INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad– 500043

Department of Mechanical Engineering

Attainment of Program Outcomes (POs) and Program Specific Outcomes (PSOs) of 2019 - 2023 batch (IARE - R18)

S. No	Subject	Course Number	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	Linear Algebra and Calculus	C101	AHSB02	1.8	1.4													
2	Waves and Optics	C102	AHSB04	1.9	1.6		1.7									1.3		
3	Programming for Problem Solving	C103	ACSB01	0.8	0.8	0.5		0.7							0.7	1.6		0.7
4	Engineering Physics Laboratory	C104	AHSB10	2.3	2.3		2.3											
5	Programming for Problem Solving Laboratory	C105	ACSB02	2.3				2.3					2.3				2.3	2.3
6	Workshop Manufacturing Practices Laboratory	C106	AMEB01	2.3		2.3		2.3						2.3				2.3
7	English	C107	AHSB01										2.7					
8	Mathematical Transform Techniques	C108	AHSB11	2.2	1.6		2.8									1.7		
9	Engineering Chemistry	C109	AHSB03	2	2.2					1.8								
10	Basic Electrical and Electronics Engineering	C110	AEEB04	1.5	1.2											1.7		
11	English Language and Communication Skills Laboratory	C111	AHSB08									2	2					
12	Engineering Chemistry Laboratory	C112	AHSB09	2.7	2.7													
13	Engineering Graphics and Design Laboratory	C113	AMEB02	2		2		2										2
14	Basic Electrical and Electronics Engineering Laboratory	C114	AEEB08	1.6							1.6	1.6	1.6		1.6			

S. No	Subject	Course Number	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
15	Engineering Mechanics	C201	AMEB03	1.7	1.7		1.7									1.5		
16	Thermodynamics	C202	AMEB04	2.4	2.7	1.9	2.9		2.9								2.5	
17	Manufacturing Processes	C203	AMEB05	2.9	2.6	2.3	2.8											2.6
18	Probability and Statistics	C204	AHSB12	2	2.6		2.1											
19	Data structures	C205	ACSB03	2.3	2.3	2.5	2.3	2.4					2.4		2.3			
20	Manufacturing Processes Laboratory	C206	AMEB06	2.3	2.3	2.3												2.3
21	Machine Drawing Through CAD Laboratory	C207	AMEB07		2.7	2.7	2.7	2.7				2.7	2.7			2.7		
22	Data structures Laboratory	C208	ACSB05	2.3	2.3	2.3	2.3	2.3	2.3		2.3	2.3	2.3		2.3			
23	Fluid mechanics and Machines	C209	AMEB08	1	1.1		0.7											1.2
24	Applied Thermodynamics - I	C210	AMEB09	1.3	1.3	1.2	1.1										1.1	
25	Kinematics of Machines	C211	AMEB10	1.4	1.5	1.7	1.2	1.2		1.2	1.2		1.7	1.2	1.2	1.2		1.7
26	Materials and Mechanics of Solids	C212	AMEB11	1.5	1.5	1.2									1.7	1.7		1.2
27	Optimization Techniques	C213	AMEB12	2.3	2.3	2.6	2.8	2.8						2.3	2.4			1.7
28	Fluid Machinery and I.C Engines Laboratory	C214	AMEB13	3		3		3										3
29	Materials and Mechanics of Solids Laboratory	C215	AMEB14	2.3	2.3	2.3						2.3				2.3	2.3	
30	Optimization Techniques Laboratory	C216	AMEB15	2.3	2.3	2.3		2.3										2.3
31	Design For Manufacturing	C217	AMEB48	1.3	1.3	1.3		1.3		1.3						1.3	1.3	
32	Manufacturing Technology	C301	AMEB16	2.2	2.6	2.9										2.5		

S. No	Subject	Course Number	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
33	Dynamics of Machinery	C302	AMEB17	1.2	1.2	1.2	1.2	1		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
34	Applied Thermodynamics-II	C303	AMEB18	1.7	1.5	1.2	2.4		1.2	1.2					2.4		1.9	
35	Automobile Engineering	C304	AMEB33	1.2	1.2	1.2			1.2	1.2							1.2	
36	Airframe Structural Design	C305	AAEB54	1.3	1.2			1.2								1.2		
37	Project Based Learning (Prototype / Design Building)	C306	AHSB15	2.3	2.3	2.3	2.3						2.3		2.3	2.3	2.3	2.3
38	Manufacturing Technology Laboratory	C307	AMEB19	2.3	2.3			2.3										2.3
39	Theory of Machines Laboratory	C308	AMEB20	2.3	2.3			2.3				2.3						2.3
40	Refrigeration and Air-Conditioning	C309	AMEB31	1.1	0.9		1.3			1.3					1		1.1	
41	Business Economics and Financial Analysis	C310	AHSB14	2.4	2.4						2.3	2.4		2				
42	Heat Transfer	C311	AMEB21	1.1	1.1	1.1	1.2		1.1	1.1							1.2	
43	Finite Element Methods	C312	AMEB22	1.1	1.1	1.2	1.2	1.2							1.1		1.2	1.2
44	Design of Machine Elements	C313	AMEB23	0.8	0.9	0.5										0.6		0.6
45	Computational Fluid Dynamics	C314	AMEB35	1.3	1.2	1	1.1	1									1.5	1.1
46	Relational Database Management Systems	C315	ACSB34	1.3	1.3	1.1										1.2		
47	Research Based Learning (Fabrication / Model Development)	C316	AHSB16	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
48	Heat Transfer Laboratory	C317	AMEB24	2.3	2.3			2.3	2.3									2.3
49	Fluid Thermal Modeling and Simulation Laboratory	C318	AMEB25	2.4	2.4	2.4	2.4	2.4	2.4		2.4	2.4	2.4	2.4	2.4		2.4	2.4
50	CAD/CAM	C401	AMEB26	1.9	2.3	2		1.4		1.9				2	1.2	1.8	1.3	

S. No	Subject	Course Number	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
51	Instrumentation and Control Systems	C402	AMEB27	1.8	1.7												2.3	
52	Advanced Machine Design	C403	AMEB42	1	1	1		0.4						0.8	0.8	0.8		0.8
53	Intellectual Property Rights	C404	AHSB22	2.2					1.7		2.1		2		2.1			
54	CAD/CAM Laboratory	C405	AMEB28	2.3	2.3											2.3		
55	Instrumentation Control Systems and PDP Laboratory	C406	AMEB29	2.7	2.7			2.7				2.7					2.7	
56	Project Work - (phase - I)	C407	AMEB58	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
57	Production Planning and Control	C408	AMEB52	2.7	2.8	2.8			2.8					2.8	2.6	2.7		2.6
58	Microprocessors and Interfacing	C409	AECB55	1.2	1.4	1.5							1.4			1.3		
59	Project Work - (phase - II)	C410	AMEB59	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Direct Attainment Value				**1.9**	**1.9**	**1.9**	**2**	**2**	**2.1**	**1.6**	**2.1**	**2.3**	**2.2**	**2.1**	**1.8**	**1.8**	**1.9**	**2**

Overall Attainment

S.No	Assessment Components (Direct + Indirect)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	Direct Assessment (CIA + SEE + Course End Survey) (a)	1.9	1.9	1.9	2	2	2.1	1.6	2.1	2.3	2.2	2.1	1.8	1.8	1.9	2
2	Program Exit Survey (b)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3
3	Alumni Survey (c)	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2	2	2.1	2.1	2.2	2.2	2.2	2.3
4	Employer Survey (d)	2.4	2.4	2.6	2.4	2.4	2.5	2.4	2.4	2.5	2.3	2.4	2.5	2.4	2.4	2.6
Final attainment = a*0.8 + b*0.1 + c*0.05 + d*0.05		**1.9**	**1.9**	**1.9**	**2**	**2**	**2**	**1.6**	**2**	**2.2**	**2.1**	**2**	**1.8**	**1.8**	**1.9**	**2**

Actions taken based on the results of evaluation of each of the POs &PSOs

Measures identified and implemented to improve POs & PSOs attainment levels.

POs Attainment Levels and Actions for improvement

<table>
<tr><th>POs</th><th>Target Level</th><th>Attainment Level</th><th>Observation</th></tr>
<tr><td colspan="4">PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</td></tr>
<tr><td>PO1</td><td>2.1</td><td>1.9</td><td>Target is not achieved. The following observations are made:
Still there is scope to increase attainment levels for the courses Engineering Mechanics [AMEB03] and Basic Electrical and Electronics Engineering [AEEB04].</td></tr>
<tr><td colspan="4">Action:
In Engineering Mechanics [AMEB03], Assignments will be given for the topics like principle of virtual work for particle & ideal system of rigid bodies and problems in Mechanical vibrations.
Additional problems will be conducted on Basic Electrical and Electronics Engineering [AEEB04].</td></tr>
<tr><td colspan="4">PO2: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.</td></tr>
<tr><td>PO2</td><td>1.8</td><td>1.9</td><td>Target level has been Achieved. The following observations are made:
This can be improved further in courses like Fluid Mechanics & Machines [AMEB08], Applied Thermodynamics - I [AMEB09], and Kinematics of Machines [AMEB10].</td></tr>
<tr><td colspan="4">Action :
In Fluid Mechanics and Machines [AMEB08], some of the topics like Moody’s diagram and Exact flow solutions in channels and ducts explained with more example programs to enhance the problem analysis and solving ability.
In Applied Thermodynamics -I [AMEB09], tutorial sessions will be taken for the application of theory to real life problem.
Additional problems will be conducted on Kinematics of Machines [AMEB10], to accomplish good results.</td></tr>
<tr><td colspan="4">PO3: 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.</td></tr>
<tr><td>PO3</td><td>1.8</td><td>1.9</td><td>Target level has been Achieved. The following observations are made:
Attainment can be increased further in this course Design of Machine</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>Elements [AMEB23].</td></tr>
<tr><td colspan="4">Action:
1. Additional classes will be conducted on Design of Machine Elements [AMEB23] to achieve design solutions for complex engineering problems.</td></tr>
<tr><td colspan="4">PO4: 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.</td></tr>
<tr><td>PO4</td><td>1.8</td><td>2.0</td><td>Target level has been Achieved. The following observations are made:
• Attainment can be increased further in these courses Dynamics of Machinery [AMEB17], and Computational Fluid Dynamics [AMEB35].</td></tr>
<tr><td colspan="4">Action:
1. Tutorial classes should conduct for topics like brakes and clutches in Dynamics of Machinery [AMEB17].
2. Extra classes will be planned beyond regular class work for Computational Fluid Dynamics [AMEB35]. .</td></tr>
<tr><td colspan="4">PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.</td></tr>
<tr><td>PO5</td><td>2.1</td><td>2.0</td><td>Target is not achieved. The following observations are made:
• This PO attainment can be increased for the course CAD/CAM [AMEB26].</td></tr>
<tr><td colspan="4">Action:
1. CAD/CAM [AMEB26] concepts will be taught using Auto CAD open-source tool for better understanding.
2. Conducted value added course on CNC part programming for getting the knowledge of code writing.</td></tr>
<tr><td colspan="4">PO6: 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.</td></tr>
<tr><td>PO6</td><td>1.8</td><td>2.0</td><td>Target level has been Achieved. The following observations are made:
• This PO attainment can be increased for the course Heat transfer [AMEB21].
• It becomes apparent that the students engage in fewer social activities and are more aware of fundamental safety and health concerns from an engineering perspective.
• Students deserve more focus on these characteristics of professional careers.</td></tr>
<tr><td colspan="4">Action:
1. In Heat transfer [AMEB21], Additional class will be taken for the topics like Biot and Fourier numbers, concept of Hydrodynamic and thermal entry lengths. .
2. Students are being encouraged to start participating in projects related to the environment, and societal issues which include examples related to Autonomous quadcopter for fire-fighting operations, Design and Analysis of Heavy lift drone for agricultural applications,</td></tr>
</table>

Development of drone with fire extinguisher, and natural fibre composites.

3. Students visited industries to expand their practical knowledge and gain comprehension of the social and safety aspects that comprise improved techniques for engineering.
4. Project works on advanced solar water heater with electricity generation.

PO7: 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.

PO7	**1.8**	**1.6**	**Target is not achieved. The following observations are made:** • Low attainment is observed in the courses refrigeration and Air-conditioning [AMEB31] and Design for manufacturing [AMEB48]. • The issues of global and environmental responsiveness among the student should be improved. • The concept of sustainability should reach the students.

Action:

1. Projects involving natural fibre composite materials, Solar Powered Cart for Street Vendors and portable solar water purifiers are encouraged for students.
2. To comprehend the influence of professional engineering solutions in societal and environmental contexts and the necessity of bringing about sustainability in overall development, courses and expert lectures that deal with environmental and sustainability issues have been presented.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	**1.8**	**2.0**	**Target level has been Achieved. The following observations are made:** • Low attainment is observed in the courses Dynamics of Machinery [AMEB17], and Kinematics of Machines [AMEB10]. • Along with technical knowledge, ethical knowledge should be included while teaching the programming courses

Action :

1. Tutorial classes should conduct for topics like balancing of reciprocating masses in Dynamics of Machinery [AMEB17], Analysis of mechanisms and gear trains in Kinematics of Machines [AMEB10] will be explained with a greater number of examples.
2. To educate the students to maintains the ethics during the design and fabrication project.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9	**1.8**	**2.2**	**Target level has been Achieved. The following observations are made:** • Students are ready to work both independently and together. • Low attainment is observed in the course Basic Electrical and Electronics Engineering Laboratory [AEEB08]

Action :

1. Group of students participated in the national level competitions such as, SAE – SUPRA, SAE student convention, SAE Aero modelling, Flipkart Robotic challenge, Design challenges at various National Level Institutes.
2. The laboratory work of the students is conducted by framing student groups so that students learn to work in a team environment.

PO10: 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.

PO10	**1.8**	**2.1**	**Target level has been Achieved. The following observations are made:** • Presentation skills need to be improved further among other medium students. • This PO attainment can be increased for the course Microprocessors and interfacing [AECB55].

Action :

1. Students that are seen to be weak in communication skills are encouraged to undergo relevant courses and are also referred to language lab for improving their communication skills.
2. In project-based learning and research-based learning, faculties are instructed to give students reviews and project presentations in English language only.
3. Microprocessors and interfacing [AECB55] assignments will be given for the topic Introduction to DOS and BIOS interrupts.

P11: 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.

PO11	**1.8**	**2.0**	**Target level has been Achieved. The following observations are made:** • Multidisciplinary projects are observed as a gap. • This PO attainment can be increased for the course Advanced Machine Design [AMEB42].

Action 1: :

1. Students are encouraged to organize department association club (MESTA) activities like (Technical/Non-Technical) to increase their management skills.
2. Special classes will be organized to understand the principles of financial analysis of projects.
3. Worm and bevel gears is a topic covered in the Advanced Machine Design [AMEB42] assignments..

P12: 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.

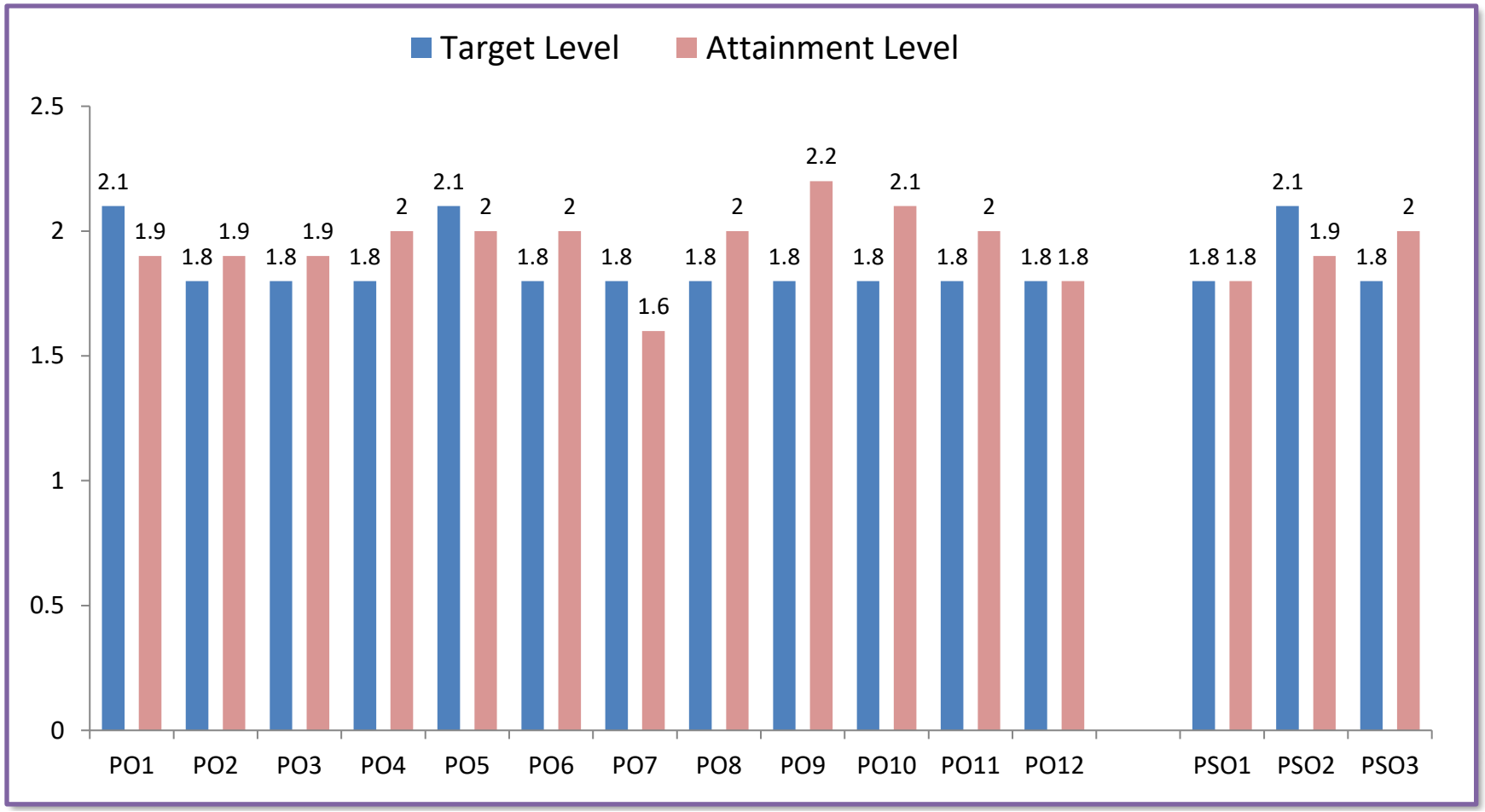
PO12	**1.8**	**1.8**	**Target level has been Achieved. The following observations are made:** • This PO attainment can be increased for the course Program for problem solving [ACSB01],

Action:

1. Industrial visits will be arranged for the ability to engage in independent and life-long learning.
2. Students are motivated to do online courses like COURSERA and UDEMY on recent technologies.
3. In Program for problem solving [ACSB01] extra classes will be touched on Pointers and file handling algorithms to make the student understand better.

PSOs Attainment Levels and Actions for improvement

PSOs	Target Level	Attainment Level	Observation
PSO1: Focus on Ideation and Research towards Digital manufacturing in Product development using Additive manufacturing, Computer Numerical Control (CNC) simulation and high speed machining.			
PSO1	**1.8**	**1.8**	**Target level has been Achieved. The following observations are made:** • This PO attainment can be increased for the course Waves and Optics [AHSB04].
Action: 1. In Waves and Optics [AHSB04] additional classes are being conducted to concepts like Attenuation in optical fibres and Harmonic waves. 2. Students are motivated to take up the real-life problems during their project work so that they can design, analyse and find solution which gives exposure to latest technologies.			
PSO2: Formulate and Evaluate concepts of Thermo-Fluid Systems to provide solutions for Inter Disciplinary Engineering Applications.			
PSO2	**2.1**	**1.9**	**Target is not achieved. The following observations are made:** • Low attainment is observed in the course of Applied Thermodynamics [AMEB09].
Action : 1. In Applied thermodynamics [AMEB09], more practice will be given to solve more problems on Heat balance sheet, Velocity diagrams, and use of p-h carts for calculations			
PSO3: Make use of Computational and Experimental tools for Building Career Paths towards Innovation Startups, Employability and Higher Studies.			
PSO3	**1.8**	**2.0**	**Target level has been Achieved. The following observations are made:** • Low attainment is observed in the course Programming for problem solving [ACSB01] .
Action: 1. Students will be motivated to enrol for higher studies and entrepreneur. 2. In the course Programming for problem solving [ACSB01], extra classes will be conducted on topics Parameter passing mechanisms and pointer basics to make the student understand better			



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