use the Engineering software for engineering application | July, 2014 |