

**GEETHANJALI COLLEGE OF ENGINEERING & TECHNOLOGY**  
Cheeryal (V), Keesara (M) Medchal. Dist

No. GCET/104A/2022-23

Dated: 24<sup>th</sup> November 2022

**OFFICE OF THE PRINCIPAL**

**CIRCULAR**

**Sub: Modifications in CO-PO/PSO mapping, COs and POs/PSOs attainment – Reg.**


In view of the modifications made under AR22 Regulations for UG Engineering Programs of the institution, which have come into existence from the student batches admitted from academic year 2022-23 onwards, wherein, the weightage for the components of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) has been changed to 40 and 60 from the earlier weightage of 30 and 70 under AR20 Regulations; the process for CO-PO/PSO mapping, and the attainment procedures for COs and POs/PSOs need to arrive at a revised procedure, taking into consideration the feedback given by the NBA expert team visited during August 12-14, 2022 towards accreditation of CSE, ECE and EEE programs. Accordingly, the following committee is constituted to develop a revised procedure for:

1. Mapping of COs and POs/PSOs.
2. Assigning correlation strengths for mapped COs and POs/PSOs.
3. Fixing of CO, PO attainment targets.
4. Computation of COs and POs/PSOs attainment.

S. No.	Name of the Faculty	Designation	Status
1	Prof. B. Hari Kumar	Dean, SE&CE	Convenor
2	Dr. R. Prasanna Kumar	Registrar	Member
3	Dr. P. Vijai Bhaskar	Dean, Academics	Member
4	Prof. V. Madhusudhan Rao	Dean, SCSI	Member
5	Dr. G. Neeraja Rani	HoD – FE	Member

A draft procedure should be submitted to the undersigned within 3 weeks.

To: All committee members

  
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**PROCEDURE FOR COMPUTING THE ATTAINMENT LEVEL of COs, POs and PSOs–  
First Year Courses  
(Effective from 2022-23 Admitted Batch)**

**Table 1: COs Assessment criteria**

CO	Assessment	Assessment Tool	Assessment Criteria	Frequency of Data Collection		
Course Code/ Name	Direct Assessment (80%)	Continuous Internal Evaluation (CIE)	Mid Term examinations (30%) • Subjective (20%), • Objective (10%),	Target for each question in Subjective Paper = 60% of maximum marks of each question. • Marks allocated for Subjective - 20 Marks Target for Objective Paper = 60% of maximum marks • Marks allocated for Objective - 10 Marks	Twice in a semester per course during 8 <sup>th</sup> and 16 <sup>th</sup> weeks	
			• Assignment (10%)	Target: 60% of total marks. – Weightage - 10% Marks allocated for assignments per course = 5	Five times in a semester per course	
			• Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject (10%)	Target: 60% of total marks. Marks allocated for Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned course = 5	Once in a semester	
	Indirect Assessment (20%)	External Assessment (50%)	Semester End Examination (SEE) -(50%)	Target: 60% of maximum marks of each question – Weightage - 50% Marks allocated for SEE = 60	Once in a Semester per course	
			TLP Feedback (50%)	Feedback on Teaching Learning Process (50%)	From all students Feedback taken centrally by IQAC	Twice in a Semester per course
			Course End Survey (50%)	Feedback on General objectives and Course outcomes (50%)	Feedback on General objectives and Specific Course outcomes for each course at the end of the course	Once in a Semester per course at the end of the semester

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### Process for computing COs attainment level

1. For computing the COs attainment, the students who attended the exam shall be considered. Absentees are not considered for the evaluation of COs.
2. For Theory Courses, Subjective Paper of mid-term examinations and for both Part A and Part B of Semester End Examinations, CO-wise attainment shall be calculated. Marks obtained in each question shall be taken into consideration for computing the attainment of COs.
3. For the Objective Paper of mid-term examinations (10 marks), Assignments (5 marks) and Subject Viva-Voce/ PPT/Poster Presentation/ Case Study (5 marks) on a topic in the concerned course, the marks obtained in each of these categories shall be considered for computation of CO attainment.
4. Similarly for the laboratory courses in both CIE (Write up on Day to Day Experiment in the lab - 10 marks, Viva-voce - 10 marks, Internal practical examinations 10 marks, Laboratory Project 10 marks) and SEE (10 marks for write-up, 15 for experiment/program, 15 for evaluation of results, 10 marks for presentation on another experiment/program in the same laboratory course and 10 marks for viva-voce on concerned laboratory course), the marks obtained in each of these categories shall be considered for computation of COs attainment. The attainment so computed shall be made applicable to all COs. This is to reduce the complexity of computation of COs attainment.
5. For measuring the attainment of COs of a theory course (both in CIE and SEE), the **targets (can be defined differently for each CO or the same target for all COs as per the deliberations that took place in the course coordinator's meeting with the instructors, approved by PAC)** are to be fixed.
6. A sample target fixing and COs attainment process for theory and laboratory courses is described below:

#### 6.1 Target fixing for Theory Courses:

- Mid Paper Subjective/ Descriptive paper: 60% of maximum marks related to each CO
- Mid Paper Objective: 60% of maximum marks (6 marks out of 10)
- Assignments: 60% of maximum marks (3 marks out of 5)
- Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject: 60% of maximum marks (3 marks out of 5)
- Semester End Examination: 60% of maximum marks related to each CO

Or

any other target proposed by the course coordinator and approved by PAC.

#### 6.2 Target fixing for Laboratory Courses

- Under the Continuous Internal Evaluation (CIE) of 40 marks



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- Write up on Day to Day Experiment in the lab: 60% of maximum marks (6 marks out of 10)
- Viva-voce: 60% of maximum marks (6 marks out of 10)
- Internal practical examinations: 60% of maximum marks (6 marks out of 10)
- Laboratory Project/Presentation: 60% of maximum marks (6 marks out of 10)
- Under the Semester End Examination (SEE) of 60 marks
  - Write-up: 60% of maximum marks (6 marks out of 10)
  - Experiment/ Program: 60% of maximum marks (9 marks out of 15)
  - Evaluation of Results: 60% of maximum marks (9 marks out of 15)
  - Presentation on another experiment/program in the same laboratory course: 60% of maximum marks (6 marks out of 10)
  - Viva-voce: 60% of maximum marks (6 marks out of 10)

Or

any other target proposed by the course coordinator and approved by PAC.

7. The attainment levels are to be fixed using the above targets as follows:

<b>Semester End Exam</b>	
<b>Level indicator for CO attainment</b>	
<b>Level 1</b>	≥ 50% and <59% of Students attain the target Marks
<b>Level 2</b>	≥ 60% and <69% of Students attain the target Marks
<b>Level 3</b>	≥ 69% of Students attain the target Marks

<b>Mid-term Exams – Subjective, Objective, Assignments and Viva-Voce/ PPT/Poster Presentation/ Case Study</b>	
<b>Level indicator for CO attainment</b>	
<b>Level 1</b>	≥ 60% and <70% of students attain the target
<b>Level 2</b>	≥ 70% to <80% of students attain the target
<b>Level 3</b>	≥ 80% of students attain the target

<b>Indirect attainment – Course End Survey and TLP feedback</b>	
<b>Level indicator for CO attainment</b>	
<b>Level 1</b>	≥ 65% and <75% of feedback score
<b>Level 2</b>	≥ 75% and <85% of feedback score
<b>Level 3</b>	≥ 85% of feedback score

8. Whenever a choice is given in the question paper and if a student answers more than one question against one question which the student is supposed to answer, the question in which the student earned more marks shall be considered for the computation of CO attainment, leaving the marks obtained in other question(s). Similarly, if a student doesn't attempt any question when the student is expected to answer one out of the two



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- questions that are given, zero marks shall be awarded for the student in either of the questions and accordingly the CO related to the question shall be evaluated.
9. As per the AR22 Regulations of the subjective part of the mid-term examinations, students must answer any 4 out of the 6 questions given. It is mandatory to ensure that each student is evaluated based on 4 questions. If a student answers fewer than 4 questions, they will receive zero marks for the remaining questions to ensure evaluation for 4 questions. Similarly, if a student answers more than 4 questions, then only the 4 answers that are awarded the highest marks will be considered for computation of COs.
10. In measuring the attainment of each CO,
- 80% of weightage shall be given for the Direct component that includes attainments in mid-term examinations (subjective and objective), semester end examinations, assignments, and Viva-Voce/PPT/Poster Presentation/ Case Study
  - 20% weightage for indirect assessment that includes students' online feedback on TLP (10%), and Course End Survey feedback (10%).
11. For determining the Direct component in a theory course
- 50% weightage shall be given for the Semester End Examination – 60 marks and
  - 50% weightage for the internal marks that includes
    - Mid-term examinations subjective – 20 marks (weightage 20%),
    - Mid-term examinations objective – 10 marks (weightage 10%),
    - Assignments – 5 marks (weightage 10%) and
    - Viva-Voce/PPT/Poster Presentation/ Case Study on a topic – 5 marks (weightage 10%).
12. For determining the Direct component in a laboratory course
- 40% weightage for the Semester End Examination
    - Write up – 10 marks (weightage 10%)
    - Experiment/ Program – 15 marks (weightage 10%)
    - Evaluation of Results – 15 marks (weightage 10%)
    - Presentation on another experiment – 10 marks (weightage 5%)
    - Viva-voce – 10 marks (weightage 5%)
  - 60% weightage for the Internal Exams
    - Write up on day to day Experiment – 10 marks (weightage 15%)
    - Internal Practical Examinations – 10 marks (weightage 10%)
    - Laboratory Project – 10 marks (weightage 25%)
    - Viva-voce – 10 marks (weightage 10%)
13. Both mid-1 and mid -2 shall be considered together in computing the attainment levels of COs.



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**For Theory Courses:**

Direct Attainment of CO = 0.2\*Mid-term Subjective+ 0.1\* Mid-term Objective+ 0.1\* Assignment+ 0.1\*Viva-Voce/PPT/Poster Presentation/ Case Study on a topic + 0.5\* End Sem. Exam

Indirect Attainment of CO = 0.5\*Feedback on TLP+ 0.5\* Course End Survey

Overall CO Attainment = 0.80\* Direct Attainment Level + 0.20\* Indirect Attainment Level

**For Laboratory Courses:**

Direct Attainment of CO = 0.1\* Internal practical examinations + 0.15\* Day to Day Experiment in the lab + 0.1\*Viva-Voce/PPT/Poster Presentation/ Case Study on a topic + 0.25 Laboratory Project + 0.4\* End Sem. Exam

Indirect Attainment of CO = 0.5\*Feedback on TLP+ 0.5\* Course End Survey

Overall CO Attainment = 0.80\* Direct Attainment Level + 0.20\* Indirect Attainment Level

14. For internal and semester end practical examinations, 60% of maximum marks shall be kept as **target** for measuring the attainment, the same way it is defined for theory courses.
15. In laboratories, either in the internal or external practical examination, a student will be asked to perform only one experiment out of the 12 or 14 experiments that are listed in the syllabus book. As it is not possible to measure the attainments of all COs that are related to different experiments, it is assumed that the attainment level obtained for a particular CO that is related to an experiment which is given during examination, is equally applicable for the remaining COs.

**Example: Lab Course**

Direct Attainment of CO = 0.1\* Internal practical examinations + 0.15\* Day to Day Experiment in the lab + 0.1\*Viva-Voce/PPT/Poster Presentation/ Case Study on a topic + 0.25 Laboratory Project + 0.4\* End Sem. Exam (Refer Point 12 for the split of End sem.)

Thus, if 71% of students attain the target marks (60% of maximum marks) in the internal examination (Level 2) and 55% of students attain the target marks (60% of maximum marks) in the end semester practical examination (Level 1), the attainment of each CO is calculated as:  $0.6 * 2 + 0.4 * 1 = 1.6$  (Direct measurement).

If the attainments in Course End Survey, and Feedback on TLP are 75% (Level 2), and 83% (Level 3) respectively, the indirect measurement can be calculated as:  $0.5 * 2 + 0.5 * 3 = 2.5$ .

The overall course attainment (which also is the attainment of each CO) =  $0.80 * 1.6 + 0.20 * 2.5 = 1.78$

Note: Similar procedure has to be adopted for Projects, Seminars, Mini Projects, Internships and other such similar courses.



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**Example: Theory Course**

Direct Attainment of CO =  $0.2 * \text{Mid-term Subjective} + 0.1 * \text{Mid-term Objective} + 0.1 * \text{Assignment} + 0.1 * \text{Viva-Voce/PPT/Poster Presentation/ Case Study on a topic} + 0.5 * \text{End Sem. Exam}$

Attainments measured of a CO in a particular course are as indicated below. The same procedure has to be adopted for measuring the remaining COs' attainment levels.

**Components that contribute to Direct attainment of CO**

Mid-term Subjective= 85% (LEVEL 3)                      Mid-term Objective=78% (LEVEL 2)  
Assignment = 96%                      (LEVEL 3)                      Presentation=90% (LEVEL 3)  
End Sem. Exam = 55% (LEVEL 1)

**Components that contribute to the Indirect attainment of CO**

Feedback on TLP = 95% (LEVEL 3)  
Course End Survey = 88% (LEVEL 3)

**Direct Attainment of CO =  $0.2 * 3 + 0.1 * 2 + 0.1 * 3 + 0.1 * 3 + 0.5 * 1 = 1.9$**

Direct Attainment Level = 1.7 (According to Target Levels Set)

**Indirect Attainment of CO =  $0.5 * 3 + 0.5 * 3 = 3$**

**Overall CO Attainment =  $0.80 * \text{Direct Attainment Level (1.9)} + 0.20 * \text{Indirect Attainment Level (3)} = 2.12$  (on a scale of 3)**

Direct		Level of attainment
Mid-term Subjective	85%	3
Mid-term Objective	78%	2
Assignment	96%	3
Presentation	90%	3
End Sem.	55%	1

Indirect		Level of attainment
TLP	95%	3
CES	88%	3

Overall CO attainment	
Direct Level Attained	1.9
Indirect Level Attained	3
$0.80 * 1.9 + 0.20 * 3$	2.12

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**Table 2: POs/PSOs Assessment Criteria**

<b>PO/ PSO</b>	<b>Assessment</b>
For each PO/PSO	Course wise weighted averages of all the COs of a course mapped to a PO/PSO are computed first. Average of all these weighted averages of the courses which are mapped to that PO/PSO would be the Direct Component of the PO/PSO attainment

**Process for computing POs and PSOs attainment level**

- The relevant Program Outcomes and/or Program Specific Outcomes to be addressed from B. Tech I year Courses are identified
- Each Course is correlated to the relevant PO and/or PSO and the correlation levels are fixed on points of 1 (Slight), 2 (Moderate) and 3 (Substantial) based on the Competency and Performance Indicators described in the AICTE Examination Reforms, January 2018.
- Attainment levels of Course outcomes are computed

The process of computing Program Outcomes/Program Specific Outcomes Attainment through the relevant COs of first year courses is given below:

$$\text{PO/PSO attainment level} = \frac{[(CO1 \text{ mapping to PO and or PSO} * \text{Overall CO1 attainment}) + (CO2 \text{ mapping to PO and or PSO} * \text{Overall CO2 attainment}) + (CO3 \text{ mapping to PO and or PSO} * \text{Overall CO3 attainment}) + \dots]}{[(CO1 \text{ mapping to PO and or PSO}) + (CO2 \text{ mapping to PO and or PSO}) + (CO3 \text{ mapping to PO and or PSO}) \dots]}$$

**Example: PO/PSO Attainment through Basic Engineering Mathematics (BEM)**

**CO-PO /PSO Correlation matrix**

<b>BEM</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	3	2	2	-	-	2	-	-	-	-	-	3	-	2	-
<b>CO 2</b>	3	3	3	-	-	2	-	-	-	-	-	3	-	2	-
<b>CO 3</b>	3	2	2	-	-	2	-	-	-	-	-	3	-	2	-
<b>CO 4</b>	3	2	2	-	-	2	-	-	-	-	-	2	-	2	-
<b>CO 5</b>	3	3	3	-	-	2	-	-	-	-	-	3	-	2	-

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### CO Attainment Values

Course name with Course Code	CO 1	CO 2	CO 3	CO 4	CO 5
Basic Engineering Mathematics 20MA11001	1.80	2.76	1.32	2.52	1.72

**PO/PSO attainment Level** =  $\frac{[(CO1 \text{ mapping to PO and or PSO} * \text{Overall CO1 attainment}) + (CO2 \text{ mapping to PO and or PSO} * \text{Overall CO2 attainment}) + (CO3 \text{ mapping to PO and or PSO} * \text{Overall CO3 attainment}) + \dots]}{[(CO1 \text{ mapping to PO and or PSO}) + (CO2 \text{ mapping to PO and or PSO}) + (CO3 \text{ mapping to PO and or PSO}) + \dots]}$

**PO 1 attainment Level** =  $\frac{[3*1.80+3*2.76+3*1.32+3*2.52+3*1.72]}{[3+3+3+3+3]} = 2.02$

**PO 2 attainment Level** =  $\frac{[2*1.80+3*2.76+2*1.32+2*2.52+3*1.72]}{[2+3+2+2+3]} = 2.06$

**PO 3 attainment Level** =  $\frac{[2*1.80+3*2.76+2*1.32+2*2.52+3*1.72]}{[2+3+2+2+3]} = 2.06$

**PO 6 attainment Level** =  $\frac{[2*1.80+2*2.76+2*1.32+2*2.52+2*1.72]}{[2+2+2+2+2]} = 2.02$

**PO 12 attainment Level** =  $\frac{[3*1.80+3*2.76+3*1.32+2*2.52+3*1.72]}{[3+3+3+2+3]} = 1.99$

**PSO 2 attainment Level** =  $\frac{[2*1.80+2*2.76+2*1.32+2*2.52+2*1.72]}{[2+2+2+2+2]} = 2.02$

### PO/PSO Attainment Level

	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
<b>20MA11001 (BEM)</b>	2.02	2.06	2.06	-	-	2.02	-	-	-	-	-	1.99	-	2.02	-
<b>20PH11002 (EP)</b>	2.33	2.33	-	-	-	-	-	-	2.33	-	-	2.33	2.33	-	-
<b>20CS11001 (PPS I)</b>	1.11	1.11	-	1.11	1.11	-	-	1.11	1.11	-	-	1.11	1.11	1.11	1.11
<b>20ME11002 (EG)</b>	1.72	1.72	-	-	-	-	-	-	1.72	-	-	-	1.72	-	-
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<b>PO/ PSO Average</b>	<b>2.33</b>	<b>2.34</b>	<b>2.33</b>	<b>2.15</b>	<b>2.10</b>	<b>2.19</b>	<b>2.27</b>	<b>2.06</b>	<b>2.44</b>	<b>2.49</b>	<b>2.88</b>	<b>2.37</b>	<b>2.39</b>	<b>1.93</b>	<b>2.15</b>



**Table: Assessment Criteria for each theory course – prior to 2022-23 admitted batches**

CO	Assessment	Assessment Tool	Assessment Criteria	Frequency of Data Collection	
Course Code/ Name	Direct Assessment (75%)	Internal Assessment (40%)	Continuous Internal Evaluation - (CIE)- Mid Term examinations (30%)	Target for each question in Subjective Paper= 60% of maximum marks of each question. – Weightage - 30% Marks allocated for Subjective Paper = 25	Twice in a semester per course during 8 <sup>th</sup> and 16 <sup>th</sup> weeks
		Internal Assessment (40%)	Continuous Internal Evaluation (CIE) - Assignments (10%)	Target: 60% of total marks. – Weightage - 10% Marks allocated for assignments per course = 5	Five times in a semester per course
		External Assessment (60%)	Semester End Examination (SEE) -(60%)	Target: 60% of maximum marks of each question – Weightage - 60% Marks allocated for SEE = 70	Once in a Semester per course
	Indirect Assessment (25%)	Class Review committee (40%)	Feedback on Course outcomes	Class Review committee comprises of Class teacher and 6 six students – Weightage - 40%	Unit wise Five times in a semester in each course
		TLP Feedback (40%)	Feedback on Teaching Learning Process	From all students Feedback taken centrally by IQAC – Weightage - 40%	Twice in a Semester per course
		Course End Survey (20%)	Feedback on General objectives and Course outcomes	Feedback on General objectives and Specific Course outcomes for each course at the end of the course – Weightage - 20%	Once in a Semester per course at the end of the semester



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