

CRITERIA 3	COURSE OUTCOMES AND PROGRAM OUTCOMES	120
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1. COURSE OUTCOMES AND PROGRAM OUTCOMES

Establish the correlation between the courses and the Program Outcomes (POs) and Program Specific Outcomes (PSOs) (20)

Program Outcomes:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and

norms of the engineering practice.

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

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

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Program Specific Outcomes (PSO) of the Department of Electronics & Telecommunication Engineering, AEC

PSO 1: Students will be able to demonstrate software skills with competence to work and deliver in industry or research.

PSO 2: Students will be competent to design applications and automation by using modern engineering tools with multi-disciplinary concepts.

3.1.1. Course Outcomes (COs) (5)

At the end of the course the student should be able to

Table: B.3.1 Course Name: ET364 (Electronic Devices)

ET364.1	Describe the behavior of semiconductor devices
ET364.2	Analyze the functioning of various solid- state devices, including diodes, BJTs and FETs.
ET364.3	Analyse the biasing techniques for BJTs and FETs.
ET364.4	Design amplifier circuits using BJTs and FETs.

Table: B.3.2 Course Name: ET465 (Signals and Systems)

ET465.1	Classify continuous time (CT) and discrete time (DT) signals and systems.
ET465.2	Describe the properties of CT and DT LTI systems.
ET465.3	Represent CT and DT systems in the frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
ET465.4	Describe the effects of sampling a CT signal.
ET465.5	Analyze CT and DT systems using Laplace transforms and Z Transforms respectively.
ET465.6	Describe the behavior of random signals and systems.

Table: B.3.3 Course Name: ET565 (Analog Communication)

ET565.1	Analysis of baseband and random signals in time & frequency domain.
ET565.2	Demonstrate understanding of various analog modulation and demodulation techniques.
ET565.3	Analyse and evaluate the impact of noise in different modulation schemes.
ET565.4	Describe PAM, PWM and PPM modulation schemes.

Table: B.3.4 Course Name: ET662 (Microprocessor & Embedded System)

ET662.1	Develop the understanding of architecture and instruction set of 8085 Microprocessor.
ET662.2	Analyse instruction cycle, machine cycle and T-state for 8085 instructions.
ET662.3	Demonstrate the knowledge of interfacing peripheral devices with the 8085 Microprocessor.
ET662.4	Write assembly language programs for different applications.
ET662.5	Develop real time systems using micro-controllers.

Table: B.3.5 Course Name: ET761 (Analog System Design)

ET761.1	Develop understanding of op-amp's basic construction, characteristics, parameter limitations, various configurations and countless applications.
ET761.2	Analyze and design linear and non-linear circuits, active filters and data converters.
ET761.3	Analyze and design voltage regulators and voltage references using op-amp.
ET761.4	Design signal generators to produce different types of waveforms.
ET761.5	Apply the concepts in real time applications.

Table B.3.6 Course Name: ET862 (Antenna & Wave Propagation)

ET862.1	Apply principles of electromagnetic theory for understanding antenna radiations.
ET862.2	Identify basic antenna parameters.
ET862.3	Design and analyze antenna arrays.
ET862.4	Design practical antennas for both HF and Microwave range.
ET862.5	Identify the characteristics of radio-wave propagation.

3.1.2 CO-PO matrices of courses selected in 3.1.1 (six matrices to be mentioned; one per semester from 3rd to 8th semester) (5)

Table B.3.7 Course Name: ET364 (Electronic Devices)

[illegible]

Table B.3.8 Course Name: ET465 (Signals and Systems)

[illegible]

Table B.3.9 Course Name: ET565 (Analog Communication)

[illegible]

Table B.3.10 Course Name: ET662 (Microprocessor & Embedded System)

[illegible]

Table B.3.11 Course Name: ET761 (Analog System Design)

[illegible]

Table B.3.12 Course Name: ET862 (Antenna & Wave Propagation)

[illegible]

3.1.3. Program level Course-PO matrix of all courses from 1st to 8th semester (10)

Table B.3.13

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH101	2.50	1.75	1.50									1.00
CY102	2.60	1.60				1.00	1.50					1.00
MA103	3.00	3.00	1.20	1.00					1.00			2.00
CE104	2.60	2.20	0.20	0.80	0.60							
HU105		1.00		1.00		1.00	1.00	1.33	3.00	2.25		3.00
CE106	3.00	3.00	2.42	2.57	2.14	2.57	0.71					
CS107	2.00		3.00	2.67	2.00							
ME108	1.80	1.40						1.20	1.80			
PH101L	2.00								1.00			
CY102L	2.50	1.75		1.00						1.00		
PH201	1.75	1.00	1.25		1.00							1.00
CY202	2.80	2.20	1.33			1.00	1.00		1.00	1.00		1.00
MA203	3.00	3.00	2.00									2.00
ME204	3.00	2.00	2.00	2.50	1.80							1.00
CE205	3.00	3.00	2.00	1.00								
EE206	3.00	3.00										
ME207	3.00	3.00	1.67		2.00	3.00						1.00
ME208	1.60	2.00						1.00	1.60			
PH201L	2.00								1.00			
CY202L	2.00	2.00	1.67	1.40	1.00	1.00	1.50		1.00	1.00	1.00	1.00
ME204L	3.00	1.50	1.30	1.80	1.30							1.00
CE205L	3.00	2.00		3.00	3.00							
EE206L	3.00	3.00		1.00					3.00	1.67		3.00
MA301	3.00	3.00										2.00
CS372	3.00	3.00										
ET 363	3.00	3.00										
ET 364	3.00	2.75										
EE342	2.20	2.20										
ME305	3.00	2.80	0.40	0.20	0.20		0.20					
CS372L				2.50								
ET363L				2.50								
ET364L				2.50								
ET367					2.00	2.00	2.00	2.33	3.00	3.00	1.00	2.00

ET368								2.00	3.00	3.00		
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Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MA401	3.00	2.40	1.60	1.00	1.00				1.00			1.40
ET 464	3.00	3.00	3.00									
ET 465	2.00	3.00										
ET 466		3.00										
EE455	2.00	2.00										
HU402		1.00				1.33	1.00	1.33	1.16	1.00	1.00	3.00
HU403		1.80		1.50		2.20	1.20	1.80	2.00	3.00		3.00
ET464L				3.00								
ET465L				3.00								
EE455L				2.00								
ET467								2.00	3.00	3.00		
HU501		1.00				2.00	1.00	1.00	2.00	1.00	1.00	2.66
ET 562	3.00	3.00	2.00									
EE 543	2.75	3.00										
ET 564	2.50	2.50										
ET 565	2.50	2.50										
ET566	2.40	2.60										
ET562L				2.50								
ET564L				3.00								
ET565L				2.50								
EE543L				2.50								
ET567									2.00	2.00		
EE641	3.00	3.00										
ET 662	3.00	2.50										
ET 663	3.00	3.00	2.00									
ET 664	2.50	2.50										
ET 665	2.50	2.50										
ET 666	3.00	3.00	2.25									
ET662L				3.00								
ET663L				3.00								
ET664L				3.00								
ET666L				3.00								
ET667									3.00	3.00		
ET 761	3.00	3.00	2.50									
ET 762	3.00	3.00	2.75									
ET 763	3.00	3.00	2.00									
ET 764	2.50	2.50										
ET 767					2.30	2.00	2.00	3.00	2.00	2.50	2.00	2.00

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ET 768					3.00	2.00	3.00	3.00	2.80	3.00	3.00	3.00
ET 861	3.00	2.40	3.00									
ET 862	3.00	3.00	2.00									
ET 863	3.00	3.00	2.00									
ET866	3.00								2.00	3.00		2.00
ET868					3.00	2.00	3.00	3.00	2.80	3.00	3.00	3.00
Avg	2.69	2.45	1.88	2.08	1.76	1.78	1.47	1.92	2.01	2.20	1.71	1.91

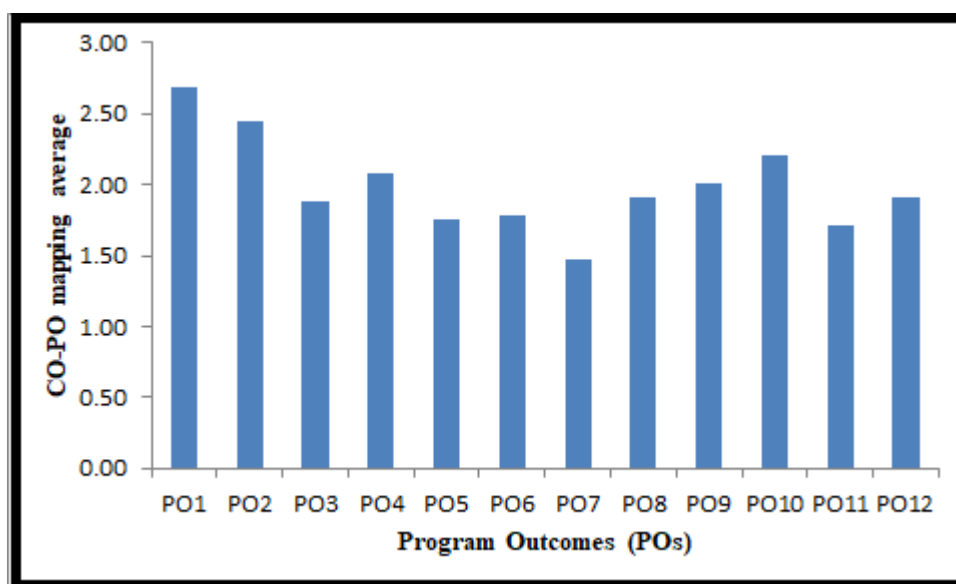


Fig. 3.1 CO-PO mapping average against Program Outcomes

Program level Course-PSO matrix of all courses INCLUDING first year courses

Table B.3.14

Course	PSO1	PSO2
PH101		
CY102		
MA103		
CE104		
HU105		
CE106		
CS107	2.00	
ME108		

PH101L		
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Course	PSO1	PSO2
CY102L		
PH201		
CY202		
MA203		
ME204		
CE205		
EE206		
ME207		
ME208		
PH201L		
CY202L		
ME204L		
CE205L		
EE206L		
MA301		
CS372	2.00	
ET 363		
ET 364		
EE342		
ME305		
CS372L	2.00	
ET363L		
ET364L		
ET367		2.00
ET368		
MA401		
ET 464		
ET 465	2.00	
ET 466		
EE455		
HU402		
HU403		
ET464L		
ET465L	2.00	
EE455L		
ET467		
HU501		

Course	PSO1	PSO2
ET 562		
EE 543	2.00	
ET 564		2.00
ET 565	2.00	
ET566		
ET562L		
ET564L		2.00
ET565L	2.00	
EE543L		
ET567		
EE641		
ET 662		
ET 663		2.00
ET 664		
ET 665		
ET 666	2.00	
ET662L		
ET663L		2.00
ET664L		
ET666L	2.00	
ET667		
ET 761		
ET 762		
ET 763		
ET 764		
ET 767		
ET 768	3.00	3.00
ET 861		
ET 862		
ET 863		
ET866		
ET868	3.00	3.00
Avg	2.17	2.29

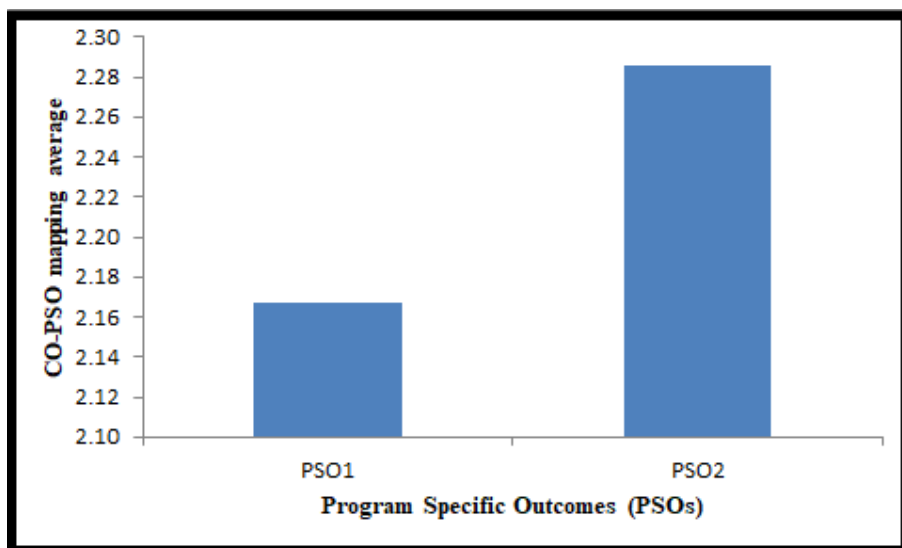


Fig. 3.2 CO-PSO mapping average against Program Specific Outcomes

Attainment of Course Outcomes (50)

Describe the assessment processes used to gather the data upon which the evaluation of Course Outcome is based (10)

CO Assessment Processes:

Course outcomes are assessed using direct assessment method. In this method, the performance of students are continuously evaluated on the basis of class tests, home works, class room assignments, power-point presentation on selected topics, quiz and finally the end semester examination. It also includes laboratory experiments in some subjects for which separate assessments are conducted.

Assam Engineering College is affiliated to Gauhati University. Hence, the BE program of this Department adheres to the regulations as laid down by the University. The end semester examination is conducted by the University and the University collects all the answer-scripts from different centres immediately after examination. The answer-script evaluation is managed and monitored by the University. Hence, a faculty taking a particular course does not necessarily set the question paper or evaluate the answer-scripts of the students of this Department. Since the college cannot retain the answer-scripts of university examination, question wise distributions of marks scored by the candidates are not available. Hence, calculation of 'CO Wise attainment' for the end semester examination could not be carried out. Also, all the evaluated answer-scripts for

continuous internal assessment have already been returned to the students till 2017. Hence for

the calculation of the course attainment, 50% of the weightage has been considered from the continuous internal assessment (sessional) and 50 % weightage from the end semester university examination.

For the evaluation of sessional marks, the University Guidelines are as follows:

Attendance: 30 % of the total marks

Class Test: 40 % of the total marks

Assignments: 10 % of the total marks

Impression: 20 % of the total marks (this includes but not limited to skill, creativity, confidence etc. as decided by the concerned faculty).

CO assessment processes for different components of the program are given below in table B.3.15

Table B.3.15

Sl.no	Components of the courses	Method Description
1.	Theory	<ul style="list-style-type: none"> • Semester Examination: Semester examination is the metric to assess whether all the course outcomes framed by the concerned teacher are attained or not. It is more focused on attainment of course outcomes and uses a descriptive exam. 50% weightage is given to the semester examination. • Internal Assessment: The internal assessment mark is based on three tests generally conducted at the end of 4, 8 and 12 weeks of each semester. An improvement test may be conducted for the weak students before the end of the semester to give an opportunity to such students to improve their Internal Assessment Marks. It is a metric to continuously assess the attainment of course outcomes w.r.t course objectives. Average of the better marks obtained from any two tests is the Internal Assessment Marks for the relevant subject. 50% weightage is given to Internal Assessment.
2.	Practical Exam	Practical examination is one of the measuring criteria to mainly assess student's practical knowledge and skills. Practical examination assessment is based on performance in the semester examination, Laboratory copy and viva- voce on that particular subject.
3.	General Proficiency, Mini Project, Industrial Training, Major Project	The internal assessment marks in these components is based on the evaluation at the end of the semester by the project guide/faculty in-charge.
4.	Project Work Viva-voce	Viva-voce examination of project work is conducted batch-wise in presence of an external examiner.

CO attainment levels:

CO attainment levels for End semester theory examination and Practical examinations are

Attainment Level 1: If 20% students score 50% marks or above.

Attainment Level 2: If 50% students score 50% marks or above.

Attainment Level 3: If 80% students score 50% marks or above.

CO attainment levels for Internal assessment, General Proficiency, Mini Project, Major Project, Training and Viva-voce exam are

Attainment Level 1: If 20% students score 60% marks or above.

Attainment Level 2: If 50% students score 60% marks or above.

Attainment Level 3: If 80% students score 60% marks or above.

3.2.2 Record the attainment of Course Outcomes of all courses with respect to set attainment levels (40)

Table B.3.16 Course Outcome Attainment for ET364

[illegible]

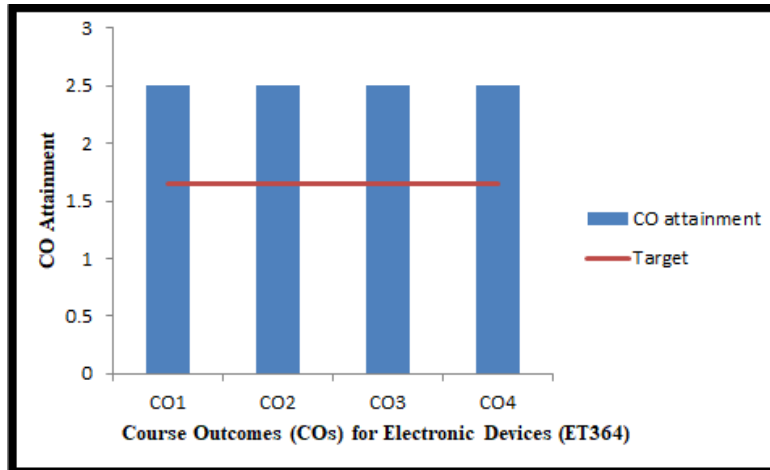


Fig 3.3: Attainment of Course Outcome of subject: ET 364

Table B.3.17 Course Outcome Attainment for ET465

ET465	Assessment	CO attainment												Total CO
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Final	2												2
	Internal	2												
CO2	Final	2												2
	Internal	2												
CO3	Final		2											2
	Internal		2											
CO4	Final	2												2
	Internal	2												
CO5	Final		2											2
	Internal		2											
CO6	Final	2												2
	Internal	2												

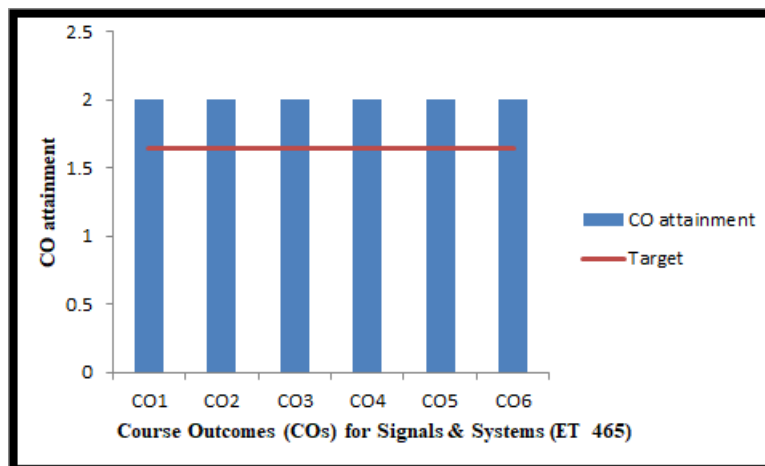


Fig 3.4: Attainment of Course Outcome of subject: ET 465

Table B.3.18 Course Outcome Attainment for ET565

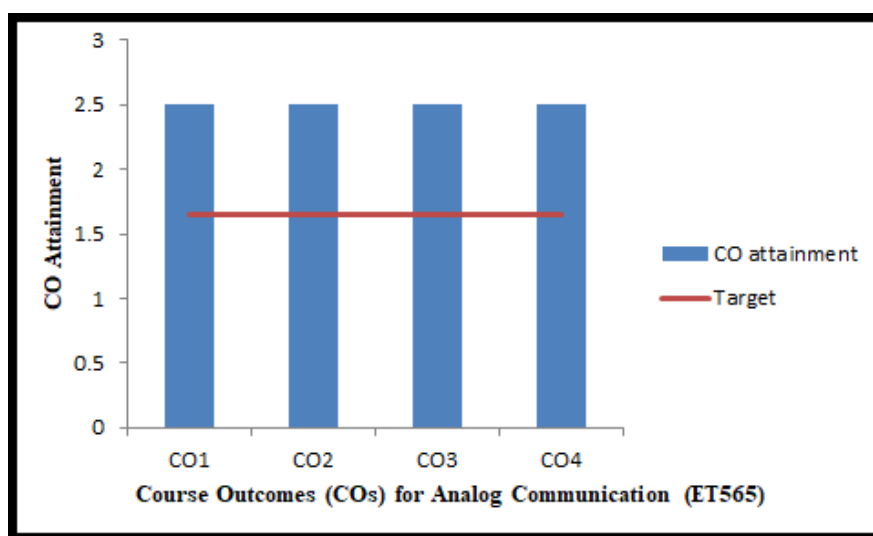
[illegible]

Fig 3.5: Attainment of Course Outcome of subject: ET 565

[illegible]

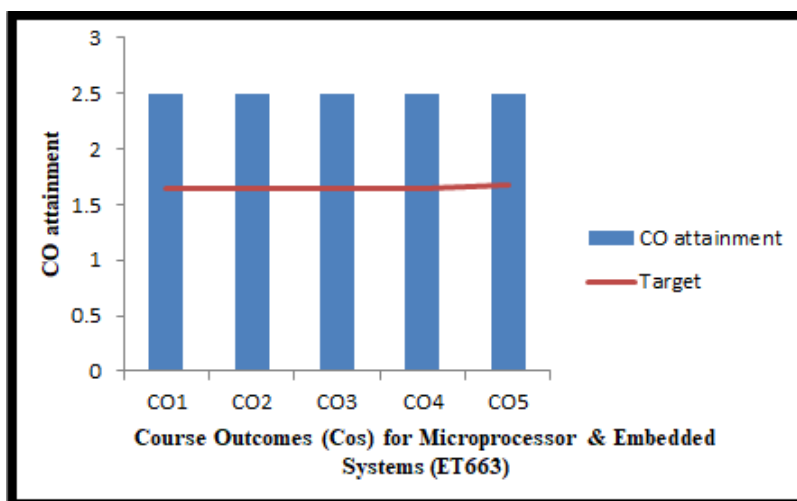


Fig 3.6: Attainment of Course Outcome of subject: ET 663

Table B.3.20 Course Outcome Attainment for ET761

ET 761	Assessment	Course Outcome Attainment												Total CO
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1	Final	1												2
	Internal	3												
CO2	Final		1	1										2
	Internal		3	3										
CO3	Final		1	1										2
	Internal		3	3										
CO4	Final			1										2
	Internal			3										
CO5	Final			1										2
	Internal			3										

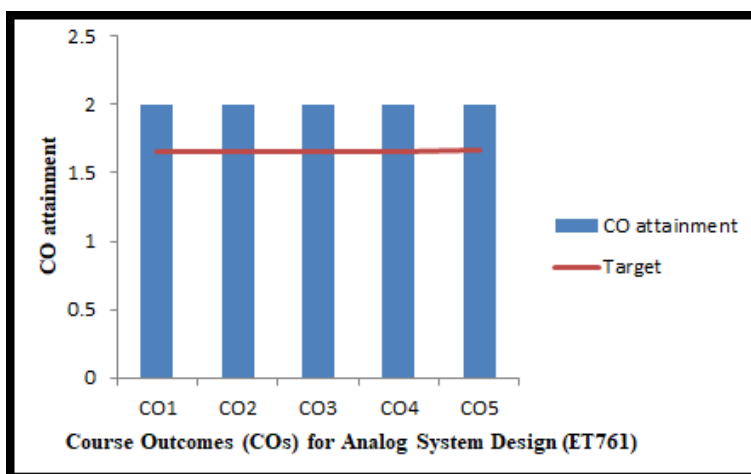


Fig 3.7: Attainment of Course Outcome of subject: ET 761

Table B.3.21 Course Outcome Attainment for ET862

ET 862	Direct Assessment	Course Outcome Attainment												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Total CO
CO1	Final	2												2.5
	Internal	3												
CO2	Final		2											2.5
	Internal		3											
CO3	Final		2	2										2.5
	Internal		3	3										
CO4	Final		2	2										2.5
	Internal		3	3										
CO5	Final	2												2.5
	Internal	3												

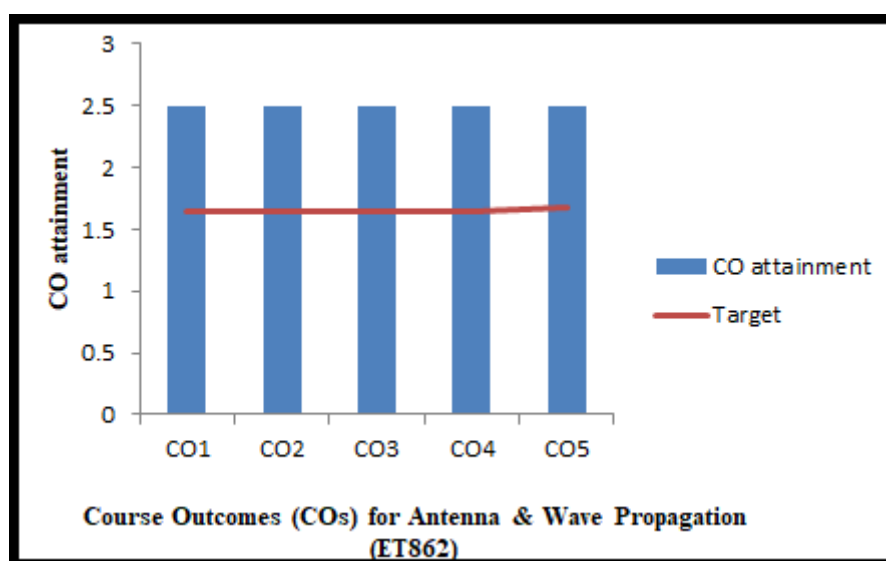


Fig 3.8 Attainment of Course Outcome of subject: ET 862 Sample

calculation for CO attainment:

For ET364:

CO attainment level for Final Examination: 2 (i.e. 50 % students scored 50% or above) CO

attainment level for Internal Assessment: 3 (i.e. 80% students scored 60% or above)

Total CO attainment = 50% of CO attainment level for Final Examination + 50% of CO attainment level for Internal Assessment

= 50% of 2 + 50% of 3

= 2.5

Attainment of Program Outcomes and Program Specific Outcomes (50)

Describe assessment tools and processes used for measuring the attainment of each PO and PSO (10)

Assessment tools for attainment of Program Outcomes (POs) and Program Specific Outcomes (PSOs) are categorized into two methods: Direct assessment method and Indirect assessment method.

- **Direct Assessment method:** Direct method which is discussed in section 3.2.1 shows the students' knowledge and skills from their performance in the continuous internal assessment tests, semester examinations, seminar, viva, class room and laboratory assignments, etc. These procedures provide a sampling of what students know and/or can do and provide strong evidence of student learning. 80% weightage is given to direct method. All the components of the program are mapped to the POs and PSOs to determine the PO attainment and PSO attainment.
- **Indirect Assessment method:** In this method Exit survey (students' feedback), Alumni survey (questionnaire) and Employer survey (questionnaire) are conducted and which display overall assessment of the program. 20% weightage is given to indirect method.

Forms for Exit survey, Alumni survey and Employer survey are enclosed in ANNEXURE III, IV, V respectively.

PO attainment (40)

PO attainment for 2013-2017 batch (CAYm4) is given in table B.3.22

Table B.3.22

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH101	1.67	1.17	1.00									0.67
CY102	1.73	1.07				0.67	1.00					0.67
MA103	2.38	2.38	2.38	2.38					2.38			2.38
CE104	2.17	1.83	0.17	0.67	0.50							
HU105		2.42		2.42		2.42	2.42	2.42	2.42	2.42		2.42
CE106	2.00	2.00	1.61	1.71	1.43	1.71	0.47					
CS107	1.67		2.5	2.23	1.67							
ME108	1.80	1.40						1.20	1.80			
PH101L	0.67								0.33			
CY102L	2.50	1.75		1.00						1.00		
PH201	1.17	0.67	0.83		0.67							0.67
CY202	1.40	1.10	0.67			0.50	0.50		0.50	0.50		0.50
MA203	2.48	2.48	2.48									2.48
ME204	2.00	1.33	1.33	1.67	1.00	2.00						0.67
CE205	2.00	2.00	1.33	0.67								
EE206	1.50	1.50										
ME207	3.00	3.00	1.67		2.00	3.00						1.00
ME208	1.60	2.00						1.00	1.60			
PH201L	1.33								0.67			
CY202L	2.00	2.00		1.25		0.50	1.00			1.00		
ME204L	3.00	1.50	1.30	1.80	1.30							1.00
CE205L	3.00	2.00		3.00	3.00							
EE206L	2.00	2.00		0.67					2.00	1.11		2.00
MA301	1.96	1.96										1.96
CS372	2.00	2.00										
ET 363	2.00	2.00										
ET 364	2.50	2.29										
EE342	1.11	1.11										
ME305	2.50	2.33										
CS372L				1.67								
ET363L				2.50								
ET364L				1.67								

[illegible]

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ET 764	2.08	2.08										
ET 767					2.30	2.00	2.00	3.00	2.00	2.50	2.00	2.00
ET 768					3.00	2.00	3.00	3.00	2.80	3.00	3.00	3.00
ET 861	2.50	2.50	1.67									
ET 862	2.50	2.50	1.67									
ET 863	2.50	2.50	1.67									
ET866	3.00								2.00	3.00		2.00
ET868					3.00	2.00	3.00	3.00	2.80	3.00	3.00	3.00
Direct Assessment	2.05	2.00	1.62	2.09	1.86	1.84	1.86	2.24	2.12	2.26	2.30	1.79
Indirect Assessment	2.59	2.63	2.32	2.64	2.44	2.69	2.66	2.75	2.83	2.68	2.70	2.70
Total	2.16	2.13	1.76	2.20	1.98	2.01	2.02	2.34	2.26	2.34	2.38	1.97

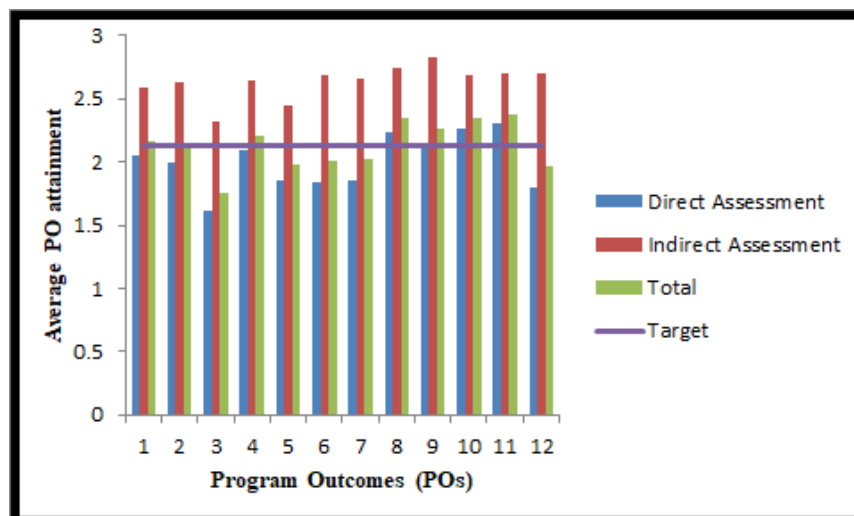


Fig. 3.9 PO attainment

Sample calculation of PO attainment:

Direct Assessment Method:

PO1 attainment for ET364

CO attainment = 2.5

CO-PO1 mapping average = 3.0

PO1 attainment for ET 364 = (CO attainment X CO-PO1 mapping average)/3
= (3.0 X 2.5)/3.0 = 2.5

Average of PO1 attainment = 2.05 (considering all the subjects in the program)

Indirect Assessment Method:

Average PO1 attainment = 2.59 (considering all the indirect assessment methods)

Total PO attainment = 80% of Direct Assessment + 20% of Indirect Assessment

$$= 80\% \text{ of } 2.05 + 20\% \text{ of } 2.59$$

$$= 2.15$$

PSO attainment:

PSO attainment for 2013-2017 batch (CAYm4) is given in table B.3.23

Table B.3.23

Course	PSO1	PSO2
PH101		
CY102		
MA103		
CE104		
HU105		
CE106		
CS107	1.67	
ME108		
PH101L		
CY102L		
PH201		
CY202		
MA203		
ME204		
CE205		
EE206		
ME207		
ME208		
PH201L		
CY202L		
ME204L		
CE205L		
EE206L		

MA301		
CS372	1.33	
ET 363		
ET 364		
EE342		
ME305		
CS372L	1.33	
ET363L		
ET364L		
ET367		2.00
ET368		
MA401		
ET 464		
ET 465	1.33	
ET 466		
EE455		
HU402		
HU403		
ET464L		
ET465L	2.00	
EE455L		
ET467		
HU501		
ET 562		
EE 543	1.33	
ET 564		1.67
ET 565	1.67	
ET566		
ET562L		
ET564L		2.00
ET565L	2.00	
EE543L		
ET567		
EE641		
ET 662		
ET 663		1.67
ET 664		
ET 665		
ET 666	1.67	
ET662L		

ET663L		2.00
ET664L		
ET666L	2.00	
ET667		
ET 761		
ET 762		
ET 763		
ET 764		
ET 765		
ET 766		
ET 767		
ET 768	3.00	3.00

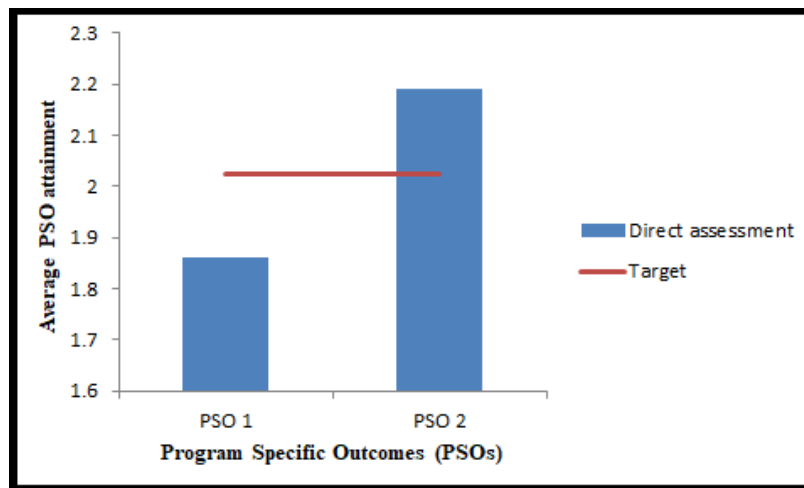


Fig. 3.10 PSO attainment