

CHRIST (Deemed to be University)
School of Engineering and Technology,
Department of Electrical & Electronics Engineering

CO-PO attainment Calculation details

ASSESSMENT PROCESS:

The attainment of course outcomes is done through direct assessment and indirect assessment.

DIRECT ATTAINMENT:

Courses with only Theory:

The direct attainment involves the Continuous Internal Assessment (CIA) and the End Semester Examination (ESE). The various components are named as follows

S.No	Assessment	Marks	Weightage marks
1	CIA I	20	10
2	CIA II (MSE: Mid Semester Examination)	50	25
3	CIA III	20	10
4	ESE (End Semester Examination)	100	50

Theory Course Assessment pattern

- Among these above components, CIA-1 and CIA-3 are conducted by respective course teachers.
- It is mandatory for all the courses to have assessment components for CIA-1 and CIA-3 each.
- Respective course teacher may decide suitable component to assess students with respect to cognitive level of each Course Outcome

ASSESSMENT TOOLS:

- The assessment tools used for CIA evaluation can include any component as per the discretion of the faculty member handling the course.
- The CIA components that will be used for evaluating the students will be made known to the students in the beginning of the semester through the course plan uploaded into the Learning Management System (LMS).
- A few of the majorly used assessment tools used in CIA evaluation of theory is listed below
 1. Assignments
 2. Closed Book Test
 3. Open Book Test
 4. Seminars/Student Presentation
 5. Quiz
- The above-mentioned list consists of not all the components and in some cases, the faculty members may use components which are not mentioned in the list also.
- In addition to the CIA evaluation, the assessment is also done through a End Semester Examination (ESE) conducted centrally by the Office of Examinations.

ASSIGNMENTS:

- Assignments are given to the students which require them to survey data either from

books or online resources.

- The assignments are given well in advance so that the students get sufficient time to work properly and submit the assignment within time.
- Few faculty members also give group assignments in their respective courses.

It is mandatory to have an evaluation rubric for assessing the assignment and this rubric needs to be given while submitting the course plan which happens before the commencement of the semester

Criterion	Outstanding (10)	Good (7-9)	Average (5-6)	Needs Improvement (0-4)
Organization	Well-planned and well-thought out. Includes title, introduction, statement of main problem, step-by-step solving with clear intermediate answers and the final answer clearly mentioned	Good overall organization	There is a sense of organization, although some of them are used weakly or missing	No sense of organization
Main Idea	Clearly presents the main problem throughout the assignment/test paper	Presents the main problem for most of the assignment/test paper	Vague sense of a main problem, weakly supported throughout the assignment/test paper.	No idea of the problem statement
Problem solving	Clearly mentions each and every step along with all the parameters and units throughout the assignment/test paper	Presents every step and units for most of the assignment/test paper	There are steps but with no proper intermediate answers	No intermediate steps and units.
Grammatical style	Excellent grammar, spelling, syntax and punctuation.	A few errors in grammar, spelling, syntax and punctuation, but not many.	Shows a pattern of errors in spelling, grammar, syntax and/or punctuation.	Continuous errors

Assignments Assessment pattern

CLOSED BOOK TEST:

- Closed book tests are conducted in few courses as part of CIA evaluation. The portions for the same will be made known to the students well in advance.
- Each question will be mapped to the corresponding CO statement.
- It is mandatory to have an evaluation scheme and answer key for the closed book test and it should be discussed with students in the class after conduction of the test.

OPEN BOOK TEST:

- Open book tests are conducted in some of the courses as part of CIA evaluation.
- The open book test will not be made known to the students till the conduction.
- The open book tests conducted are time restricted.
- It is mandatory to have an evaluation scheme and answer key for the closed book test and it should be discussed with students in the class after conduction of the test.

SEMINARS/STUDENT PRESENTATION

- Selected topics from the syllabus of a course will be asked to presented either by a group of students or individually by assigning the topics well in advance.
- This assessment allows exposing the students to not just technical aspects but also confidence building and communication improvement.
- It is mandatory to have an evaluation rubric for assessing the assignment and this rubric needs to be given while submitting the course plan which happens before the commencement of the semester.

QUIZ

- Quiz pertaining to the given topics are also used as an assessment tool for CIA evaluation. The quiz may consist of multiple-choice questions

MID SEMESTER EXAMINATION (MSE)

- A centralized examination called as Mid Semester Examination (MSE) of 50 marks is conducted by the Office of Examinations. It will be a 2hour duration closed book examination comprising of the portions covered until that time. It happens usually 6-8 weeks of commencement of the semester.
- The MSE is considered as part of evaluation of CIA-2(Continuous Internal Assessment).

END SEMESTER EXAMINATION (ESE)

- A centralized examination called as End Semester Examination (ESE) of 100 marks is conducted by the Office of Examinations. It will be a 3hour duration closed book examination comprising of the entire portions.
- A student has to score a minimum of 40 marks to clear the examination.

Assessment Component	Covered COs
CIA -1	CO1 and CO2
MSE / CIA-2	CO1, CO2 and CO3
CIA-3	CO4 and CO5
ESE	CO1, CO2, CO3, CO4 and CO5

The course outcomes of respective course

Assessment Type	Mark Distribution among Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
CIA-1	10	10			
CIA-2	20	20	10		
CIA-3				10	10
ESE	20	20	20	20	20

The Marks are distributed among all the Course Outcomes

The Course Outcome attainment will be calculated for individual question given in different component and average attainment value is taken for overall Course Outcome attainment at course level.

CO Direct attainment is then calculated as

$$\text{CO Direct Attainment} = 0.5 * \text{CIA Attainment of CO} + 0.5 * \text{ESE Attainment of CO}$$

COURSES WITH THEORY & PRACTICAL

The courses which are having theory cum practical component will be assessed as follows:

- For Theory Portions, assessment will be done as mentioned above by conducting CIA-1, CIA-2, CIA-3 and ESE. The Course outcomes also would be covered in the same manner.
- Each laboratory session is conducted for 2 hours and the course plan is shared by the faculty to the students within a week of commencement of the semester.
- Each student is expected to maintain an observation book and a record book for all the practical courses.
- The observation book should be filled with the experiment that the student is expected to perform in that particular laboratory session before entering the laboratory. This book is evaluated for 10 marks in each session of the laboratory. The overall average of the observation book marks scored by a student for all the experiments is calculated for 10 marks.
- A practical record book needs to be maintained by each student for every laboratory course and the record book should contain the complete write-up about the experiment, values take, design part and calculations and results with necessary diagrams, graphs etc. This book is evaluated for 10 marks in each session of the laboratory. The overall average of the record book marks scored by a student for all the experiments is calculated for 10 marks.
- A student is evaluated for each laboratory session based on the conduct of the student, the curiosity and interest shown while doing the experiment and the debugging aspect of the student. This evaluation is done for 30 marks based on a rubric to be maintained by the laboratory course delivery faculty member. The overall average of the experiment conduction marks scored by a student for all the experiments is calculated for 30 marks.
- All these marks of 10 marks for observation, 10marks for practical record book and 30 marks for conduction of the experiment together constitute the direct attainment of the student in courses of theory with practical.

Category	Allocated Marks	High	Medium	Low	Need Improvement
Conduction of experiment	20	Given experiment was done, explanation is detailed and clear	Given experiment was done, explanation clear	Given experiment was done, explanation is little difficult to understand but include critical components	No work done or Absent
		17-20 Marks	11-16 Marks	1-10	0
Observation Book	10	When observation book is completed without any error	Information with in observation book is clear how ever data like figure/program/units are not proper	Data such as figure/program/units are missing	observation book not written or Absent
		9-10 Marks	6-8 Marks	1 - 5Mark	0
Viva Voce	10	Student answered all the viva voce questions	Student Answered only a few viva voce questions	Partial answer given	No answer given or Absent
		9-10 Marks	6-8 Marks	1 - 5Mark	0
Record writing	10	Completed record was submitted	Record was submitted but incomplete	Record was submitted but incomplete and error found	Record book not written or Absent
		9-10 Marks	6-8 Marks	1 - 5Mark	0

Laboratory Course Assessment pattern

INDIRECT ASSESSMENT:

The indirect assessment tools used for calculating the attainment include the course exit surveys which are collected by the students for all the courses of the program.

Each course exit survey consists of a questionnaire comprising questions pertaining to the attainment of course outcomes.

The students will be giving their answers for the rating of 5. The level of rating will be

Strongly Agreed (SA)	5 Points
Agreed (A)	4 Points
Likely Agreed (LA)	3 Points
Disagreed (D)	2 Points
Strongly Disagreed (SD)	1 Point

After collecting survey forms from students, CO attainment will be calculated as :

$$\frac{(\text{No. of SA} \times 5) + (\text{No. of A} \times 4) + (\text{No. of LA} \times 3) + (\text{No. of D} \times 2) + (\text{No. of SD} \times 1)}{\text{Total No. of students}} \times 3$$

The above formula is used to calculate the marks for indirect COs of all the courses in the curriculum in the respective regulation.

OVERALL CO ATTAINMENT:

The overall CO attainment is then calculated as a combination of direct attainment and indirect attainment with a ratio of 90% to 10%.

$$\text{Overall CO Attainment} = 0.9 * \text{CO Direct Attainment} + 0.1 * \text{CO Indirect Attainment}$$

PROCEDURE FOR ESTABLISHING CORRELATION BETWEEN CO AND PO:

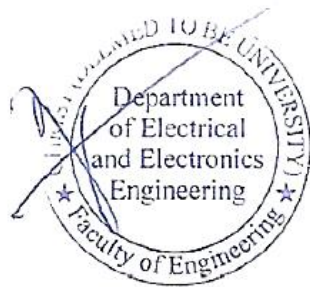
- Outcome mapping facilitates the alignment of course-level outcomes with program outcomes. It allows faculty to create a visual map of a program.
- The process of attainment of COs and POs starts from writing appropriate COs for each first year courses.
- The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom and Anderson.
- Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high).

CO	CO Statement	Revised Bloom's Taxonomy Level (RBT)	Devoted Class Hours
CO1	Discuss the consistency of the system of linear equations and the spectral matrix by using Eigen values and Eigen Vectors.	L3	9
CO2	Evaluate definite integrals by Leibnitz rule of differentiation under integral sign for multivariable functions	L4	9
CO3	Solve definite integrals as surface area and volume of solid of revolution using Reduction formulae.	L3	9
CO4	Solve first order nonlinear differential equations by reducing into homogenous, linear and exact forms	L3	9
CO5	Determine the velocity and acceleration of a moving particle, vector potential, scalar potential	L3	9

An example of course outcome for the course Mathematics I, MA131

CO No	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
MA131.1	3	2	1	-	-	-	-	-	-	-	-	-
MA131.2	3	3	2	-	-	-	-	-	1	-	-	-
MA131.3	3	2	1	-	-	-	-	-	-	-	-	-
MA131.4	3	2	1	-	-	-	-	-	-	-	-	-
MA131.5	2	2	1	-	-	-	-	-	-	-	-	-

The mapping of the course Mathematics I, MA131 to PO



Head, Electrical and Electronics Engineering