

Criteria 2- Teaching- Learning and Evaluation

Key Indicator- 2.6 Student Performance and Learning Outcome

2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

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Criteria 2- Teaching- Learning and Evaluation

Key Indicator- 2.6 Student Performance and Learning Outcome

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Dissemination of CO-PO-PSO		
Sl. No.	Programme	Website Link
1	Aeronautical Engineering	VIEW
2	Artificial Intelligence and Machine Learning Engineering	VIEW
3	Biotechnology	VIEW
4	Civil Engineering	VIEW
4	Computer Science & Engineering	VIEW
6	Computer Science Engineering (Data Science)	VIEW
7	Electrical & Electronics Engineering	VIEW
8	Electronics & Communication Engineering	VIEW
9	Information Science & Engineering	VIEW
10	Mechanical Engineering	VIEW
11	Mechatronics Engineering	VIEW
12	Master of Computer Application	VIEW
13	Master of Business Administration	VIEW



ACHARYA INSTITUTE OF TECHNOLOGY

Acharya Dr. Sarvepalli Radhakrishnan Road, Acharya P.O., Soladevanahalli, Bangalore-560107, INDIA

Affiliated to VTU, Belagavi, Karnataka and Approved by AICTE, New Delhi

Accredited by NBA (AE, BT, CSE, ECE, ME and MT)

www.acharya.ac.in, Email: principalait@acharya.ac.in, Ph. No. 080 22 555 555, +91 63645 22980

Date: 15.07.2025

Certificate of Authenticity

I hereby certify that all the supporting documents provided and uploaded under this metric are genuine, authentic, and accurately represent the intended information. Each document has been thoroughly reviewed and verified to ensure compliance with the applicable guidelines and Standard Operating Procedures (SOPs) of NAAC.

Principal

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DISSEMINATION OF PO-PEO-PSO

1. Dissemination of Vision, Mission and PO-PSO-PEO of all programs in the college website
2. Dissemination of Vision, Mission and PO-PSO-PEO in HOD Office
3. Dissemination of Vision, Mission and PO-PSO-PEO in Department Corridors
4. Dissemination of Vision, Mission, and PO-PSO-PEO in Department Laboratories
5. Dissemination of Vision, Mission PO-PEO-PSO-COs during Orientation Program
6. Dissemination of Vision, Mission and PO-PSO-PEO in the Department Magazine.
7. Dissemination of COs in IA Question Paper and Assignments



Programmes

Engineering - B.E

- » Aeronautical Engineering
- » Artificial Intelligence and Machine Learning Engineering
- » Biotechnology
- » Civil Engineering
- » Computer Science & Engineering
- » Computer Science Engineering (Data Science)
- » Electrical & Electronics Engineering
- » Electronics & Communication Engineering
- » Information Science & Engineering
- » Mechanical Engineering
- » Mechatronics Engineering
- » Master of Computer Application
- » Master of Business Administration



Address

Acharya Institute of Technology

Acharya Dr. S. Radhakrishnan Road,

PRINCIPAL
ACHARYA INSTITUTE OF TECHNOLOGY
SOLDEVANAHALLI, BENGALURU - 560 107

+91 740-6644-449 / +91 720-4036-555 +91 973-1755-966



AIT Aeronautical Engineering

Departments

Aeronautical Engineering

Aeronautical Engineering is a branch of engineering that deals with the research, design, development, construction, testing, science, and technology of an aircraft. The field also covers the investigation into aerodynamic characteristics of aircrafts, including behaviors and related factors like airfoil, control surfaces, lift and drag. With a good record of graduate students and placements, Acharya's department of aeronautical engineering continues to be one of the best Aeronautical engineering colleges in Bangalore.

Career Enhancement

Aeronautical Engineering at Acharya Institute of Technology offers superlative project-based learning to our students that motivates and inspires them to learn and grow in their career. The programme is designed for deep demonstration of knowledge that leads to superior impending and progression, enabling our students to better opportunities in India and abroad through industry-based project experience and various interfacing abilities. Our students attend international competitions in India & Abroad, giving students the

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opportunity for hands-on learning. These aspects have ensured the colleges consistently feature among the top Aeronautical engineering colleges in Bangalore.

Aeronautical Engineering is a combination of multiple disciplines that incorporates knowledge of multiple branches of the engineering field. Which ultimately results in career opportunities in various sectors including government and non-government organizations. Aeronautical is the branch that involves flavours of multiple domains, promoting students' future scope.

Activities

Acharya's Aeronautical Engineering is one of the best Aeronautical Engineering Colleges in Bangalore. We offer multiple activities, Aero model Activities is one of the offerings that grab students' attention and help them imply the knowledge they have gained.

Project-based learning is another offering that entices the student's consideration and increases their curiosity in the subject. We also offer educational trips around the country to stimulate and enhance the knowledge & skills, these facilities are offered other than classroom learning, as it energizes the enthusiasm within students.

Faculty

The department consists of a large pool of expert faculty members, highly qualified and proficient in their specific areas of technical specialisations. Holding Ph.D. & Master's degree from institutions such as IIT's and more. The faculty provide continuous inputs in designing and offering curriculum in diverse areas of aeronautics such as Aerodynamic Proportions, Structural Mechanics etc. This input helps in the department offering continuous value added programmes that are beyond regular university curriculum and are future ready. The department has published over 150 national and international publications and its also a VTU recognised research center, offering in-house research experience to our students that enhances their practical skills.

Why Acharya?



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We are counted among the top Aeronautical Engineering Colleges in Bangalore, because of our top-notch offerings that include,

- Innovative Teaching Methodology with rich and varied learning resources.
- State-of-art campus with Digital Classrooms
- Global Internship opportunities, interfacing with top universities of the world.
- Intra-college Events for more exposure.

Career Scope

Acharya is one of the best Aeronautical Engineering Colleges in Bangalore that offers a wide range of career opportunities to its students. Apprentices can pursue their career in Government and non-government organizations, for instance, they can join the Space Programmes like ISRO & HAL. Including various other IT, Non-IT, Core, Non-Core companies with the knowledge of the latest technology. Also, students have the opportunity to pursue further education in India and Abroad.

APPLY NOW

Vision

To impart quality education fostering excellence in academics, research and innovation to develop globally competent aeronautical engineers contributing to the society.

Mission

M1. To offer outcome-based learning that encompasses research and innovation.

M2. To promote interdisciplinary learning and interaction with the global

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community.

M3. To enable holistic education engrossed with social values.

Program Overview

Duration : 4 Years

Eligibility : Pass in 10+2 / Higher Secondary (HS) / Pre University (PUC) / 'A' Level (with 12 years of schooling) or its equivalent with English as one of the languages. Shall have secured a minimum of 45% marks in aggregate in Physics, Mathematics and any one of the following : Chemistry, Biology, Computer Science, Electronics. AIT admits students as per prevailing rules and regulations of VTU.

Programme Educational Objectives

PEO1: Employability: Graduates of the program shall have necessary skills and competence to be employable in the core industry, academia and multi-disciplinary sectors.

PEO2: Advancement: Graduates of the program shall advance professionally in the management, entrepreneurship and allied industries.

PEO3: Contribution: Graduates of the program shall have innovative idea and the potential to contribute to the expansion, maintenance and ongoing needs of the aviation industry.

PEO4: Lifelong learning: Graduates of the program shall possess an unrelenting interest in learning and adapt new technological advancements to the requirements of the evolving industrial contexts.



Programme 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 modeling 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



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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

Programme Specific Outcomes

PSO1: Elements of Aircraft Components and their operations: Apply the foundations of aerodynamics, propulsion, aircraft structure and materials; Evaluate the performance and operation of components of aircrafts and flying vehicles.

PSO2: Flight Vehicle design and development: Demonstrate the flight vehicle design, integrate the aircraft systems and components and test the flight.

PSO3: Aircraft Thermal and Fluid Structure Interaction: Apply the concepts of aerothermodynamics, energy conversion, heat and mass transfer in analyzing both internal and external flows; Demonstrate it for various aircraft engines and structures.

PSO4: Aircraft Avionics, Stability and Control: Apply the basic knowledge of avionics to communicate and control with the aircraft components; Evaluate the stability of the overall aircraft.

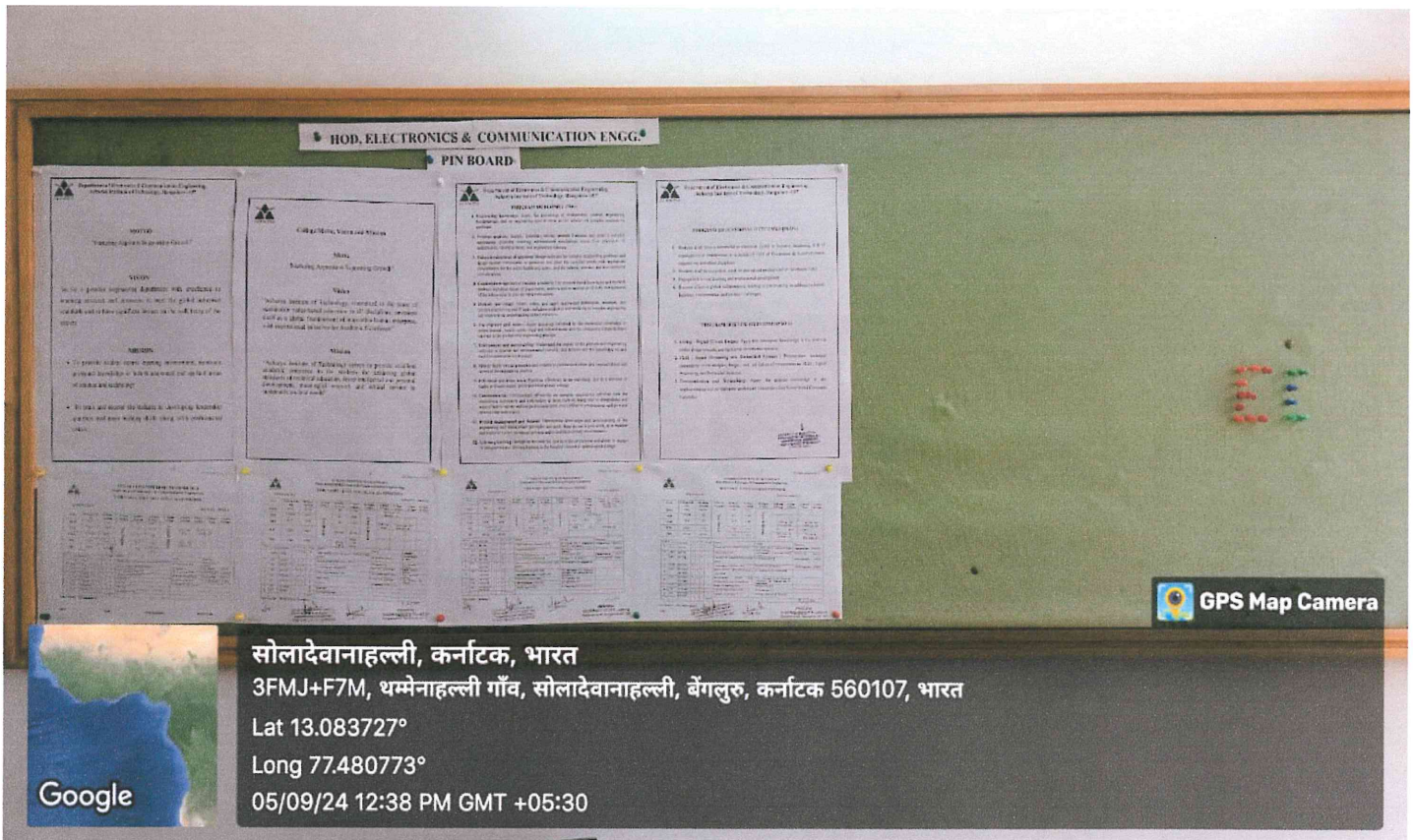
Course Content

Course Outcome of All Courses Offered

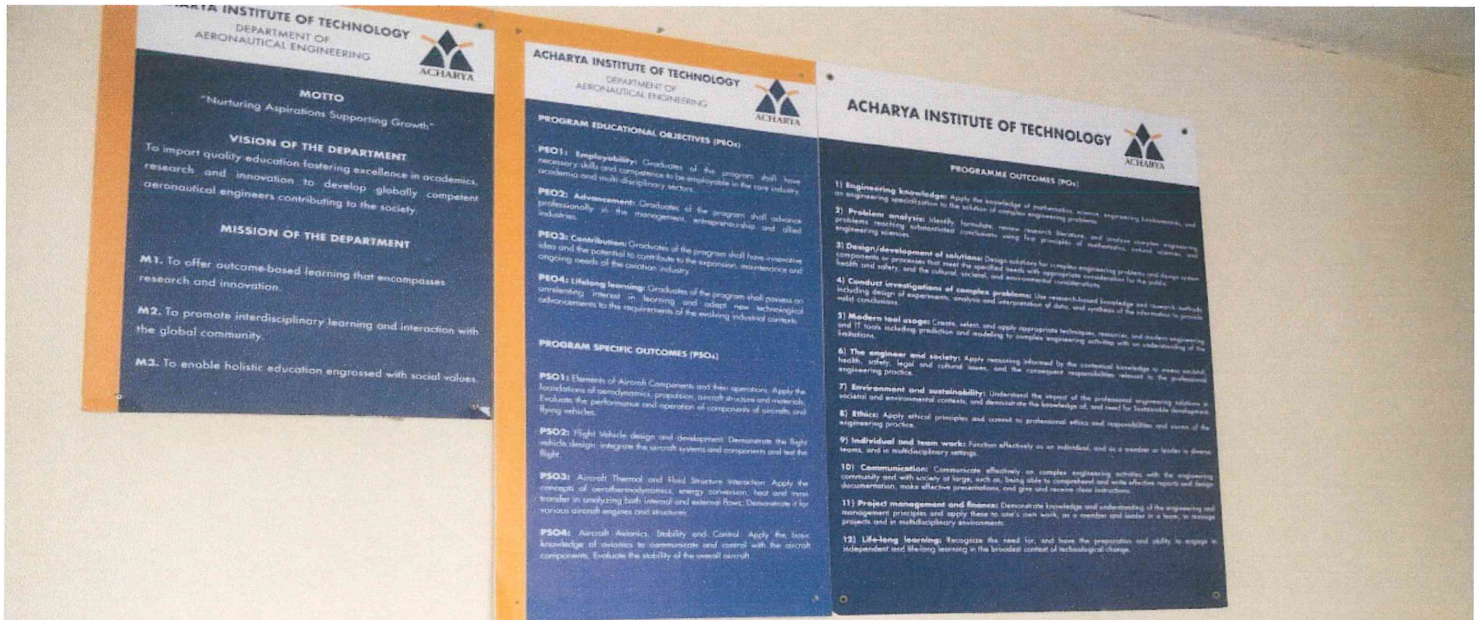


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Dissemination of Vision, Mission and PO-PSO-PEO in HOD Office



Dissemination of Vision, Mission and PO-PSO-PEO in Department Corridors



ACHARYA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING

MOTTO
"Nurturing Aspirations Supporting Growth"

VISION OF THE DEPARTMENT
To impart quality education fostering excellence in academics, research and innovation to develop globally competent aeronautical engineers contributing to the society.

MISSION OF THE DEPARTMENT

- M1. To offer outcome-based learning that encompasses research and innovation.
- M2. To promote interdisciplinary learning and interaction with the global community.
- M3. To enable holistic education engrossed with social values.

ACHARYA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1: **Employability:** Graduates of the program shall have necessary skills and competence to be successful in the core industry.
- PEO2: **Advancement:** Graduates of the program shall advance professionally in the management, entrepreneurship and allied industries.
- PEO3: **Contributions:** Graduates of the program shall have creative ideas and the potential to contribute to the research, maintenance and ongoing needs of the aviation industry.
- PEO4: **Lifelong learning:** Graduates of the program shall possess an unwavering interest in learning and adopt new technological advancements to the requirements of the existing industrial contexts.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1: **Elements of Aircraft Components and their operations:** Apply the foundations of aerodynamics, propulsion, aircraft structures and materials, Evaluate the performance and operation of components of aircraft and flying vehicles.
- PSO2: **Flight Vehicle design and development:** Demonstrate the flight vehicle design, integrate the aircraft systems and components and test the flight.
- PSO3: **Aircraft Thermal and Fluid Structure Interaction:** Apply the concepts of thermodynamics, energy conversion, heat and mass transfer in analyzing fuel, thermal and material flows. Demonstrate the various aircraft engines and structures.
- PSO4: **Aircraft Dynamics, Stability and Control:** Apply the basic knowledge of dynamics to communicate and control with the aircraft components. Evaluate the stability of the overall aircraft.

ACHARYA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING

PROGRAMME OUTCOMES (POs)

- 1) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of intricate engineering problems.
- 2) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems requiring substantial knowledge using first principles of mathematics, relevant 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 to 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 modeling to complete 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 defend 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 documents, 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) **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.



Soladevanahalli, Karnataka, India
3FMM+RQG, Soladevanahalli, Bengaluru, Karnataka 560107, India
Lat 13.084491°
Long 77.484616°
04/09/24 09:40 AM GMT +05:30

 **GPS Map Camera**


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Dissemination of Vision, Mission, and PO-PSO-PEO in Department Laboratories



College Motto, Vision and Mission

Motto
"Nurturing Aspirants Supporting Growth"

Vision
"Acharya Institute of Technology, committed to the cause of sustainable value-based education in all disciplines, envisions itself as a global benchmark of innovative, learner-centric, with international influence for Academic Excellence"

Mission
"Acharya Institute of Technology strives to provide excellent education, guidance to the students for achieving global standards of technical education, foster intellectual and personal development, encourage research and ethical service to sustainable societal needs"

Department of Electronics & Communication Engineering
Acharya Institute of Technology, Bangalore 560107

MOTTO
"Nurturing Aspirants Supporting Growth"

VISION
To be a premier engineering department with excellence in teaching, research and innovation to meet the global industrial standards and to have significant impact on the well being of the society

MISSION

- To provide student-centric, inspiring, contemporary, scientific, professional knowledge in both fundamental and applied areas of science and technology.
- To train and service the students in developing leadership qualities and team building skills along with professional ethics.

Department of Electronics & Communication Engineering
Acharya Institute of Technology, Bangalore 560107

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- Graduates will have a soundly professional ability to design, develop, & test applications or systems in specialized area of Electronics & Communication Engineering and good innovation.
- Graduates will be competent, creative and ethical professionals in the chosen field.
- Graduates will have strong leadership and professional development.
- Graduates will have strong leadership, working in partnership or within business, industry, or research and social challenges.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

- Graduates will have a soundly professional ability to design, develop, & test applications or systems in specialized area of Electronics & Communication Engineering and good innovation.
- Graduates will be competent, creative and ethical professionals in the chosen field.
- Graduates will have strong leadership and professional development.
- Graduates will have strong leadership, working in partnership or within business, industry, or research and social challenges.

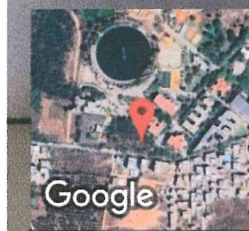
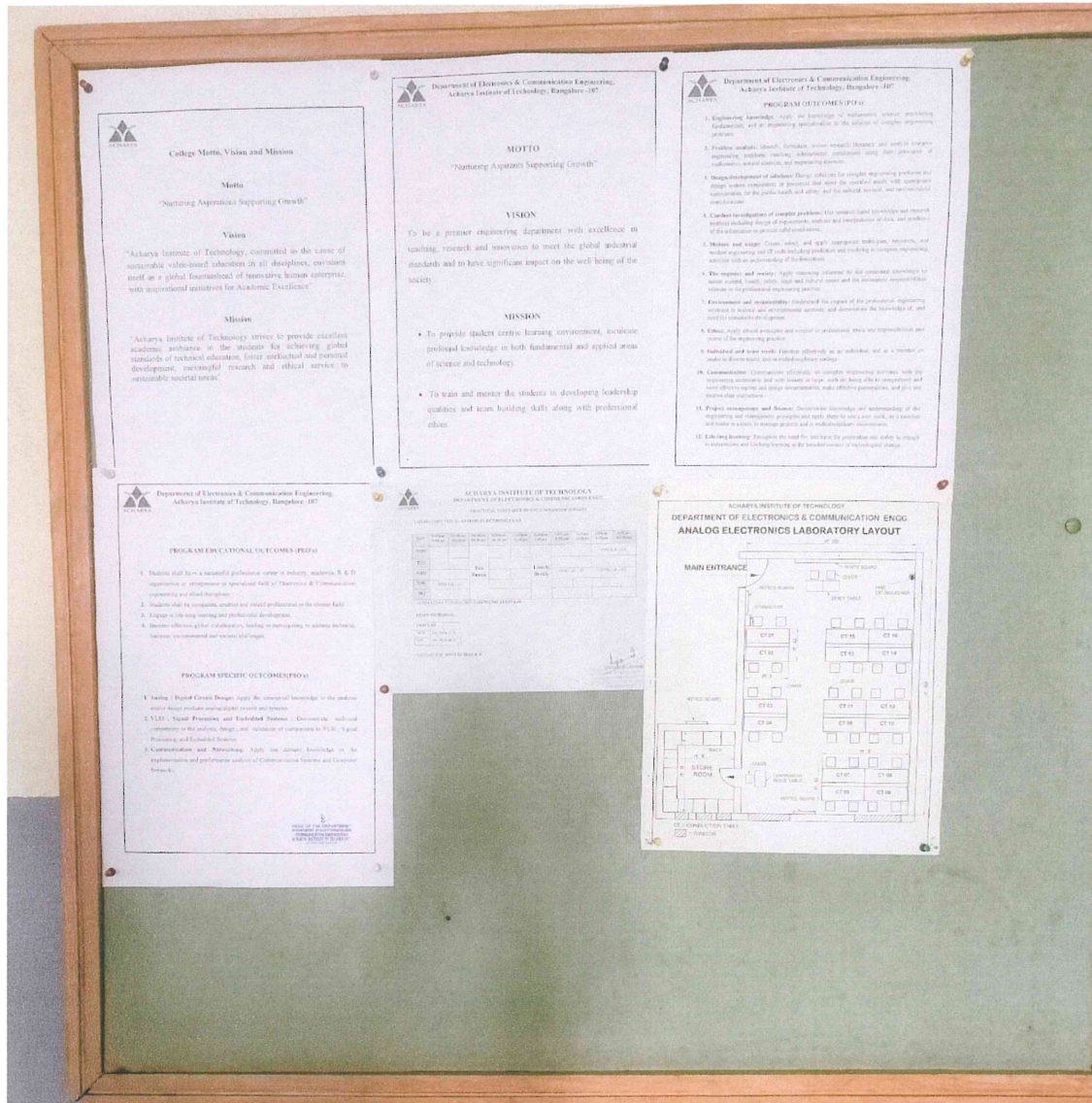
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG. O S P LABORATORY LAYOUT

MAIN ENTRANCE

GPS Map Camera

Soladevanahalli, Karnataka, India
3FMM+P94, Soladevanahalli, Bengaluru, Karnataka 560107, India
Lat 13.084312°
Long 77.483096°
05/09/24 03:46 PM GMT +05:30

Dissemination of Vision, Mission, and PO-PSO-PEO in Department Laboratories



Bengaluru, Karnataka, India

Electrical Sciences Block, Way to Stadium, Bengaluru, Soladevanahalli, Karnataka
560107, India

Lat 13.084328°

Long 77.483336°

05/09/24 03:50 PM GMT +05:30



Dissemination of Vision, Mission PO-PEO-PSO-COs during Orientation Program

Report on Student Induction Program-2023-24

Preamble to Student Induction Program

When a student graduates, he or she must have knowledge and competencies in the field of study. However, student also needs a wide understanding of society and interpersonal relationships. For him to comprehend and fulfil his responsibilities as an engineer, a citizen, and a human being, he must develop his character. Aside from the aforementioned, there are a few meta-skills and underlying ideals that must be possessed.

As per university communication, we at Acharya Institute of Technology started the student induction program along with regular academics from 11th September to 16th September 2023. Around 700 students attended the induction program.

The objectives of a student induction program are

To ensure a smooth transition for new students into an educational institution and to help them acclimate to the academic, social, and cultural aspects of their new environment.

List of sessions and points discussed during interaction.

1. Welcome and Integration:

- To provide a warm and welcoming environment for new students, making them feel included and part of the academic community.
- To foster a sense of belonging and connection with the institution and its values.

2. Orientation to the Institution:

- To familiarize students with the physical layout of the campus, including key buildings, facilities, and services.
- To introduce students to the institutional culture, policies, and academic expectations.

3. Information Dissemination:

- To provide essential information about academic programs, courses, and degree requirements.
- To provide information to students about Program Outcomes(POs), Program Educational Objectives (PEOs), Program Specific Objectives(PSOs) and Course outcomes (COs) of all streams of engineering.



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- To communicate administrative details, such as registration processes, important deadlines, and campus resources.

4. Introduction to Support Services:

- To inform students about available support services, such as academic advising, counseling, career services, and student organizations.
- To guide students on how to access and utilize support services throughout their academic journey.

5. Academic Preparedness:

- To prepare students for the academic challenges they may face, including study skills, time management, and effective learning strategies.
- To familiarize students with the expectations of their chosen academic programs and the resources available to help them succeed.

6. Social Integration:

- To facilitate social interactions among new students through icebreaker activities, group discussions, and team-building exercises.
- To encourage networking among students, faculty, and staff to build a supportive community.

7. Introduction to Campus Life:

- To expose students to extracurricular activities, clubs, and events on campus.
- To provide information about recreational facilities, student housing, and other aspects of campus life.

8. Safety and Well-being:

- To educate students on campus safety procedures, emergency protocols, and available health services.
- To promote a culture of well-being and self-care among students.

9. Orientation to Diversity and Inclusion:

- To promote awareness and understanding of the diverse backgrounds and perspectives within the student body.


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- To encourage a culture of inclusivity and respect for differences.

10. Academics and promotions norms

- Overview and Definitions
- Programs Offered and Durations
- Curriculum Framework and Academic Processes
- Attendance criteria and Eligibility
- Assessment and Evaluation guidelines
- Maximum Duration for Programme Completion
- Grading and Vertical Progression
- Eligibility for Award of Degree, Prizes, Medals, and Ranks

11. Examination procedure and norms

- Procedure to fill the online exam application form
- Collection of Admission ticket
- Do's and Don'ts in VTU examinations
- Procedure to apply for revaluation/Photocopy

12. Career Services and Guidance

- Language Training
- Skill and Domain Training
- Internship and Industrial Training and carrier Development

13. Assesment, Training and Placements

- Pre-assessment
- Training
- Post assessment
- Super-100

14. Institutional Policies and norms

- IT Policy
- General Access Policies


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- Code of Conduct
- Dress Code
- Anti-Bullying Policy
- Zero Tolerance Policy
- Grievance Redressal Mechanisms

Photo gallery of Student Orientation Program.



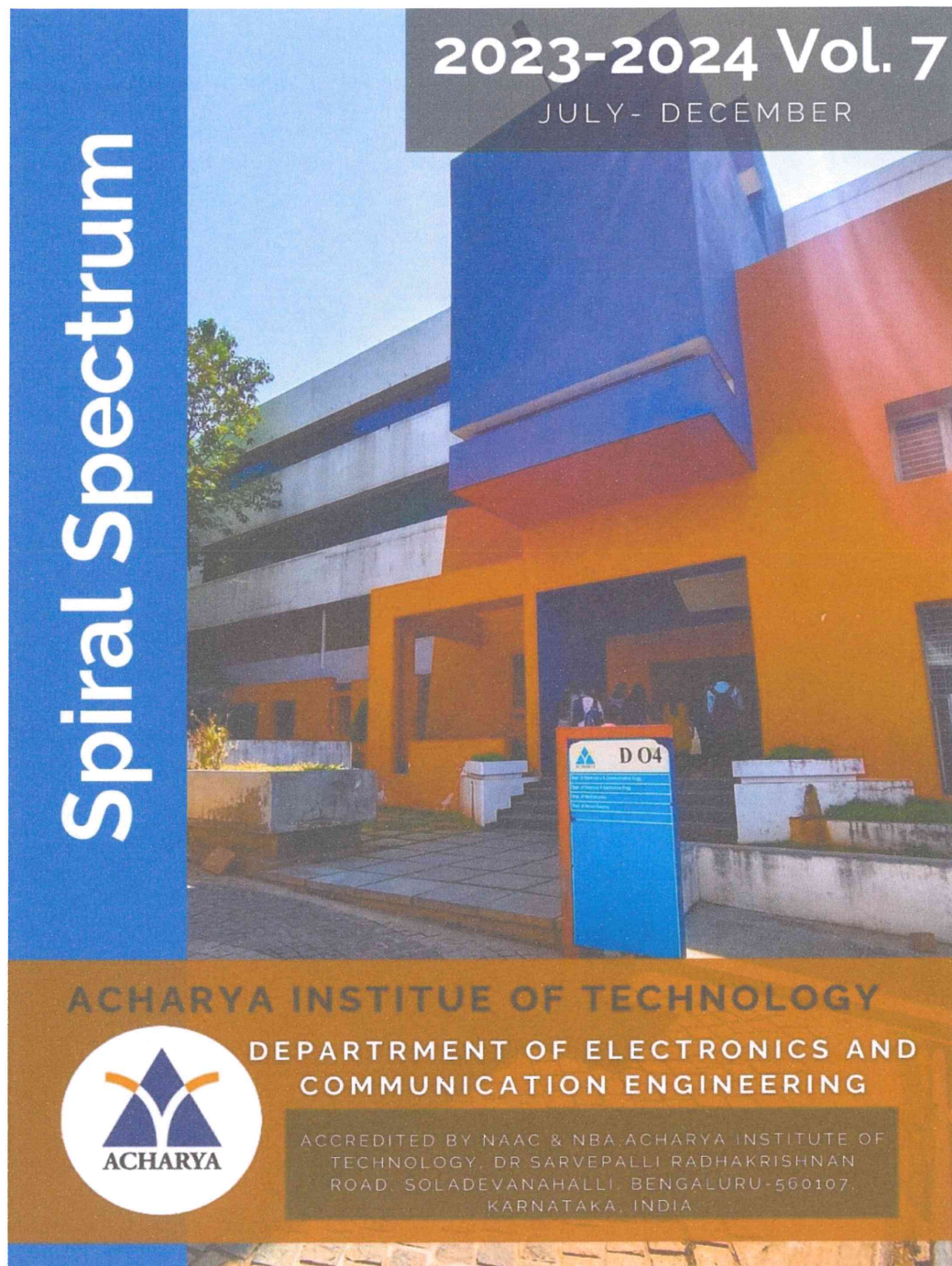
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Soladevanahalli, Hesaraghatta Main Road, ACHIT Nagar post, Bangalore-560107, Karnataka, India

<https://ait.ac.in> Ph.: 080 22555555

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Dissemination of Vision, Mission and PO-PSO-PEO in the Department Magazine.



N. Cypher

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Soladevanahalli, Hesaraghatta Main Road, ACHIT Nagar post, Bangalore-560107, Karnataka, India

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Vision and Mission

Institute

Motto

"Nurturing Aspirations Supporting Growth"

Vision

"Acharya Institute of Technology, committed to the cause of sustainable value-based education in all disciplines, envisions itself as a global fountainhead of innovative human enterprise, with inspirational initiatives for Academic Excellence".

Mission

"Acharya Institute of Technology strives to provide excellent academic ambiance to the students for achieving global standards of technical education, foster intellectual and personal development, meaningful research and ethical service to sustainable societal needs."

Department

Vision

"To be a premier engineering department with excellence in teaching, research and innovation to meet the global industrial standards and to have significant impact on the well being of the society".

Mission

- To provide student centric learning environment, inculcate profound knowledge in both fundamental and applied areas of science and technology.
- To train and mentor the students in developing leadership qualities and team building skills along with professional ethics.



The Acharya emblem with motto and mission



Admin Block



View of EC block



View of Central Library



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Soladevanahalli, Hesaraghatta Main Road, ACHIT Nagar post, Bangalore-560107, Karnataka, India

<https://ait.ac.in> Ph.: 080 22555555

PEO's and PSO's

Program Educational Objectives (PEO's)

PEO 1

Students shall have a successful professional career in industry, academia, R & D organization or entrepreneur in specialized field of Electronics & Communication engineering and allied disciplines.

PEO 2

Students shall be competent, creative and valued professional in the chosen field.

PEO 3

Engage in life-long learning and professional development.

PEO 4

Become effective global collaborators, leading or participating to address technical, business environmental and societal challenges

Program Specific Outcomes (PSO's)

PSO 1

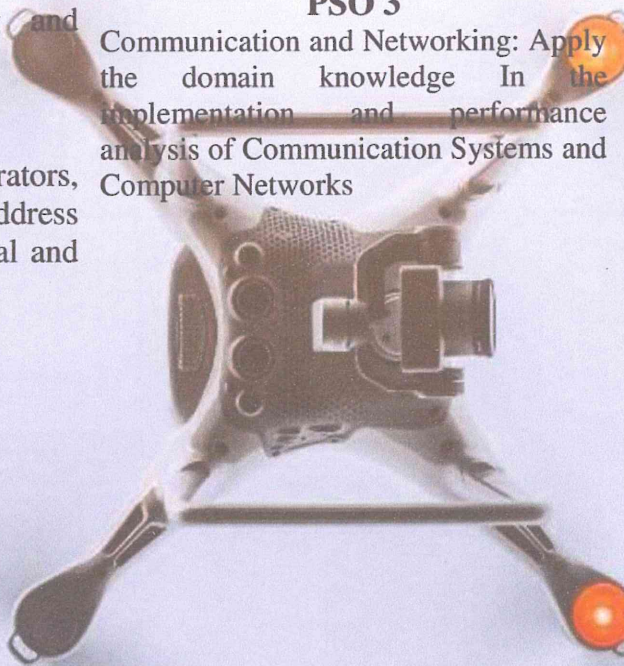
Analog / Digital Circuit Design: Apply the conceptual knowledge in the analysis and/or design; evaluate analog/digital circuits and systems

PSO 2

VLSI, Signal Processing and Embedded Systems: Demonstrate technical competency in the analysis, Design and validation of components in VLSI, Signal Processing, and Embedded Systems.

PSO 3

Communication and Networking: Apply the domain knowledge In the implementation and performance analysis of Communication Systems and Computer Networks



[Signature]

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Dissemination of COs in IA Question Paper and Assignments



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BENGALURU 560107

Department of Information Science & Engineering

INTERNAL ASSESMENT - I [Academic Year: 2023-24]

Sub with Code: Artificial Intelligence & Machine Learning(21CS54)

Semester/Section: 5th / A&B

Max Marks: 20

Time: 60 mins

Note: Answer all the questions

1.	a.	Classify the various Machine Learning algorithms and explain each.	5M	(CO1)	BL2					
(OR)										
2.	a.	Describe the various steps in the Machine Learning Process.	5M		BL2					
3.	a.	Classify the different data types of descriptive statistics with examples.	5M	(CO1)	BL2					
(OR)										
4.	a.	Explain how Skewness & Kurtosis are used to measure direction, degree of symmetry and peak of the dataset.	5M		BL2					
5.	a.	Apply the Find - S algorithm to generate the specific hypothesis for the below dataset.				5M	BL3			
		Origin	Manufacturer	Color	Decade			Type	Example Type	
		Japan	Honda	Blue	1980			Economy	Positive	
		Japan	Toyota	Green	1970			Sports	Negative	
		Japan	Toyota	Blue	1990			Economy	Positive	
		USA	Chrysler	Red	1980			Economy	Negative	
		Japan	Honda	White	1980			Economy	Positive	
		Japan	Toyota	Green	1980			Economy	Positive	
		Japan	Honda	Red	1990			Economy	Negative	
(OR)										
6.	a.	Apply the candidate elimination algorithm to generate version space for the below dataset.				5M	BL3			
		CGPA	Interactiveness	Practical Knowledge	Communication Skills			Logical Thinking	Interest	Job Offer
		>=9	Yes	Excellent	Good			Fast	Yes	Yes
		>=9	Yes	Good	Good			Fast	Yes	Yes
		>=8	No	Good	Good			Fast	No	No
		>=9	Yes	Good	Good			Slow	No	Yes

Department of Information Science and Engineering, Acharya Institute of Technology, Bangalore-560107

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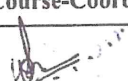
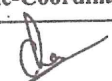
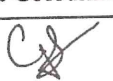
7.	a.	Consider the below data set which describes the performance of individual students in course. Apply the Weighted KNN for test instance (CGPA=7.6 ,Assessment=60,Project Submitted = 8) and classify the performance of test instance pass or fail.				5M	(CO3)	BL3																																				
		<table><tr><th>CGPA</th><th>Assessment</th><th>Project Submitted</th><th>Result</th></tr><tr><td>9.2</td><td>85</td><td>8</td><td>Pass</td></tr><tr><td>8</td><td>80</td><td>7</td><td>Pass</td></tr><tr><td>8.5</td><td>81</td><td>8</td><td>Pass</td></tr><tr><td>6</td><td>45</td><td>5</td><td>Fail</td></tr><tr><td>6.5</td><td>50</td><td>4</td><td>Fail</td></tr><tr><td>8.2</td><td>72</td><td>7</td><td>Pass</td></tr><tr><td>5.8</td><td>38</td><td>5</td><td>Fail</td></tr><tr><td>8.9</td><td>91</td><td>9</td><td>Pass</td></tr></table>							CGPA	Assessment	Project Submitted	Result	9.2	85	8	Pass	8	80	7	Pass	8.5	81	8	Pass	6	45	5	Fail	6.5	50	4	Fail	8.2	72	7	Pass	5.8	38	5	Fail	8.9	91	9	Pass
		CGPA	Assessment	Project Submitted	Result																																							
		9.2	85	8	Pass																																							
		8	80	7	Pass																																							
		8.5	81	8	Pass																																							
		6	45	5	Fail																																							
		6.5	50	4	Fail																																							
		8.2	72	7	Pass																																							
		5.8	38	5	Fail																																							
8.9	91	9	Pass																																									
(OR)																																												
8	a.	Consider the below data set where five weeks sales data is given . Apply linear regression and find the best fit model to predict the 7th and 9th month sales.				5M	BL3																																					
		<table><tr><th>X(week)</th><th>Y(sales in thousand)</th></tr><tr><td>1</td><td>1.2</td></tr><tr><td>2</td><td>1.8</td></tr><tr><td>3</td><td>2.6</td></tr><tr><td>4</td><td>3.2</td></tr><tr><td>5</td><td>3.8</td></tr></table>						X(week)	Y(sales in thousand)	1	1.2	2	1.8	3	2.6	4	3.2	5	3.8																									
		X(week)	Y(sales in thousand)																																									
		1	1.2																																									
		2	1.8																																									
		3	2.6																																									
		4	3.2																																									
5	3.8																																											

CO1: Illustrate the working of Artificial Intelligence & Machine Learning concepts.

CO2: Demonstrate the concepts of Artificial Neural Network .

CO3: Apply the statistical concepts to solve the problems using Supervised algorithms

CO4: Apply the knowledge of clustering algorithms on various dataset.

	Course-Coordinator	Module-Coordinator	Test-Coordinator	HOD
Signature				

Department of Information Science and Engineering, Acharya Institute of Technology, Bangalore-560107 2

Soladevanahalli, Hesaraghatta Main Road, ACHIT Nagar post, Bangalore-560107, Karnataka, India

<https://ait.ac.in> Ph.: 080 22555555 ACHARYA INSTITUTE OF TECHNOLOGY
SOLDEVANAHALLI, BENGALURU - 560 107



Department of Electronics and Communication Engineering
Acharya Institute of Technology
Soladevanahalli Bangalore

Assignment No :5

Even Sem 2023-24

Sub with Code: Microwave Theory and Antennas (21EC62)

Semester: VI

Max Marks: 10

Date:22/07/24

Note: Answer ALL questions.

Qn No	Question	CO	Marks	BL
1	Determine the directivity of an antenna system with radiation intensity $U=U_m \cos^4 \theta \sin^2 \phi$ where $0 < \theta < \pi/2$ and $0 < \phi < 2\pi$ using i. exact method and ii. approximate method	CO3	05	3
2	Determine the directivity of an antenna system with radiation intensity $U=U_m \sin \theta \sin^2 \phi$ where $0 < \theta < \pi$ and $0 < \phi < \pi$ using i. exact method and ii. approximate method	CO3	05	3
3	Compute the power received by a receiver antenna kept at a distance of 100km by transmitter radiating at 3Mhz. Assume $G_t=40$ and $G_r=15$ and $P_t=1000KW$	CO3	05	3
4	The antenna in the far field receives a power of 15MW placed at a distance of 2Km from the transmitter operating at GHz. If the gain values are 35dB and 25dB for transmitting and receiving antenna respectively with reference to isotropic antenna. Calculate tied power.	CO3	05	3
5	The power density of an antenna is $P(\theta, \phi) = \frac{A_m \sin^2 \theta}{r^2}$ where A_m is the maximum value 'r' is the distance from the antenna to any point 'P' in the far field. Determine i. Exact D, ii. Approximate D, iii. Decibel D.	CO3	05	3

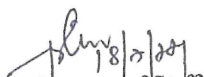
[Signature]

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Department of Electronics & Communication Engineering, Acharya Institute of Technology Bangalore

	Course Outcomes
CO 1:	Describe the operation of microwave sources, transmission lines, active and passive devices -L2
CO 2:	Find the electrical parameters in a microwave network using transmission line equations, reflection coefficients-L3
CO3:	Interpret antenna parameters and the relationship between them in Radio communication -L2
CO4:	Derive and compute the radiation intensity and efficiency parameters for point sources, electric dipoles and antenna arrays -L3
CO5:	Discuss the working principle and application of different antenna types such as loops, horn antennas and parabolic reflectors in wireless communication. -L2
CO6:	Infer the transmission characteristics of waveguides and microwave devices such as resonator, coupler and power divider using microwave testbenches-L3.
CO7:	Study and analyze a given antenna with respect to its gain, directivity and aperture.-L3


Signature of Staff


Signature of Module Coordinator.


Signature of HOD.


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Department of Electronics & Communication Engineering, Acharya Institute of Technology Bangalore



ACHARYA INSTITUTE OF TECHNOLOGY

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and Accredited by NBA (AE, BT, CSE, ECE, ME, MT)

MAPPING OF CO-PO-PSO

AIT/NBA/ COURSE/ 2022-23				ACHARYA INSTITUTE OF TECHNOLOGY Bengaluru – 560 107 Department of Aeronautical Engineering																															
Course Information																																			
Programme Name:		Aeronautical Engineering																																	
Academic Year:		2022-23		Semester:		7		Section:		A		Subject Type:		Theory																					
Course Title:		AIRCRAFT STABILITY AND CONTROL																																	
Course Instructor Name:				MR.AKASH S								Class Strength:																							
Subject Code:		18AE71		Course No:		1		Course ID:		C401		56																							
Scheme of Teaching & Marks																																			
Contact Hr/Week:		3		Lecture Hours (Hr.):				0		Tutorials (Hr.):		3																							
Max.CIE Marks:		40		Max. SEE Marks:				60		Total Max.Marks:		100																							
Min.CIE Marks:		19		Min.SEE Marks:				21		Total Min.Marks:		40																							
Final CIE (IA) Marks:		40		Assignment Marks:				10		Test Marks:		30																							
Threshold Values for Attainment Calculation														Final CO Attainment																					
Attainment level		3		%		2		%		1		%		(Percentage Contribution, %)																					
Internal Assessment		>=		70		>=		60		>=		40		CIE		60		SEE		30															
SE Examination		>=		60		>=		50		>=		35		-				CES		10															
Statements of Course Outcomes														No.of CO's		4		Target(%)		BL															
C401.1		Demonstrate the static longitudinal stability and control of aircraft with stick-fixed and stick-free configurations.												65		3																			
C401.2		Analyze directional & lateral stability on aircraft, including the effects of various components & adverse weather conditions in design of flight vehicles.												65		4																			
C401.3		Estimate the stability parameters of aircrafts with the aid of equations of motion to communicate effectively about complexity involve in design of aircrafts.												65		4																			
C401.4		Analyze different modes of motion associated with dynamic stability of an aircraft & function effectively as a team to design a aircraft that recovers from these modes.												65		4																			
Semester End Exam. (SEE) Target(%)				65				Course End Survey(CES) Target (%)				65																							
CO-PO Mapping Table (In the scale of 3)														CO-PSO Mapping Table																					
CO/PO		1		2		3		4		5		6		7		8		9		10		11		12		CO/PSO		1		2		3		4	
C401.1		3		3		2		1		1								1		2				2		C401.1		2				3			
C401.2		3		3		2		2		1								1		2				2		C401.2		2				3			
C401.3		3		3		2		2		2								2		2				2		C401.3		2				3			
C401.4		3		3		2		1		2								2		2				2		C401.4		2				3			
Total		12		12		8		6		6								6		8				8		Total		8				12			

(Signature)

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 ACHARYA INSTITUTE OF TECHNOLOGY
 SOLDEVANAHALLI, BENGALURU - 560 107



ACHARYA INSTITUTE OF TECHNOLOGY

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and Accredited by NBA (AE, BT, CSE, ECE, ME, MT)

NBA ACCREDITATION CERTIFICATES

राष्ट्रीय प्रत्यायन बोर्ड

चौथा तल, ईस्ट टावर, एन. बी. सी. प्लेस, भीष्म पितामह मार्ग, प्रगति विहार, लोधी रोड, नई दिल्ली - 110003
NATIONAL BOARD OF ACCREDITATION
4th Floor, East Tower, NBCC Place, Bhisham Pitamah Marg, Pragati Vihar, Lodhi Road, New Delhi 110003



File No: 25-127-2010-NBA

Date: 09-10-2023

To
The Principal
Acharya Institute of Technology,
Soladevanahalli, Hesaraghatta Main Road,
Karnataka 560090

Subject: Accreditation status of programs applied by Acharya Institute of Technology, Soladevanahalli, Hesaraghatta Main Road, Karnataka 560090.

Sir,

This has reference to your application I.D. No. 6951-08/06/2022 seeking accreditation by National Board of Accreditation to UG Engineering programs offered by Acharya Institute of Technology, Soladevanahalli, Hesaraghatta Main Road, Karnataka 560090.

2. An Expert Team conducted onsite evaluation of the programs from 21st to 23rd July, 2023. The report submitted by the Expert Team was considered by the concerned Committees constituted for the purpose in NBA. The Competent Authority in NBA has approved the following accreditation status to the programs as given in the table below:

Sl. No.	Name of the Program(s) (UG)	Basis of Evaluation	Accreditation Status	Period of validity	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
1.	Aeronautical Engineering	Tier II June 2015 Document	Accredited	Academic Years 2023-2024 to 2025-2026 i.e. up to 30-06-2026	Accreditation status granted is valid for the period indicated in Col.5 or till the program has the approval of the Competent Authority, whichever is earlier
2.	Biotechnology		Accredited	Academic Years 2022-2023 to 2024-2025 i.e. upto 30-06-2025	

3. It may be noted that only students who graduate during the validity period of accreditation, will be deemed to have graduated with an NBA accredited degree.

4. The programs have been granted accreditation for 3 years. Acharya Institute of Technology, Soladevanahalli, Hesaraghatta Main Road, Karnataka 560090 should submit the Compliance Report at least six months before the expiry of validity of accreditation mentioned above so as to be eligible for consideration by the concerned Committee in NBA for further processing of the accreditation status.

5. The accreditation status awarded to the programs as indicated in the above table does not imply that the accreditation has been granted to Acharya Institute of Technology, Soladevanahalli, Hesaraghatta Main Road, Karnataka 560090 as a whole. As such the Institution should nowhere along with its name including on its letter head etc. write that it is accredited by NBA because it is program accreditation and not Institution accreditation. If such an instance comes to NBA's notice, this will be viewed seriously. Complete name of the program(s) accredited, level of program(s) and the period of validity of accreditation, as well as the Academic Year from which the accreditation is effective should be mentioned unambiguously whenever and wherever it is required to indicate the status of accreditation by NBA.

Contd/..

6. The accreditation status of the above programs is subject to change on periodic review, if needed by the NBA. It is desired that the relevant information in respect of accredited programs as indicated in the table in paragraph 2, appears on the website and information bulletin of the Institute.

7. The accreditation status awarded to the programs as indicated in table in paragraph 2 above is subject to maintenance of the current standards during the period of accreditation. If there are any changes in the status (major changes of faculty strength, organizational structure etc.), the same are required to be communicated to the NBA, with an appropriate explanatory note.

8. A copy each of the Report of Chairman of the Visiting Team and Evaluators' Reports in respect of the above programs is enclosed.

9. If the Institute is not satisfied with the decision of NBA, it may appeal within thirty days of receipt of this communication giving reasons for the same and by paying the requisite fee.

Yours faithfully,



(Dr. Anil Kumar Nassa)
Member Secretary

Encls: 1. Copy of Report of Chairman of the Visiting Team.
2. Copy each of Expert Reports of the Visiting Team.

Copy to:

1. The Registrar,
Visvesvaraya Technological University
Jnana Sangama, Belgaum-590018, Karnataka
2. Principal Secretary (Hr. & Tech. Education)
Govt. of Karnataka, K.G.S. 6th Floor
M.S. Building, R No. 645
Dr. B.R. Ambedkar Road, Bangalore-560001, Karnataka
3. Director Technical Education
Tantrik Shikshan Bhawan, Palace Road
Bangalore-560001, Karnataka
4. Master Accreditation Folder of the State
5. Accreditation File

राष्ट्रीय प्रत्यायन बोर्ड

चौथा तल, ईस्ट टावर, एन. बी. सी. प्लेस, भीष्म पितामह मार्ग, प्रगति विहार, लोधी रोड, नई दिल्ली -110003

NATIONAL BOARD OF ACCREDITATION

4th Floor, East Tower, NBCC Place, Bhisham Pitamah Marg, Pragati Vihar, Lodhi Road, New Delhi 110003



File No. 25-127-2010-NBA

Date 19-10-2022

To
The Principal
Acharya Institute of Technology,
Soladevanahalli, Hesaraghatta,
Main Road, Karnataka-560090

Subject: Further accreditation status on the basis of Compliance Report of the programs in Tier II offered by **Acharya Institute of Technology, Soladevanahalli, Hesaraghatta, Main Road, Karnataka-560090.**

Sir,

This is regarding Compliance Reports submitted by **Acharya Institute of Technology, Soladevanahalli, Hesaraghatta, Main Road, Karnataka-560090** for the UG Engineering programs which were accredited by NBA in Tier-II for academic years 2019-20 to 2021-22 i.e. up to 30-06-2022.

2. An Expert Team conducted data verification of the programs on 27th August, 2022. The report submitted by the Expert Team was considered by the concerned Committees constituted for the purpose in NBA. The Competent Authority in NBA has approved the following accreditation status to the programs as given in the table below:

Sl. No	Name of the Program(s) (UG)	Basis of Evaluation	Accreditation Status	Period of validity	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
1.	Computer Science & Engineering	Tier-II June 2015 Document	Accredited	Academic Years 2022-2023 to 2024-2025 i.e. Up to 30-06-2025	Accreditation status granted is valid for the period indicated in Col.5 or till the program has the approval of the Competent Authority, whichever is earlier.
2.	Electronics & Communication Engineering		Accredited		
3.	Mechanical Engineering		Accredited		
4.	Mechatronics		Accredited		

3. It may be noted that only students who graduate during the validity period of accreditation, will be deemed to have graduated with an NBA accredited degree.

4. The programs have been granted accreditation for further 3 years. **Acharya Institute of Technology, Soladevanahalli, Hesaraghatta, Main Road, Karnataka-560090** should submit fresh online application under First Cycle SAR Tier II June 2015 document through eNBA portal at least five months before the expiry of validity of accreditation mentioned above.

5. The accreditation status awarded to the programs as indicated in the above table does not imply that the accreditation has been granted to **Acharya Institute of Technology, Soladevanahalli, Hesaraghatta, Main Road, Karnataka-560090** as a whole. As such the Institution should nowhere along with its name including on its letter head etc. write that it is accredited by NBA because it is program accreditation and not Institution accreditation. If such an instance comes to NBA's notice, this will be viewed seriously. Complete name of the program(s) accredited, level of program(s) and the period of validity of accreditation, as well as the Academic Year from which the accreditation is effective should be mentioned unambiguously whenever and wherever it is required to indicate the status of accreditation by NBA.

6. The accreditation status of the above programs is subject to change on periodic review, if needed by the NBA.

Contd/..

It is desired that the relevant information in respect of accredited programs as indicated in the table in paragraph 2, appears on the website and information bulletin of the Institute.

7. The accreditation status awarded to the programs as indicated in table in paragraph 2 above is subject to maintenance of the current standards during the period of accreditation. If there are any changes in the status (major changes of faculty strength, organizational structure etc.), the same are required to be communicated to the NBA, with an appropriate explanatory note.

8. A copy each of Report of the Visiting Team in respect of the above programs is enclosed.

Yours faithfully,



(Dr. Anil Kumar Nassa)
Member Secretary

Encls: 1. Copy each of Report of the Visiting Team in respect of the programs.

Copy to:

1. Principal Secretary (Hr. & Tech. Education)
Govt. of Karnataka, K.G.S., 6th Floor
M.S. Building, R. No. 645, Dr. B.R Ambedkar Road
Bangalore-560001, Karnataka
2. The Registrar,
Visvesvaraya Technological University
Jnana Sangama, Belgaum-590018, Karnataka
3. Director Technical Education
Tantrik Shikshan Bhawan
Palace Road, Bangalore-560001, Karnataka
4. Accreditation File
5. Master Accreditation file of the State



ACHARYA INSTITUTE OF TECHNOLOGY

OUTCOME BASED EDUCATION MANUAL



ACHARYA INSTITUTE OF TECHNOLOGY

Affiliated to Visvesvaraya Technological University, Belagavi, Govt. of Karnataka.
Approved by AICTE, New Delhi and Accredited by NBA and NAAC

OUTCOME BASED EDUCATION MANUAL



Prepared By

IQAC | Internal Quality Assurance Cell
Acharya Institute of Technology

PREFACE

This manual is a reference to help faculty members and Stakeholders to understand the Outcome Based Education (OBE) system implemented at Acharya Institute of Technology (AIT) since 2014. This manual provides a detailed description of Outcome Based Education implementation at all the four stages of educational process including Curriculum design, Teaching and Learning process, Assessment & Evaluation and Continuous quality improvement. Also it provides suitable guidelines for the faculty members to develop the course plan, assessment plan etc., in the process to measure the outcome of the students during their course of study and also after their graduation.

Outcome-Based Education (OBE) is an educational model that forms the base of a quality educational system. There is no single specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help the students to achieve the set goals. The faculty may adapt the role of instructor, trainer, facilitator, and/or mentor based on the outcomes targeted. OBE enhances the traditional methods and focus on what the Institute provides to students. It show the success by making or demonstrating outcomes using statements "able to do" in favour of students. OBE provides clear standards for observable and measurable outcomes.

India, OBE and accreditations

The induction of India in the Washington Accord in 2014 with the permanent signatory status of the National Board of Accreditation (NBA) is considered a big leap forward for the higher-education system in India. It means that an Engineering graduate from India can be employed in any one of the other countries who have signed the accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model.

The National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) are the autonomous bodies for promoting global quality standards for technical education in India. NBA has started accrediting only the Programs running with OBE from 2013.

The National Board of Accreditation mandates establishing a culture of outcome based education in institutions that offer Engineering, Pharmacy and Management program. Reports of outcome analysis help to find gaps and carryout continuous improvements in the education system of an Institute, which is very essential.

Vision- Mission and Quality Policy

Vision

Acharya Institute of Technology, committed to the cause of sustainable value-based education in all disciplines, envisions itself as a global fountainhead of innovative human enterprise, with inspirational initiatives for Academic Excellence.

Mission

Acharya Institute of Technology strives to provide excellent academic ambience to the students for achieving global standards of technical education, foster intellectual and personal development, meaningful research, ethical, and sustainable service to societal needs.

Quality Policy

“We at Acharya Institute of Technology, promise to continually strive towards total quality in all our endeavours through Equity with Accessibility, Commitment with Honesty, Adaptability with Efficiency while blending Concern for Environment and Social Development”.

Motto

“Nurturing Aspirations, Supporting Growth”

Core Values

- Pursuit of Excellence
- Integrity and Transparency
- Leadership
- Teamwork

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Abbreviations:

OBE	Outcome Based Education	BTL	Bloom's Taxonomy Level
LOT	Lower Order of Thinking	HOT	Higher Order of Thinking
PEO	Program Educational Objectives	PO	Program Outcome
CO	Course Outcome	PSO	Program Specific Outcome
UE	University Theory Exam	POE	Practical Oral Exam
CE	Course Exit Survey	HoD	Head of Department
PC	Program Coordinator	DAB	Department Advisory Board
PAC	Program Assessment Committee	A.Y.	Academic Year

1. PRIMARY DEFINITIONS AND NOMENCLATURE

Vision: A vision statement is a document that states the current and future objectives of a Department. The vision statement is intended as a guide to help the department make decisions that align with its philosophy and declared set of goals.

Mission: The mission statement should define the broad purposes the program /department is aiming to achieve, describe the community the program /department is designed to serve, and state the values and guiding principles which define its standards.

Program educational objectives (PEOs): PEOs are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. Knowledge, Skill and Attitude are the three behavioral elements based on which PEOs are constructed.

Program Outcomes (POs): Program outcomes are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude and behavior that students acquire through the program.

Program Specific Outcomes (PSOs): Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

Course Outcomes (COs): It is a detailed description of what a student must be able to do at the conclusion of a course.

Course Information Sheet (CIS): This sheet summarizes the information of a particular course and it gives the overall view of how the COs and POs are mapped in each unit.

Continuous Internal Evaluation (CIE): Continuous Internal assessment is a form of educational examination that evaluates a student's progress throughout a prescribed course.

Semester End Examinations (SEE): SEE means the examinations to be held at the end of each semester separately for theory & practical part on such dates as the University/College may determine.

Attainment is the action or fact of achieving a standard result towards the accomplishment of desired goals. Primarily attainment is the standard of academic attainment as observed by test or examination result.

2. OUTCOME BASED EDUCATION (OBE):

Outcome-Based Education (OBE) is an educational model that forms the base of a quality educational system. There is no single specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help the students to achieve the set goals. The faculty may adapt the role of instructor, trainer, facilitator, and/or mentor based on the outcomes targeted. OBE enhances the traditional methods and focus on what the Institute provides to students. It shows the success by making or demonstrating outcomes using statements "able to do" in favor of students. OBE provides clear standards for observable and measurable outcomes.

Outcome based education (OBE) is a student-centred instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitudes. Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behavior a graduate is expected to attain upon completion of a program and after 4 years of graduation. In the OBE model, the required knowledge and skill sets for a particular engineering degree are predetermined and the students are evaluated for all the required parameters (Outcomes) during the course of the program.

Benefits of OBE

- **Clarity:** The focus on outcome/ creates a clear expectation of what needs to be accomplished by the end of the course.
- **Flexibility:** With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the student's needs.
- **Comparison:** OBE can be compared across the individual, class, batch, Program and Institute levels.
- **Involvement:** Students are expected to do their own learning. Increased student involvement allows students to feel responsible for their own learning, and they should learn more through this individual learning.

Features of OBE

- OBE is an educational process that focuses on what students can do or the qualities they should develop after they are taught.
- OBE involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of higher order learning and mastery rather than accumulation of course credits.
- Both structures and curricula are designed to achieve those capabilities or qualities.

- Discourages traditional education approaches based on direct instruction of facts and standard methods.
- It requires that the students demonstrate that they have learnt the required skills and content.

Deficiencies in Traditional education

- Provides students with a learning environment with little attention to whether or not students ever learn the material.
- Students are given grades and rankings compared to each other – students become exam oriented or CGPA driven.
- Graduates are not completely prepared for the workforce.
- Lack of emphasis on soft skills needed in jobs e.g. communication skills, interpersonal skills, analytical skills, working attitude etc.

Expectations of students under OBE – the outcome

- Students are expected to be able to do more challenging tasks other than memorize and reproduce what was taught.
- Students should be able to: write project proposals, complete projects, analyze case studies, give case presentations, show their abilities to think, question, research, and make decisions based on the findings.
- Be more creative, able to analyze and synthesize information.
- Able to plan and organize tasks, able to work in a team as a community or in entrepreneurial service teams to propose solutions to problems and market their solutions.
- Students should be enriched on three dimensional scales of knowledge, skill and attitude throughout the course.

3. PROCESS OF DEFINING VISION AND MISSION OF THE DEPARTMENT

The following steps are followed to establish Vision and Mission of Department.

Step 1: The Vision & Mission of the Institute is taken as the basis.

Step 2: The Department conducts brain-storming sessions with the faculty and Department Academic Committee (DAC) on the skill-set required by the local and global employers, Industry Advances in Technology and R & D, and the draft copy of the Vision and Mission of the Department is drafted.

Step 3: The department circulates these statements among the stakeholders of the programme such as Industry, Faculty, Alumni, Parents & Employer and collects the views to refine the draft Vision and Mission statements.

Step4: Department Academic Committee (DAC) based on stakeholder's feedback revises the draft version based on their inputs.

Step 5: These draft statements are forwarded to the Department Advisory Board (DAB) to look into the relevance and consistency with the Vision and Mission of the institute.

Step 6: The accepted views are analysed and reviewed by IQAC to check the consistency with the vision and mission of the institute.

4. PROCESS OF DEFINING PSOs AND PEOs OF THE DEPARTMENT

- The Program curriculum is adopted as per university regulation since we affiliated to VTU, Belagavi
- Inputs are obtained from alumni and other stake holders. Also the inputs are considered from reports like WEF's Future of Jobs, India skills, FICCI and Deloitte.
- Besides, a skill in demand analysis is carried out periodically at the Academic council, Programme Assessment Committee and Department Advisory committee to identify the core areas in the Program domain that are consistent with industry needs.
- The Centre of Excellence in the department is established based on core areas in the program.
- PSOs are defined based on the Centre of Excellence of the Department. A list of 2 to 4 Program Specific Outcomes (PSOs) that the graduates of the program will attain will be listed here.
- The PEOs are established to reflect the career and professional accomplishments of the graduates based on the three behavioral elements of Knowledge, Skill and Attitude.

5. THE PROGRAM OUTCOMES (POS) DEFINED BY NATIONAL BOARD OF ACCREDITATION (NBA)

The POs essentially indicate what the students can do from subject-wise knowledge acquired by them during the program. As such, POs define the professional profile of an engineering graduate. NBA has defined the following twelve POs for an engineering graduate. These are in line with the Graduate Attributes as defined by the Washington Accord.

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, 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 for complex problems.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling 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 lifelong learning in the broadest context of technological change.

6. PUBLICATION AND DISSEMINATION:

The Vision, Mission statement of the Department and Institution, CO statements, PSO statements, PO and PEO statements are reached to all the students and stake holders of the department. The process of publication and dissemination is described below.

- College Website
- Principal Room
- Department
- HOD Chamber
- Laboratories
- Department Library
- Classrooms
- Lab Manuals
- Course files
- News Letter
- Department Magazines

7. OBE FRAMEWORK

The OBE model measures the progress of the graduate in four parameters, which are

- Program Educational Objectives (PEO)
- Program Specific Outcomes (PSO)
- Program Outcomes (PO)
- Course Outcomes (CO)

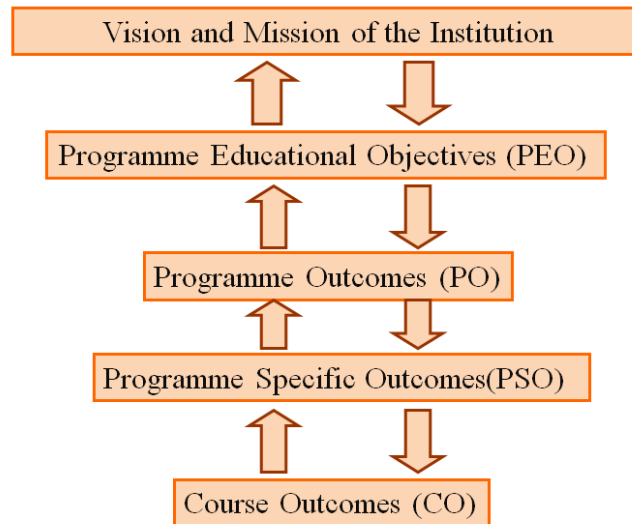


Figure 1. Parameters of Outcome Based Education (OBE)

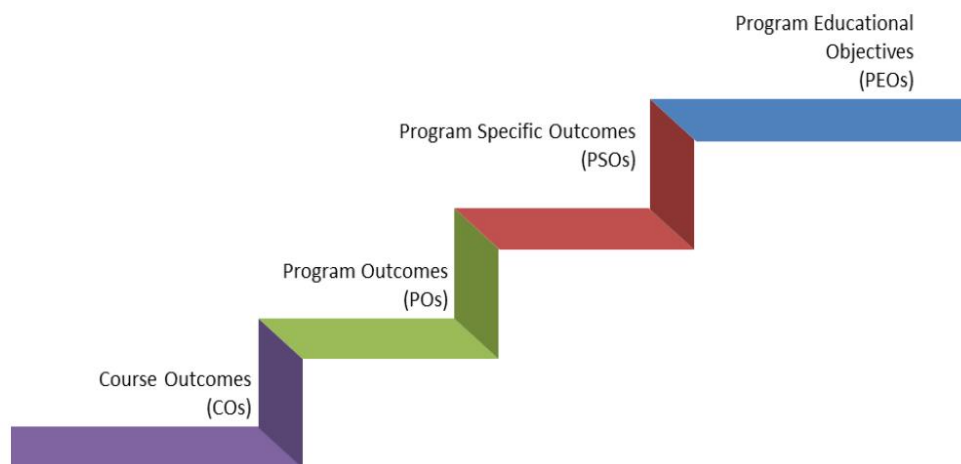
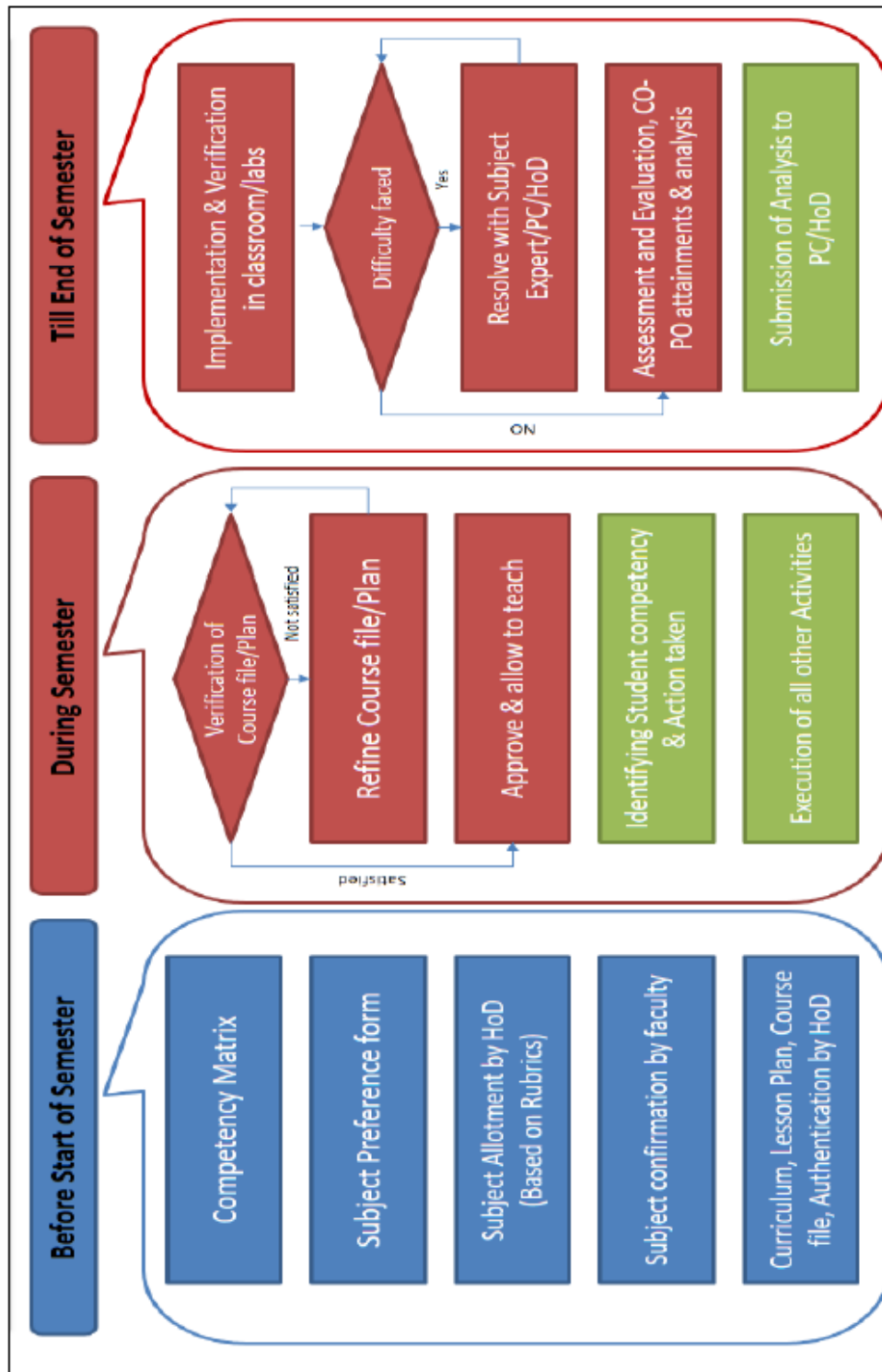


Figure 2: Process for the evaluation of Programme Outcomes POs, PSOs and PEOs

OBE Framework for an Institute



8. COURSE OUTCOME STATEMENTS

Course Outcomes (COs): Statements indicate, what a student can do after the successful completion of a course. Every Course leads to some Course Outcomes. The CO statements are defined by considering the course content covered in each module of a course. For every course, Course outcomes are written module wise and there may be 5 or 7 COs. The keywords used to define COs are based on Bloom's Taxonomy.

Well-written course outcomes involve the following parts:

1. Action verb
2. Subject content
3. Level of achievement as per BTL
4. Modes of performing task (if applicable)

Illustration:

Students are able to

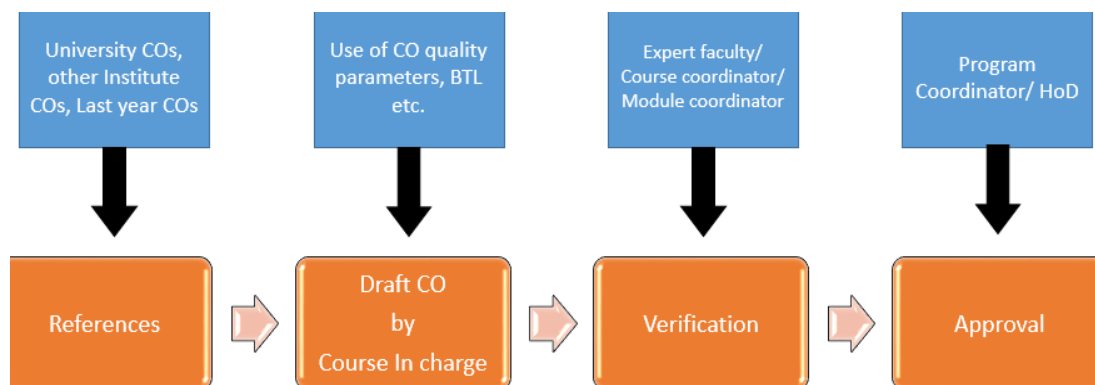
- 1) Design column splices and bases → action verb (underline)
- 2) Determine the losses in a flow system → Subject content
- 3) Use structural analysis software to a competent level. → level of achievement
- 4) Present seminar on real life problems → Modes of performing task with action verb

While writing COs the following questions/points must be addressed properly.

Specific	Is there a description of precise behavior and the situation it will be performed in? Is it concrete, detailed, focused and defined?
Measurable	Can the performance of the outcome be observed and measured?
Achievable	With a reasonable amount of efforts and application can the outcome be achieved? Are you attempting too much?
Relevant	Is the outcome important or worthwhile to the learner or stakeholder? Is it possible to achieve this outcome?
Time-Bound	Is there a time limit, rate number, percentage or frequency clearly stated? When will this outcome be accomplished?

Quality of Course Outcome

Process at department level to maintain quality of CO



BLOOM'S TAXONOMY

Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr. Benjamin Bloom in order to promote higher forms of thinking in education, such as analysing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. It is most often used when designing educational, training, and learning processes. Bloom's Taxonomy should be applied when creating objectives. At the end of the learning process, the goal of Bloom's taxonomy is that a student has sharpened a new skill, level of knowledge, and/or developed a different attitude towards the subject.

Bloom's Taxonomy comprises of three learning domains: cognitive, affective, and psychomotor. Designers, trainers, and educators often refer to them as KSA (Knowledge [cognitive], Skills [psychomotor], and Attitudes [affective]). After a learning experience, the learner should possess a new skill, knowledge, and/or attitude. The Figure presented here depicts the hierarchy of skills in the cognitive domain.

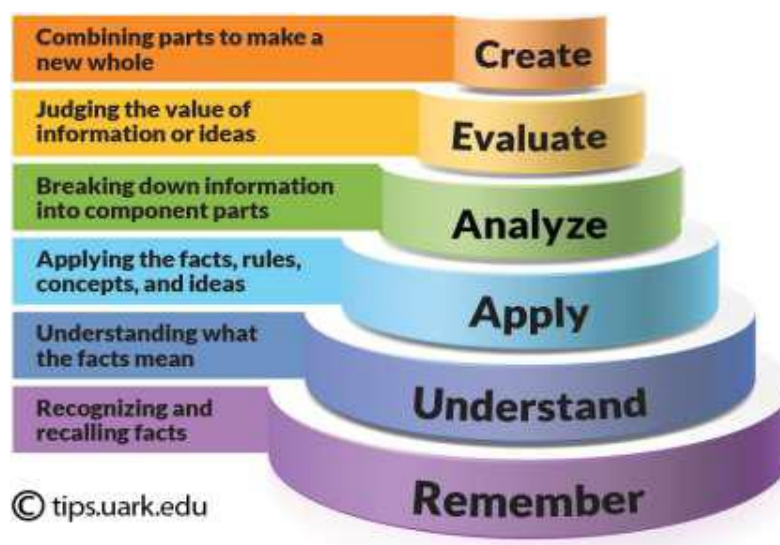


Figure 3: BLOOM'S TAXONOMY

Blooms Taxonomy		
Domains	Keywords	Example
Remembering: Recall or retrieve previous learned information.	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces selects, states	Recite a policy. Quote prices from memory to a customer. Recite the safety rules.
Understanding: Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	Comprehends, converts, defends, estimates, explains, extends, generalizes, gives an example, infers, interprets, distinguishes, paraphrases, predicts, rewrites, summarizes, translates	Rewrite the Principles of test writing. Explain in one's own words the steps for performing a complex task. Translate an equation into a computer spreadsheet.
Applying: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the workplace.	Applies, changes, computes, constructs, demonstrates, shows, discovers, modifies, manipulate, operates, predicts, produces, prepares, relates, solves, uses	Use a manual to calculate an employee's vacation time. Apply laws of statistics to evaluate the reliability of a written test.
Analyzing: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	Analyzes, breaks down, relates, compares, contrasts, diagrams, differentiates, identifies, illustrates, discriminates, distinguishes, infers, outlines, selects, separates deconstructs,	Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training.
Evaluating: Make judgments about the value of ideas or materials.	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, evaluates, explains, interprets, justifies, discriminates, summarizes, supports, relates,	Select the most Effective solution. Hire the most qualified candidate. Explain and justify a new budget
Creating: Builds a structure or pattern from diverse elements. Put	Categorizes, combines, compiles, composes, creates, devises, designs, explains,	Write a company Operations or process manual. Design a machine

parts together to form a whole, with emphasis on creating a new meaning or structure.	generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes	to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome
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The cognitive process dimensions- categories					
Lower Order of Thinking (LOT)			Higher Order of Thinking (HOT)		
Knowledge	Understand	Apply	Analyse	Evaluate	Create
Recognizing (identifying)	Interpreting	Executing	Differentiating	Checking (coordinating, detecting, testing, monitoring)	Planning
Recalling (retrieving)	Illustrating	Implementing	Organizing		Generating
	Classifying		Attributing	Critiquing (judging)	Producing (construct)
	Summarizing				
	Inferring (concluding)				
	Comparing				
	Explaining				



The Knowledge Dimension			
Concrete Knowledge		Abstract knowledge	
Factual	Conceptual	Procedural	Metacognitive
• Knowledge of terminologies • Knowledge of specific details & elements	• Knowledge of classifications and categories • Knowledge of principles & generalizations • Knowledge of theories, models & structures	• Knowledge of subject specific skills and algorithms • Knowledge of subject specific techniques and methods • Knowledge of criteria for determining when to use appropriate procedures	• Strategic Knowledge • Knowledge about cognitive task, including appropriate contextual and conditional Knowledge • Self- Knowledge

9. CO-PO Mapping Guidelines

All the courses in the curriculum must cover all the POs (and PSOs). For a course, we map the COs to POs through the CO-PO matrix and to PSOs through the CO-PSO matrix in Course Information sheet (CIS).

PROCESS INVOLVED IN CO-PO MAPPING

The role of CO-PO mapping will be assigned to the Course instructor (faculty) involved in the teaching-learning process of that particular course. After the course (subject) allotment by the department, the Module co-ordinator of the course has to write appropriate COs for their corresponding course discussing with course handling faculty members. It should be narrower and measurable statements. By using the action verbs of learning levels (Bloom's Taxonomy), CO's will be designed and written. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behavior that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. The Course Outcome attainment coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual students extra-curricular and co-curricular activities for PO attainment evaluation.

1. **Map COs to POs:** Each CO is mapped to relevant POs (direct or indirect contribution).
2. **Use a Correlation Level Scale:**

Level	Meaning
1	Low correlation
2	Medium correlation
3	High correlation
-	No correlation

Rubrics for CO-PO Correlation Level

- A CO shouldn't map to all POs. Typically, 50% and above POs to be mapped per CO.
- **Provide evidence:** Each mapped PO should be supported by specific assessments.
- Use **Level 3** if the CO directly targets the knowledge or skills mentioned in the PO. CO **strongly contributes** to achieving the PO.

- Use **Level 2** if the CO supports or enhances the PO indirectly or partially. (CO **moderately contributes** to the PO).
- Use **Level 1** if the CO marginally targets to knowledge or skills in the PO. CO has and **minimal contribution** to the PO.
- Use **0** or leave blank if there's no alignment between the CO and the PO.

Correlation Level	Score	Description
High	3	CO strongly contributes to achieving the PO. - Assessed directly via major assessments (e.g., exam questions, projects). - If the CO directly targets the knowledge or skills mentioned in the PO.
Moderate	2	CO moderately contributes to the PO. - Assessed through some activities or assignments. - If the CO supports or enhances the PO indirectly or partially.
Low	1	CO has a minimal contribution to the PO. - Evidence is weak or partial. - If the CO contributes marginally.
No Correlation	-	CO does not contribute to the PO. No direct or indirect relationship.

Example (CO-PO Justification Based on Rubric):

CO Statement	Mapped PO	Correlation	Justification
Apply Newton's laws to solve engineering problems	PO1 (Engineering Knowledge)	3	Strong conceptual application tested via problem-solving in tests
Prepare lab reports and communicate results	PO10 (Communication)	2	Report writing and presentations partially assessed
Use Excel for basic data analysis	PO5 (Modern Tool Usage)	1	Limited use in one assignment only

CO Target Setting Process:

The target (or set) attainment level should be fixed by the Course coordinator based on the previous year results and quality of current batch of students. Target setting is used to define a measurable benchmark for student achievement of each CO.

Steps to Set CO Targets:

1. Define Assessment Tools:

- Internal exams (IA-1, IA-2, etc.)
- Assignments, labs, projects
- End Semester Exam (SEE)

2. Weightage for CIE and SEE

- CIE=60% SEE=30% CES =10%

3. Threshold for CIE and SEE:

- Threshold for CIE $\geq 70\% = L3$, $\geq 60\% = L2$ $\geq 40\% = L1$
- Threshold for SEE $\geq 60\% = L3$, $\geq 50\% = L2$ $\geq 35\% = L1$

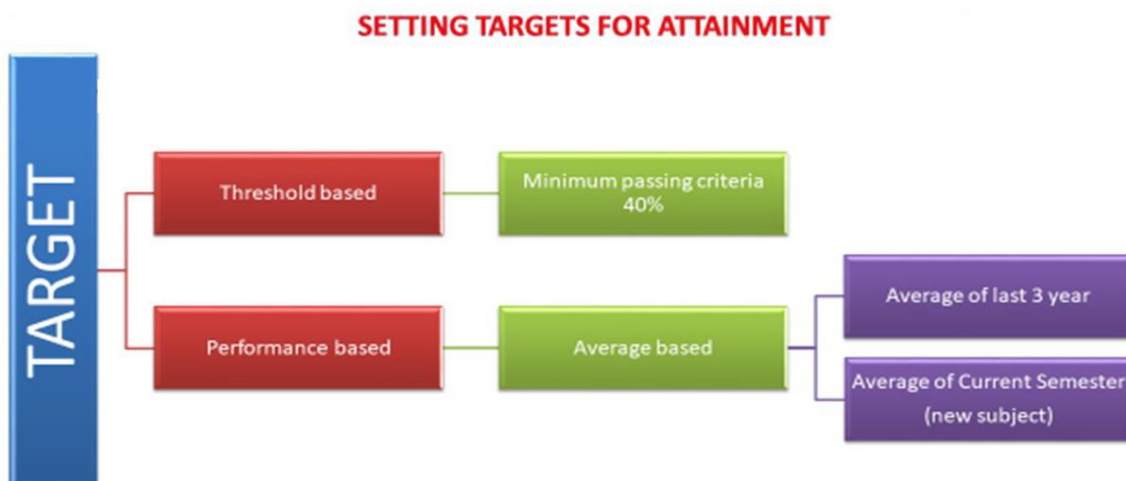
4. Select target Marks and Target attainment on:

- Past Student performance
- Course Difficulty level
- Bloom's Taxonomy level of the CO

Rubric for setting target marks and target attainment for CIE:

Target scores are set for each CO as per the following procedure:

- a. If the average CO attainment over the past three years, ie, $((CAYm1 + CAYm2 + CAYm3)/3) \geq 1.8$, the target marks shall be increased by 5% (ie., 65% if the already set value is 60%) otherwise keep the target marks same as that in the previous year. Once the target marks is increased by 5%, that value is maintained for 2 academic years.
- b. If any of the CO fails to attain the required level (≥ 1.8), the target marks is sustained and this procedure is repeated in the subsequent year.
- c. For practical courses set the minimum target marks as 70% and an increment of "5%" (ie., 75% if the already set value is 70%), can be given if the required target level is met (If avg. CO attainment ≥ 2.1).



Level is the set percentage of students scoring the set target score in percentage.
3 levels of attainment are defined as 1-Low; 2-medium; 3- High

Example: If the set target marks is 60%

- Level 3 indicates 70% of students score $\geq 60\%$ of marks of the particular CO.
- Level 2 indicates 60% of students score $\geq 60\%$ of marks of the particular CO.
- Level 1 indicates 40% of students scoring $\geq 60\%$ of mark of the particular CO.

Target Attainment	Target marks	CO Target Description	Typical Criteria
$\geq 70\%$	$\geq 60\%$	70% of students attain $\geq 60\%$ marks	• Used for foundational or well-supported topics with high student engagement. • CO with L1 and L2 RBTL
$\geq 60\%$	$\geq 60\%$	60% of students attain $\geq 60\%$ marks	• Used for moderately challenging topics. • CO with L3 RBTL
$\geq 40\%$	$\geq 60\%$	40% of students attain $\geq 60\%$ marks	• Used for complex or abstract topics, or newly introduced concepts. • CO with L4 and above RBTL

• **Rubric for Attainment in SEE**

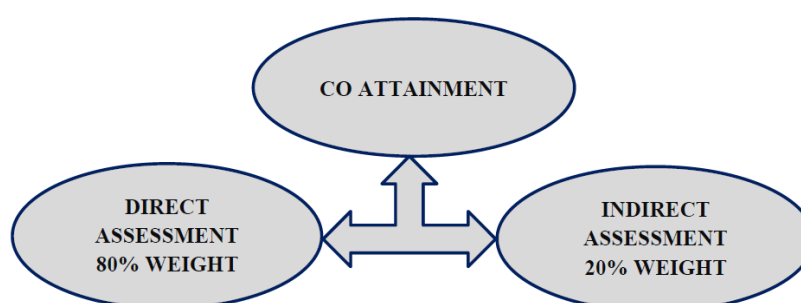
Target Attainment	Target marks	CO Target Description	Typical Criteria
$\geq 50\%$	$\geq 50\%$	$\geq 50\%$ of students attain $\geq 50\%$ marks	• Common for all COs i.e Equal Weightage to all COs

10. CO ATTAINMENT ASSESSMENT

AIT has its own well defined course outcomes based on the syllabus of each course provided by the University. Both direct and indirect method of assessment is followed for Course Outcome (CO) attainment assessment. The weightage for direct attainment is 80% while that for indirect attainment is 20%. The various assessment tools for direct attainment assessments are Internal Tests, Mid -Semester and End Semester Examination and Assignments. The indirect tool used is Course End Survey. A standard excel template has been implemented in the institute to assess periodically the attainment of course outcomes and also program outcomes by the courses.

The standardised template has the following information.

- The course outcome statements have defined for each course by the team comprising of DAC members, domain experts and faculty members through meetings.
- The threshold values and target percentage for Continuous Internal Evaluation (CIE) and for Semester End Examination (SEE) were set through the department academic committee and course coordinators based on the previous university results of students.
- The weight percentages are defined for components like CIE, SEE and CES which contributes to final attainment of the course outcomes.
- All course outcomes are mapped to PO's and PSO's in the scale of 1 to 3 by the help of DAC members, domain experts and faculty members.
- The final course outcomes, program outcomes and program specific outcomes attainments are computed by using standardised excel template considering the weight percentages accounting CIE, SEE and CES.



Attainment of COs

- Attainment of COs can be measured directly and indirectly.
- Direct attainment of COs can be determined from the performances of students in all the relevant assessment instruments.
- Indirect attainment of COs can be determined from the course end survey.
- The course end survey form should permit receiving feedback from students on all the COs.

Direct CO attainment

- Direct attainment of COs is determined from the performances of students in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- The proportional weightages of CIE: SEE: CES will be as per the academic regulations in force. Proportions of 60:30:10 are all possible!
- Direct attainment of a specific COs is determined from the performances of students to all the assessment items related to that particular CO.
- Hence, every assessment item needs to be tagged with the relevant CO.

Direct CO attainment from CIE

- Continuous Internal Evaluation (CIE) is conducted and evaluated by the Department itself. Thus, institutions have access to question-wise marks in all assessment instruments in CIE.
- When questions are tagged with relevant COs, the department has access to performances of students with respect to each CO.
- Hence, computing the direct attainment of COs from CIE is straight forward for Tier 2 institutes.

Direct CO attainment from SEE

- However, Semester End Examination (SEE) is conducted and evaluated by the University (VTU) in Tier 2 institutes. Thus the departments get only total marks scored in SEE and not question-wise marks!
- The average marks in SEE taken as the common attainment of all COs (Equal Weightage to all COs).

CO-PO attainment Computation Procedure:

STEP-1: For every subject 5-7 course outcomes (CO) are defined and mapped to Program outcomes (PO) on a scale of 1 to 3. Highest correlation is 3. For example as shown in fig. 1 and fig. 2

Number of Course Outcomes for the course - C311		5	Set Target(%)		
CO No	Statements of Course Outcomes	MARKS	ATN	BL	
C311.1	Apply finite element methods to solve engineering problems, formulate boundary conditions, and select appropriate elements.	70	60	3	
C311.2	Use finite element methods to analyze 1D bars, trusses, and 2D elements, using higher-order interpolation and numerical integration	70	60	3	
C311.3	Evaluate displacement, stress, and torsion in beams and shafts using finite element analysis and appropriate boundary conditions.	70	60	3	
C311.4	Implement finite element methods to analyze heat transfer and fluid flow, emphasizing conduction, convection, and radiation.	70	60	3	
C311.5	Solve axisymmetric and dynamic problems using finite element methods for mass, stiffness, and eigenvalue analysis.	70	60	3	

Fig 1. Course Outcome’s ID, Description, Target marks in percentage and Blooms Level

11	CO-PO Mapping Table (In the scale of 3)													CO-PSO Mapping Table				
12	CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	CO/PO	1	2	3	4
13	C311.1	2	3	1	2	1	2		1	1	1		2	C311.1		1		
14	C311.2	2	3	1	1		2		1				1	C311.2		1		
15	C311.3	2	3	1	1		2		1				1	C311.3		1		
16	C311.4	2	3	2	2		2		1				1	C311.4		2		
17	C311.5	2	3	2	1		2		1				1	C311.5		2		
18																		
19																		
20																		
21																		
22																		
23	Total	10	15	7	7	1	10		5	1	1		6	Total		7		

Fig 2. Mapping of Course Outcomes to the Program Outcomes (POs) and Program Specific Outcomes (PSOs)

STEP 2: Maximum marks allotted to each question, mapped to a cognitive level and the corresponding CO. Record the percentage of students achieving a set percentage of max marks allotted to an individual CO in a given IAT. For example as shown in fig.3 ,

	A	B	C	D	E	F	G	H	I	J	K	L
1	AIT/NBA/ CIE-MARKS/ 2023-24		ACHARYA INSTITUTE OF TECHNOLOGY Bengaluru – 560 107 Department of Mechanical Engineering									
2												
3	Course Title:		FINITE ELEMENT METHODS									
4	Course Code:		18ME61	Semester & Section				6 - A	No.Students	10		
5	Course Instructor Name:		Dr. MANJUNATHA B					Course ID:	C311			
6			Test No:1									
7	Ref-Question Number:		1	2	3	4	5	6	7	8	9	10
8			CIE Marks Entry Format For the Academic Year - 2022-23									
9	Questions		1,2	3,4	5,6	7,8		cra1	cra2	asg1	asg2	
10	Main Question No.		1	2	3	4		1	2	1	2	
11	Mapped CO-No.		1	1	2	3		2	4	5	5	
12	Sl.	USN/Q-Marks	10	10	15	15		10	10	10	10	
13	1	1AY20ME400	10	8	13	14		9	4	10	9	
14	2	1AY20ME401	10	8	12	15		8	9	6	10	
15	3	1AY20ME402		8	10	14		6	8	5	5	
16	4	1AY20ME403	2	8	15	15		7	4	9	5	
17	5	1AY20ME404	4	10	4	14		10	10	10	6	
18	6	1AY20ME405	8	6	10	12		8	9	7	5	
19	7	1AY20ME406	10	8	10	14		5	5	9	8	
20	8	1AY20ME407	5	8	15	15		5	8	5	9	
21	9	1AY20ME408	10	8	6	8		10	4	9	10	
22	10	1AY20ME409	5	9	5	15		5	9	4	3	

Fig 3. CIE Marks Entries against each CO and Student wise

Below table summarizes the CO attainment calculation and interpretation of Excel Template values

Sl.	USN	Max Marks -20 & Sum of Scored marks against CO-1 only	CO attainment Calculation For CO-1 Refer Qn No. 1 & 2	Attainment of CO
1	1AY20ME400	18	$(18/20)*100 = 90\% \Rightarrow 70\%$	CO Attained
2	1AY20ME401	18	$(18/20)*100 = 90\% \Rightarrow 70\%$	CO Attained
3	1AY20ME402	8	$(8/10)*100 = 80\% \Rightarrow 70\%$	CO Attained
4	1AY20ME403	10	$(10/20)*100 = 50\% \leq 70\%$	CO Not Attained
5	1AY20ME404	14	$(19/20)*100 = 95\% \Rightarrow 70\%$	CO Attained
6	1AY20ME405	14	$(14/20)*100 = 70\% \Rightarrow 70\%$	CO Attained
7	1AY20ME406	18	$(18/20)*100 = 90\% \Rightarrow 70\%$	CO Attained
8	1AY20ME407	13	$(13/20)*100 = 65\% \leq 70\%$	CO Not Attained
9	1AY20ME408	18	$(18/20)*100 = 90\% \Rightarrow 70\%$	CO Attained
10	1AY20ME409	14	$(14/20)*100 = 70\% \Rightarrow 70\%$	CO Attained

Refer to the Excel template.

By executing the attainment command, you will get either 1 or blank (empty). 1 means attained Blank (empty) means not attained.

This indicates that the scored marks percentage is less than or greater than the threshold percentage

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	AIT/NBA/ CO-ATNT/ 2023-24		 ACHARYA INSTITUTE OF TECHNOLOGY Bengaluru – 560 107 Department of Mechanical Engineering															
3	Course Title		FINITE ELEMENT METHODS								Course ID		C311					
4	Course Code		18ME61	Semester	6	Section	A		Emp.ID		AI00024							
5	Course Instructor		Dr. MANJUNATHA B								No.students		10					
7	Course Outcome Analysis of students -SUB, Academic Year 2023-24																	
8	Sl.	USN	Course Outcome Number			CO1	CO2	CO3	CO4	CO5								
9			Total Maximum Marks			20	25	15	10	20								
10	1	1AY20ME400	ABHILASH			1	1	1		1								
11	2	1AY20ME401	ABHISHEK H			1	1	1	1	1								
12	3	1AY20ME402	AKASH R N			1		1	1									
13	4	1AY20ME403	AKRAMKHAN H				1	1		1								
14	5	1AY20ME404	AKSHAY L			1		1	1	1								
15	6	1AY20ME405	ANIKETH S			1	1	1	1									
16	7	1AY20ME406	BADRI TELU			1		1		1								
17	8	1AY20ME407	BORAPPANAYAKA				1	1	1	1								
18	9	1AY20ME408	CHAITRANJALI			1				1								
19	10	1AY20ME409	CHANDAN C			1		1	1									
22				Students Attained			8	5	9	6	7							
23				Total Students			10	10	10	10	10							
24				% Attainment			80	50	90	60	70							
25				Attainment Level			3	1	3	2	3							

Fig 4. Number of students attained, Total students, Percentage of attainment and Attainment Level

STEP 3: Performances of a student from CIE (Two/three IA and Assignments) are used for calculating attainment levels for CO1. The process is described below.

Condition IF S3 % of students score $\geq$ M3% of Max marks allotted to CO - Attainment Level 3

ELSE IF S2% of students score $\geq$ M2% of Max marks allotted to CO - Attainment Level 2

ELSE IF S1% of students score $\geq$ M1% of Max marks allotted to CO - Attainment Level 1

In our Institute we have set % of student S3, S2, S1 as 70%,60%,40% and % marks M3,M2,M1 as 60%

	CIE, SEE, CES - Threshold Values for Attainment Levels							Set Target Percentage			
	Attainment level	3	%	2	%	1	%	Marks		Attainment	
18											
19											
20	Internal Assessment, IA	$\geq$	70	$\geq$	60	$\geq$	40	SEE, %	50	SEE, %	60
21	SE Examination, SEE	$\geq$	60	$\geq$	50	$\geq$	40	Set Target Level & Percentage			
22	Course End Survey, CES	$\geq$	70	$\geq$	60	$\geq$	40	CES, L	3	CES, %	60

Fig 5. Different Attainment Levels and Threshold Values for Different Components of TLP

STEP 4: Repeat the above condition to evaluate all COs

STEP 5: Calculate the CO attainment of the course based on CIE and VTU University Examinations using the below formula.

Attainment Level = $\left(\frac{\text{Number of Students Attained}}{\text{Total Students}}\right) \times 100$ Example: Attainment level 3 = $\left(\frac{8}{10}\right) \times 100 = 80\%$ Refer the Threshold Table for deciding Attainment level The Calculated 80% is more than 70%, therefore CO-1 Attainment Level is 3 Note: Same Procedure shall be followed for calculating other CO attainment Levels
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For Internal Exam
Level 3 is 70% of students scoring $\geq 60\%$ of marks allocated to CO.
Level 2 is 60% of students scoring $\geq 60\%$ of marks allocated to CO.
Level 1 is 40% of students scoring $\geq 60\%$ of marks allocated to CO.

CO Attainment Calculation Procedure for the SEE (External Examinations)

If the student scores more than or equal to 50% marks. Such student attained in the COs. Refer the threshold table for deciding the Level of attainment. From the table, Level of attainment is 3 if number of students attained are $\geq 60\%$ Level of attainment is 2 if number of students attained are $\geq 60\%$ Level of attainment is 1 if number of students attained are $\geq 60\%$
--

49	Format for Entry of Semester End Examination Marks								50	50	100
50	Sl.	USN	NAME	CIE	SEE	TOT	Result	Class	ATNT	Grade	Rank
51	1	1AY20ME400	ABHILASH	34	47	81	PASS	FCD	1	9	1
52	2	1AY20ME401	ABHISHEK H	34	22	56	PASS	SC		6	4
53	3	1AY20ME402	AKASH R N	27	49	76	PASS	FCD	1	8	2
54	4	1AY20ME403	AKRAMKHAN H	24	32	56	PASS	SC	1	6	4
55	5	1AY20ME404	AKSHAY L	25	10	35	FAIL			0	8
56	6	1AY20ME405	ANIKETH S	27	42	69	PASS	FC	1	7	3
57	7	1AY20ME406	BADRI TELU	25	24	49	PASS	SC		4	7
58	8	1AY20ME407	BORAPPANAYAKA	33	22	55	PASS	SC		6	5
59	9	1AY20ME408	CHAITRANJALI	28	21	49	PASS	SC		4	7
60	10	1AY20ME409	CHANDAN C	27	25	52	PASS	SC	1	5	6

Fig 6. Attainment of CO from the SEE

The Level of attainment from the SEE is 2 as 50% students attained, i.e., the number of students obtained 50% and more are more than or equal to 50% but less than 60%. The total COs attainment from CIE and SEE is computed as described below

24	Weight %, for Final CO attainment (CIE+SEE+CES)						Weight %, CO Attainment			
25	CIE	60	SEE	40	CES	0	Direct	100	Indirect	0
26										

Fig 7. Weight Percentage allocated for CIE and SEE

Let us consider CO attainment from SEE is 3. Then the overall CO attainment is calculated as follows:

Total CO1 attainment = CO1 attainment from CIE x wt% + CO1 attainment from SEE x wt%

Total CO1 attainment = 3 x 0.6 + 2 x 0.4 = 2.6

	A	B	C	D	E	F	G	H	I	J	K	L	M	N		
1	AIT/NBA/ CO-PO-PSO REPT/ 2023-24		 ACHARYA INSTITUTE OF TECHNOLOGY Bengaluru – 560 107 Department of Mechanical Engineering													
2																
3	Course Title		FINITE ELEMENT METHODS									Course Code		C311		
4	Subject Code		18ME61		Semester		6		Section		A		Emp.ID		AI00024	
5	Faculty Name		Dr. MANJUNATHA B									No.students		10		
6																
7	Summary of CO attainments of Sub: 18ME61 in the Academic Year:2023-24															
8	CO	CID_CO	CIE			SEE			CES			TOT_Attainment				
S_AT			T_ST	ATN	S_AT	T_ST	ATN	S_AT	T_ST	ATN	ATN	%	Status			
9																
10	CO1	C311.1	8	10	3	5	10	2				2.6	87	YES		
11	CO2	C311.2	5	10	1	5	10	2				1.4	47	NO		
12	CO3	C311.3	9	10	3	5	10	2				2.6	87	YES		
13	CO4	C311.4	6	10	2	5	10	2				2	67	YES		
14	CO5	C311.5	7	10	3	5	10	2				2.6	87	YES		
15																

STEP 7 Program outcomes attained through the attainment of COs. For a given course, all COs are mapped to certain POs, as shown in STEP 1. The overall CO attainment value as computed in STEP 7 and the CO-PO mapping values given in the STEP 1 used to compute the attainment of POs.

Course wise PO attainment can be computed for a course using the below formula.

*Attainment of PO1 = (Mapped Value of CO – 1 to PO 1) /
Sum of Mapped Values for PO1 + (Mapped Value of CO – 2 to PO 1)/
Sum of Mapped Values for PO1, +...*

Note: Consider the COs which are mapped to PO-1 only, Refer the Table shown in Figure 2

PO attainment is calculated as follows (Note: Total of CO as follows

CO1 = 2.6, CO2 = 1.4, CO3 = 2.6 (Calculations are described above, but for CO4 = 2.0 and CO5 = 1.8 are considered for the reference and understanding purpose only)

PO-1 attainment = (2/11) x CO-1 attainment + (2/11) x CO-2 attainment+ (2/11) x CO-3 attainment+ (2/11) x CO-4 attainment+ (2/11) x CO-5 attainment

PO-1 attainment = (2/7) x 2.6 +(1/7) x 1.4+(2/7) x 2.6+(1/7) x 2.0+(1/7) x 2.6 = 2.2

21	Summary of PO attainments of Sub: 18ME61 in the Academic Year:2023-24												
22	PO Number	1	2	3	4	5	6	7	8	9	10	11	12
23	Direct ATNT(D)	2.2	2.2	2.3	2.3	2.6	2.2		2.2	2.6	2.6		2.3
24	Indirect ATNT(ID)	0	0	0	0	0	0		0	0	0		0
25	Total-ATNT	2.2	2.2	2.3	2.3	2.6	2.2		2.2	2.6	2.6		2.3
26	Total-ATNT (%)	73	73	77	77	87	73		73	87	87		77
27													

Fig 8. Table shows PO attainment from direct (CIE+SEE), indirect (CES) and Total attainment (Direct + Indirect)

STEP 8 PO attainment can be computed for a batch using the below formula. Indirect attainment is determined from student exit surveys, employer surveys, co-curricular activities, extracurricular activities and mapped to POs. A questionnaire was designed for this purpose and the average response of the outgoing students for each PO is computed.

Batch PO attainment can be computed for a batch using the below formula.

PO/PSO attainment = (CO attainment * CO-PO Mapping)/Max correlation strength

Final PO attainment for a particular batch = 0.8 * Direct Attainment + 0.2 * Indirect attainment

CO Assessment Process for Various Courses in The Curriculum

Course outcomes of all courses are assessed with the help of below-mentioned assessment tools and attainment level is evaluated based on set attainment rubrics. The curriculum is a bundle of various components like Theory courses, Theory with Lab components, Laboratory courses, Mini-Projects, Projects and Internships /Implant training / Technical seminar.

Theory Courses				
Method	Assessment Tools	Marks	weightage	Regulation
Direct Assessment	Continuous Internal Evaluation	40		2018
	Semester End Examination	60		
Indirect assessment	Course End survey			
Direct Assessment	Continuous Internal Evaluation	50		2021 & 2022
	Semester End Examination	50		

Indirect assessment	Course End survey			
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Mini/Main Projects				
Method	Assessment Tools	Marks	weightage	Regulation
Direct Assessment	Continuous Internal Evaluation	40		
	Semester End Examination	60		
Indirect assessment	Course End survey			

Internships/Technical Seminar				
Method	Assessment Tools	Marks	weightage	Regulation
Direct Assessment	Continuous Internal Evaluation	40		
	Semester End Examination	60		
Indirect assessment	Course End survey			

Sample CO Attainment Calculations

CO attainment from the Marks

Threshold Values for Attainment Calculation						
Attainment level	3	%	2	%	1	%
Internal Assessment	>=	70	>=	60	>=	40
SE Examination	>=	60	>=	50	>=	35

Questions	1,2	3,4
Main Question No.	1	2
Mapped CO-No.	1	2
Sl. USN/Q-Marks	10	10
1 BT001	9	10
2 BT002	6	4
3 BT003	5	8
4 BT004	10	8
5 BT005	9	7
6 BT006	5	7
7 BT007	4	8
8 BT008	3	9
9 BT009	10	10
10 BT010	8	9

Questions	1,2	3,4
Main Question No.	1	2
Mapped CO-No.	1	2
Sl. USN/Q-(%)	100	100
1 BT001	90	100
2 BT002	60	40
3 BT003	50	80
4 BT004	100	80
5 BT005	90	70
6 BT006	50	70
7 BT007	40	80
8 BT008	30	90
9 BT009	100	100
10 BT010	80	90
70% and above	5	9

Number of Students having

CO-1 Attainment Calculation

$$= \frac{5}{10} \times 3 = 1.5 \quad \text{1.5 means 50 \% students have } \geq 70 \% \text{ Marks}$$

CO-2 Attainment Calculation

$$= \frac{9}{10} \times 3 = 2.7 \quad \text{2.7 means 90 \% students have } \geq 70 \% \text{ Marks}$$

	Attainment Level					
Level	3	%	2	%	1	%
%	>=	70	>=	60	>=	40
Range	>=	2.1	>=	1.8	>=	1.2

CO-1 Attainment Level

Attainment value = 1.5

Attainment level = 1

CO-2 Attainment Level

Attainment value = 2.7

Attainment level = 3

PO attainment from the Matrix of CO-PO mapping

CO-PO Mapping Table												
PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2											
CO2	1	2										
CO3	2	2	1									1
CO4	1	2	1									1

(Reference values only)

Total		
CIE-60	SEE-30	CES-10
1.2		
2.0		
0.2		
2.0		

PO - Weight and Attainment												
Total	6	6	2									2
Attainment	1.1	1.4	1.1									1.1

$$\begin{aligned}
 \text{PO-1 attainment} &= (2/6) * \text{CO-1} + (1/6) * \text{CO-2} + (2/6) * \text{CO-3} + (1/6) * \text{CO-4} \\
 &= (2/6) * 1.2 + (1/6) * 2.0 + (2/6) * 0.2 + (1/6) * 2.0 \\
 &= 1.13 \quad (\text{It means } 1.13/3 = 37.7 \% \text{ PO-1 attained, or } 2.26 \text{ out of } 6 \text{ PO-1 attained})
 \end{aligned}$$

11. PROGRAM OUTCOME (PO)/PROGRAM SPECIFIC OUTCOME (PSO) Assessment

At the end of the each program, the PO/PSO assessment is done from the CO attainment of all curriculum components. As per NBA guidelines, program can appropriately define the attainment level. For the evaluation and assessment of PO's and PSO's, assessment tools are used.

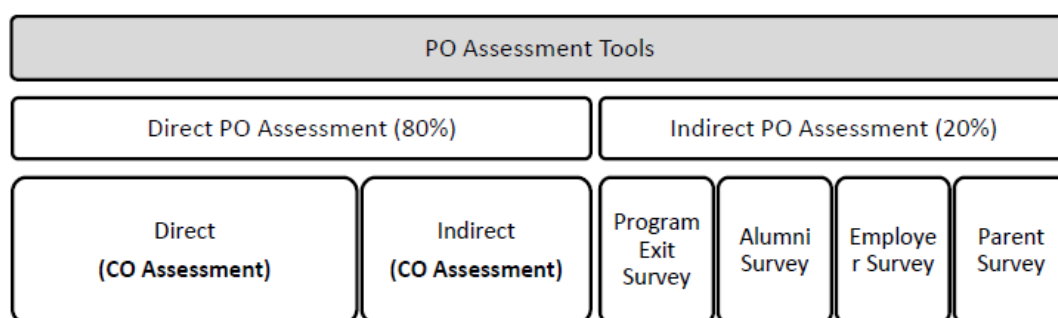
All (Direct + Indirect) CO assessment tools = PO Direct assessment tools

Sample CO assessment Tools

- CIE
- SEE
- Quiz
- Assignment
- Practical/ Lab work
- Industrial Visit, Workshop
- Other Task/Activity
- Course End Survey

Direct Tools: (Measurable in terms of marks and w.r.t. CO) Assessment done by faculty at Department level

Indirect Tools: (Non measurable in terms of marks and w.r.t. CO) Assessment done at Department Level



The Program Outcome (PO) attainment and Program Specific Outcome (PSO) attainments are evaluated by direct method with 80% weightage and indirect method with 20% weightage. The Direct attainment level of Particular PO /PSO is determined by taking average of all course outcomes mapping that program Outcome.

Indirect attainment level of PO/PSO is determined based on Surveys and Co-curricular activities. Out of 100%, 30% weightage is given to co-curricular activities and 70% weightage to Surveys. This 100% weightage is converted to 20 % scale for PO attainment calculation.

The various Surveys taken are Student exit survey, Employer survey, Alumni survey and Parents feedback. The co-curricular activities are Value added Courses, Workshops etc related to the unattained POs(less mapped POs in CO-PO matrix). The PO/PSO Attainment Level is fixed as Maximum level of 3 & Minimum level of 1.

Course End Survey: The course end survey is based on the feedback taken from the students after studying each course.

Graduate Exit survey: The graduate exit survey is based on the feedback collected from graduates at the end of the program.

Alumni Feedback: This feedback is about how effectively they can able to implement their knowledge acquired through BE- Programme in their workplace.

Employer Feedback: This feedback is about how alumni of department can able to implement their knowledge in the company.

Parent’s Feedback: This feedback is collected from the parents about their satisfaction in the knowledge, skill and employment level of their wards.

Co-curricular activities:

- Workshops
- Placement training programs
- Value added courses in Modern trends

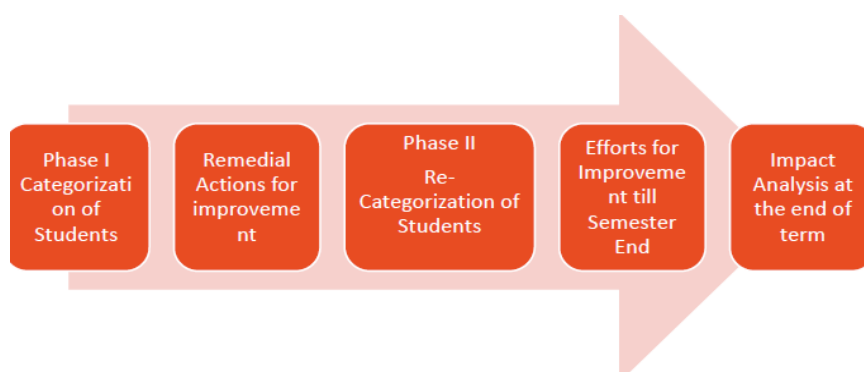
Batch PO attainment can be computed for a batch using the below formula.

PO/PSO attainment = (CO attainment * CO-PO Mapping)/Max correlation strength

Final PO attainment for a particular batch = 0.8 * Direct Attainment + 0.2 * Indirect attainment

12. STUDENT COMPETENCY

Chart of action plan for categorization of students as slow learners, average learners and advanced learners.



Guidelines for First Year

Phase I- Categorization (After 15 Days of start of semester)	Phase II- Re-categorization (After CIE Result)
12th Marks	CIE Result
Prerequisite Test	Timely Completion of work
Surprise Test after 15 days	Lab Performance
Attendance & Behaviour	Attendance & Behaviour
Previous Semester University Result (Applicable for Sem-II)	

Guidelines for Higher Classes

Phase I- Categorization (After 15 Days of start of semester)	Phase II- Re-categorization (After CIE Result)
Previous semester University Result whichever is available	CIE Result
Prerequisite Test	Timely Completion of work
Surprise Test after 15 days	Lab Performance
Attendance & Behaviour	Attendance & Behaviour
Previous semester University Result	

Base Score for student category

<40% - Slow Learner

40% to 65% - Average Learner

>65% - Advanced Learner

Strategies for Slow, Average and Advanced Learners***For Slow learners***

- Document/record of remedial classes with timetable & attendance
- Specially designed assignment/ task
- Student study group for peer-to-peer learning
- Individual Counselling

Note: Remedial sessions should be conducted once every week

For Average Learners

- Additional assignment/ task
- Encouraging for timely and effective completion of work
- Conduction of quiz, orals etc.
- Solving previous year University question papers and test papers
- Presentation on technical topics/ case studies/mini projects

Note: Activities should be on continuous basis

For Advanced Learners

- Encouraging to present & publish papers in journals/conferences/competitions
- Guidance for GATE/ competitive Examination
- Encouraging to participate in professional activities.
- Special guidance for career building

Note: Activities should be on continuous basis

13. CONTINUOUS IMPROVEMENT

A) Contribution of CO in PO attainment and Continuous Improvement (Faculty Level)

Outcome	Action to be taken by faculty
All CO-PO attained highly (>2.5 out of 3)	Set new higher targets or attainment levels for next Academic Year (A.Y.).
All CO-PO attained moderately (1.8 to 2.49 out of 3)	Record observations, Continue action plan of last A.Y. with plan for improvements.
All CO-PO attained lowly (0.9 to 1.79 out of 3)	Record observations, assess the target set, revise/improve action plan of last A.Y. to achieve the attainment with plan for improvements.
CO-PO not attained, poor performance (<0.9 out of 3)	Record observations, Critical assessment of target with Program Assessment Committee (PAC), Revise action plan of last A.Y. at faculty/department level.

B) PO attainment and Continuous Improvement (PC and HoD Level)

Category	Outcome	Action by PC and HoD
Course related	PO attained highly	Include activities with HOD.
	PO not attained highly	Identify concerned courses, plan for immediate improvements, guide, support and monitor its execution.
Activity related	Activities Conducted	Critical assessment, impact analysis to be done and revise as per the need for improvements

Document Prepared by:

Internal Quality Assurance Cell(IQAC)
Acharya Institute of Technology

Date: April 2025

Verified and Entrusted by:

Coordinator
Internal Quality Assurance Cell (IQAC)

Principal
Acharya Institute of Technology

