



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad– 500043

Mechanical Engineering

Attainment of Program Outcomes (POs) and Program Specific Outcomes (PSOs) of 2018 - 2022 batch (IARE - R18)

S.No	Subject	COURSE	Sub Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	Airframe Structural Design	C101	AAEB54	1.10	1.00													
2	Programming for Problem Solving	C102	ACSB01	1.30	1.50		1.20									2.10		
3	Programming for Problem Solving Laboratory	C103	ACSB02	1.00	1.00	0.50		0.80							0.70	2.20		0.70
4	DATA STRUCTURES	C104	ACSB03	2.30	2.30		2.30											
5	DATA STRUCTURES LABORATORY	C105	ACSB05	1.60				1.60					1.60					
6	Relational Database Management Systems	C106	ACSB34	2.00		2.00		2.00						2.00				2.00
7	Microprocessors and Interfacing	C107	AECB55										2.80					
8	Basic Electrical and Electronics Engineering	C108	AEEB04	1.70	0.90		1.20									0.90		
9	Basic Electrical and Electronics Engineering Laboratory	C109	AEEB08	0.80	1.00					1.20								
10	English	C110	AHSB01	0.50	0.40											0.40		

11	Linear Algebra and Calculus	C111	AHSB02									2.30	2.30					
12	Engineering Chemistry	C112	AHSB03	1.60	1.60													
13	Waves and Optics	C113	AHSB04	1.60	1.60	1.60		1.60										1.60
14	English Language and Communication Skills Laboratory	C114	AHSB08	2.30							2.30	2.30	2.30		2.30			
15	Engineering Chemistry Laboratory	C201	AHSB09	1.40	1.20		0.60									0.70		
16	Engineering Physics Laboratory	C202	AHSB10	1.60	1.90	1.30	2.10		2.10								1.60	
17	Mathematical Transform Techniques	C203	AHSB11	1.80	1.80	1.60	1.30		1.80	1.80						1.60		1.80
18	Probability and Statistics	C204	AHSB12	1.40	1.50		1.10											
19	Business Economics and Financial Analysis	C205	AHSB14	1.40	1.40	1.60	1.20	1.60					1.70		1.50			
20	Project Based Learning (Prototype / Design Building)	C206	AHSB15	2.10	2.10	2.10			2.10	2.10	2.10	2.10	2.10		2.10	2.10		2.10
21	Research Based Learning (Fabrication / Model Development)	C207	AHSB16		1.70	1.70	1.70	1.70				1.70	1.70			1.70		
22	Soft Skills and Interpersonal Communication	C208	AHSB18	1.60	1.60	1.60	1.60	1.60	1.60		1.60	1.60	1.60		1.60			
23	Workshop Manufacturing Practices Laboratory	C209	AMEB01	1.50	1.50		0.70											2.30
24	Engineering Graphics and Design Laboratory	C210	AMEB02	2.20	2.30	2.20	2.40											2.40
25	Engineering Mechanics	C211	AMEB03	1.80	2.10	1.80	1.30	2.10		1.20	1.80		2.30	1.80	1.30	1.80		
26	Thermodynamics	C212	AMEB04	1.80	2.10	1.40									2.00	1.20		2.30
27	Manufacturing Processes	C213	AMEB05	2.30	2.30	2.40	2.60	2.60						2.30	2.30			2.20

28	MANUFACTURING PROCESSES LABORATORY	C214	AMEB06	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
29	MACHINE DRAWING THROUGH CAD LABORATORY	C215	AMEB07	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
30	FLUID MECHANICS AND MACHINES	C216	AMEB08	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
31	APPLIED THERMODYNAMICS - I	C217	AMEB09	2.60	2.90	2.60		2.40	2.40	2.40							2.60	
32	KINEMATICS OF MACHINES	C218	AMEB10	2.30	2.20	2.10			2.80	2.10	2.80						2.40	2.20
33	MATERIALS AND MECHANICS OF SOLIDS	C301	AMEB11	2.50	2.50	2.90											1.80	
34	OPTIMIZATION TECHNIQUES	C302	AMEB12	2.60	2.80	2.60	2.40	2.90		2.90	2.20	2.20	2.90	2.20	2.40	2.20	2.40	
35	FLUID MACHINERY AND I.C ENGINES LABORATORY	C303	AMEB13	1.30	1.30	1.50	1.60		1.50	2.10						1.60		1.00
36	MATERIALS AND MECHANICS OF SOLIDS LABORATORY	C304	AMEB14	0.80	0.80	0.70			0.70	0.70								0.80
37	OPTIMIZATION TECHNIQUES LABORATORY	C305	AMEB15	2.40	2.50			1.70									2.40	
38	Manufacturing Technology	C306	AMEB16	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
39	Dynamics of Machinery	C307	AMEB17	2.10	2.10			2.10	2.10	2.10	2.10	2.10	2.10	2.10		2.10	2.10	2.10
40	Applied Thermodynamics-II	C308	AMEB18	2.10	2.10	2.10	2.10	2.10		2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
41	Manufacturing Technology Laboratory	C309	AMEB19	2.10	2.10	2.40	2.50										1.20	1.20
42	Theory of Machines Laboratory	C310	AMEB20	1.30	1.30							0.90	1.00		1.10			

Direct Attainment Value	1.7	1.7	1.7	1.7	1.9	1.8	1.8	2	1.9	2	1.9	1.7	1.6	1.7	1.8
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Overall Attainment

S.No	Assessment Components (Direct + Indirect)	Program Outcomes (POs)														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	Direct Assessment (CIA + SEE + Course End Survey) (a)	1.7	1.7	1.7	1.7	1.9	1.8	1.8	2	1.9	2	1.9	1.7	1.6	1.7	1.8
2	Program Exit Survey (b)	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.2	2.2	2.3	2.3	2.4	2.3	2.2	2.2
3	Alumni Survey (c)	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3
4	Employer Survey (d)	2.6	2.5	2.5	2.5	2.4	2.5	2.5	2.5	2.6	2.5	2.5	2.5	2.6	2.5	2.5
Final attainment = $a*0.8 + b*0.1 + c*0.05 + d*0.05$		1.9	1.9	1.9	1.8	2	2	2	2	2	2.1	2	1.8	1.8	1.8	1.9

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

POs	Target Level	Attainment Level	Observation
PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	2.0	1.9	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> Mechanical engineering curriculum requires the strong foundation of theoretical and practical knowledge of science and mathematics, which the students study during their entire programme, especially in their first year, but improvement in correlating the theoretical concepts with applications is required.

			2. Students should give more attention to solve the subjects having critical thinking.
<p>Action:</p> <ol style="list-style-type: none"> 1. The department encouraging the students to participate in Professional activities/ Design challenges such as, SAE-SUPRA (Formula Student Racing Car), CII design, Robotic challenge by Flipkart, SAE Aeromodelling Competitions and SAE student conventions which enhanced their Engineering knowledge with defined level of their standards. 2. Additional classes are conducted for enhancing the mathematical fundamentals. 3. More tutorial sessions conducted for core subjects such as Applied thermodynamics, Kinematics of Machinery, Design of Machine Members and Thermal Engineering for problem solving. 4. Assignments will be given for practice. 			
<p>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.</p>			
PO2	1.5	1.9	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. Students should focus on real world Problems 2. Research exposure of the students to be enhanced.
<p>Action :</p> <ol style="list-style-type: none"> 1. More emphasize on tutorial classes for problem solving. 2. More problems of assignment and the observing the same on a regular basis. 3. Students are motivated to observe, their homes and surroundings to gain insight into real life engineering problems and think of possible approaches/solutions to these problems by interactive sessions. 4. Gained knowledge on complex engineering problems and solution on visiting field/ industry and internships. 5. Students are inspired to participate technical events like, Azadi ka Amrit Mahotsav and industry exhibitions air shows for developing an analytical mind which can work towards problem solving. 6. Students are encouraged to do their final project works in the areas of sustainable development goals. i.e,Waste management and waste recycling 			
<p>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.</p>			

<p style="text-align: center;">PO3</p>	<p style="text-align: center;">1.4</p>	<p style="text-align: center;">1.9</p>	<p>Target level has been Achieved. The following observations are made:</p> <p>Most of the projects developed by the student as course/ mini projects/ major projects (final year) are considering the social and environmental issues.</p>
<p>Action:</p> <ol style="list-style-type: none"> 1. More design classes to be taught in tutorial classes. 2. More emphasis on mathematical basic to be given in the previous course 3. Students are motivated to include all standard parameters and constraints according to National and International safety norms and to address environmental concerns. 4. Practical approach of teaching to be adapted. 5. Students are encouraged to involve in the industry consultation activities and provide solutions in the diversified areas which include, pharmaceutical industries, power transmission industries. 			
<p>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.</p>			
<p style="text-align: center;">PO4</p>	<p style="text-align: center;">1.4</p>	<p style="text-align: center;">1.8</p>	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. Develop the ability to experimentally analyze the problems through relevant softwares. 2. Most of the project works are research based where students have to design experiments analyses and synthesis the data, produce results and derive specific conclusions.
<p>Action:</p> <ol style="list-style-type: none"> 1. Conducted expert talk on emerging technologies for employing complex problem-solving methods by Industry and academia experts. 2. Courses are included and syllabi updated to include and inculcate the analysis and research skills. 			

PO5: 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.			
PO5	2.0	2.0	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. Students were needed to be encouraged to use the Design/Analysis tools for better opening for placements and/or higher studies. 2. It is perceived that Up-gradations of tools and resources are essential to meet the industry standards and research.
<p>Action:</p> <ol style="list-style-type: none"> 1. Conducted hands on training and certification programmes on modelling and simulation tools like, ANSYS, MATLAB, QForm, Fusion 360, Revit, Solid works and CATIA. 2. Conducted workshop on CNC Programming to prepare online and offline program techniques. 3. Training programs on basic Electro hydraulic and pneumatic technologies using trainer kits. 4. Students are taught with modern modes and methods of teaching like using interactive and digital boards and learning in smart class rooms equipped with real time lecture facilities. 5. The students are insisted to develop python coding for the mathematical modelling of their project work. 			
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.			
PO6	1.6	2.0	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. Exploration of problems faced by society were addressed. 2. The students are found to be less active as far as social activities were concerned; also, they are sensitized about the basic health and safety issues with engineering point of view. 3. Students need to be giving more significance to these

			dimensions in the professional career.
<p>Action:</p> <ol style="list-style-type: none"> 1. Students are encouraged to take up the project works on environment , health and social problems which include examples related to Desktop oil extraction Machine, Pharmaceutical Blending Machine, Rice planting and paddy cutting machines, Milk Extraction Machine, Rescue Robot in disaster management, and assistance in Mask design in the pandemic. 2. To understand the safety concerns and social aspects, students visited industry to expand their practical knowledge with the effect of improved practices in engineering 3. Project works on Experimental investigation of Effective Waste Recovery from Automotive Exhausts. 			
<p>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.</p>			
PO7	1.6	2.0	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. The issues of global and environmental responsiveness among the student should be improved. 2. The concept of sustainability should reach the students.
<p>Action:</p> <ol style="list-style-type: none"> 1. Students are encouraged to do projects on composite materials, Solar energy operated vehicle, Solar Refrigeration system. and alternate fuels (Bio fuel). 2. Courses and expert lectures, that deal with environmental and sustainability issues, have been introduced with the aim of understanding the impact of professional engineering solutions in societal and environmental contexts and understanding the need for bringing about sustainability in overall development. 3. Students are encouraged to do their final project works in the areas of sustainable development goals. i.e,Waste management and waste recycling 			
<p>PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</p>			
PO8	1.6	2.0	<p>Target level has been Achieved. The following observations are made:</p> <ol style="list-style-type: none"> 1. The students are doing better in improving the

			<p>overall expertise in field of engineering but due to less stress on communications and ethical/ moral knowledge, there is some lagging.</p> <p>2. Ethical practice of engineering system is implemented.</p>
<p>Action :</p> <p>1. Guest lectures are conducted to improve the moral values.</p> <p>2. Students are enthused and made aware about the demands of engineering profession, duties towards society & fellow human beings and importance of honesty and ethics.</p>			
<p>PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</p>			
PO9	1.6	2.0	<p>Target level has been Achieved. The following observations are made:</p> <p>The students seem ready for working both as individuals and in a team work.</p>
<p>Action :</p> <p>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.</p> <p>2. The laboratory work of the students is conducted by framing student groups so that students learn to work in a team environment.</p>			
<p>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.</p>			
PO10	1.6	2.1	<p>Target level has been Achieved. The following observations are made:</p> <p>The communication, presentation and report writing skills are to be further enhanced among the students.</p>
<p>Action :</p>			

1. Soft skill training is imparted to students to develop various expressions of communication or technical talks by group discussion, Business presentations, Budget estimations and new learning outcomes.
2. 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.
3. In the present curriculum students are presenting Teck-Talk and concept videos as a part of continuous internal assessment to improve their communication skills

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	1.5	2.0	<p>Target level has been Achieved. The following observations are made:</p> <p>Few courses of curriculum give information of Management principle and applying managerial principles to his/her work including financial inferences and to manage the project in multidisciplinary environments.</p>
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Action 1 :

1. The Project based learning and Research based Learning also studied for implementing their projects.
2. The awareness is created among the student regarding the management principles and managing projects. The relevant courses are revised and upgraded regularly to cater to latest techniques and trends in the area.

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	1.4	1.9	<p>Target level has been Achieved. The following observations are made:</p> <p>The pre final year and final year courses of the program are demonstrating the resource for contemporary issues and lifelong learning.</p>
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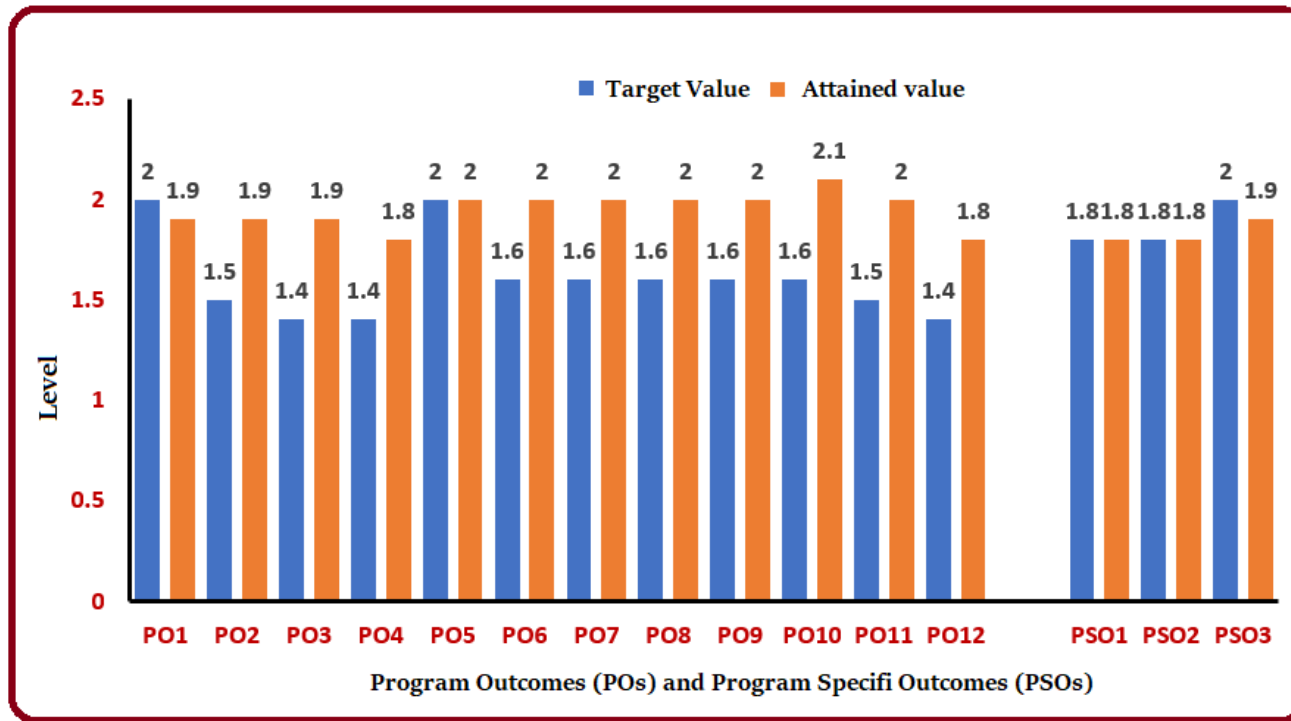
Action:

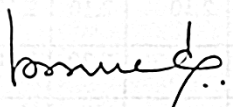
1. Expert talks for different topics were conducted in our institutions
2. Students are encouraged to take-up field visits, internships. Inplant training and field practisms to get the awareness on current industrial challenges.

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	1.5	1.8	Target level has been Achieved. The following observations are made: Different manufacturing methods and designs are used to develop/ implement, test, validate and maintain the Mechanical engineering foundation for industry. Publish/ exhibit/ innovate through conferences, journals etc.
Action: 1.CNC simulations and training is given to students with real time problems. 2. Concepts of Rapid prototyping and new developments are imparted to students. 3. Students are motivated to take up the real life problems during their project work so that they can design, analyze 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	1.8	1.8	Target level has been Achieved. The following observations are made: Concepts of Thermo-fluid systems provide various solutions through modelling and optimization methods.
Action : 1.Guest lecture arranged the following topics such as ANSYS CFD simulations, QForm for metal forming simulations, Aerodynamic testing of wing bodies, Turbine blades to enhance the simulation knowledge. 2.Academic workshops and conferences are coming into picture to apply more knowledge in terms of conduction of experiments and analysis as required			
PSO3 : Make use of Computational and Experimental tools for Building Career Paths towards Innovation Startups, Employability and Higher Studies.			
PSO3	1.6	2.0	Target level has been Achieved. The following observations are made: Computational and Experimental knowledge / skills to be transferred to the Mechanical engineers.
Action:			

1. Students are encouraged to participate in lectures conducted by MSME – Govt of India and NIT Ahmedabad to take up entrepreneurship and focus on Higher education and Research.
2. Project works are encouraged that involve the usage of modern tools and techniques of Data Collection/ Analysis/ Implementing




 Head of the Department
 Mechanical Engineering
 INSTITUTE OF AERONAUTICAL ENGINEERING
 Dundigal, Hyderabad - 500 043

HOD, ME