INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

AERONAUTICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	**AIRCRAFT MATERIALS AND PRODUCTION LABORATORY**				
Course Code	AAE105				
Programme	B.Tech				
Semester	IV	AE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	3	2
Chief Coordinator	Dr. D. Govardhan, Professor				
Course Faculty	Mr. S. Devaraj, Assistant Professor Mr. R. Suresh kumar, Assistant Professor				

I. COURSE OVERVIEW:

The aim of this course is to conduct experiments chiefly encompasses Metal casting, welding, riveting, machining using lathe, milling, shaping, drilling etc. It inculcates knowledge and skill to the students starting from preparing a wooden pattern to completion of a casting which also comprises different Sand testing techniques. Also, students can understand broadly Welding and Riveting and machining skills employed in Industries. Aircraft materials and Production lab also throws light on machining of materials by Lathe machine, Milling machine, Drilling machine and surface grinding machines.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AME101	I	Basic Workshop	2

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Aircraft Materilas and Production Laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✘	Quiz	✘	Assignments	✘	MOOCs
✘	LCD / PPT	✔	Demonstration	✔	Experimentation	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	**Laboratory**		**Total Marks**
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):
One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	**Performance**	**Calculations and Graph**	**Results and Error Analysis**	**Viva**	**Total**
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Lab Experiments
PO 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.	1	Lab Experiments
PO 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.	2	Lab Experiments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** Able to utilize the knowledge of aeronautical/aerospace engineering in innovative, dynamic and challenging environment for design and development of new products	2	Lab Experiments
PSO 2	**Problem solving skills**: imparted through simulation language skills and general purpose CAE packages to solve practical, design and analysis problems of components to complete the challenge of airworthiness for flight vehicles.	-	-
PSO 3	**Practical implementation and testing skills:** Providing different types of in house and training and industry practice to fabricate and test and develop the products with more innovative technologies	2	Lab Experiments
PSO 4	**Successful career and Entrepreneurship:** To prepare the students with broad aerospace knowledge to design and develop systems and subsystems of aerospace and allied systems and become technocrats.	1	Presentation on real-world problems

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand practical orientation of manufacturing processes.
II	Knowledge on different kinds of production processes and practices available for shaping or molding several daily used parts for industries.
III	Determine Micro structures for different materials like ferrous and non ferrous materials
IV	Understand different welding joints.
V	Understand different maching manufacturing processes.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AAE105.01	CLO 1	Understand the microstructures of ferrous materials.	PO 1, PO 2, PO 3	3
AAE105.02	CLO 2	Understand the micro structures of non ferrous and heat treated materials.	PO 1, PO 2, PO 3	3
AAE105.03	CLO 3	Demonstrate practical understanding of lathe machining and different operations	PO 1, PO 2, PO 3	3
AAE105.04	CLO 4	Demonstrate practical understanding of shaping machine and keyway cuttings.	PO 1, PO 2, PO 3	2
AAE105.05	CLO 5	Demonstrate and practical understanding of surface grinding and cylindrical grinding machine.	PO 1, PO 2, PO 3	2
AAE105.06	CLO 6	Demonstrate practical understanding drilling and different operation using drilling machine.	PO 1, PO 2, PO 3	2
AAE105.07	CLO 7	Introduction to CNC machining operations and demonstration of CNC machining.	PO 1, PO 2, PO 3	1
AAE105.08	CLO 8	Demonstrate practical understanding of gas welding, Brazing and soldering.	PO 1, PO 2, PO 3	1
AAE105.09	CLO 9	Demonstrate and practical understanding of ARC welding, Spot welding TIG and MIG	PO 1, PO 2, PO 3	2
AAE105.10	CLO 10	Demonstrate practical understanding of mould preparation and pattern making for sand casting and metal casting.	PO 1, PO 2, PO 3	2
AAE105.11	CLO 11	Demonstrate practical understanding of different riveting joints.	PO 1, PO 2, PO 3	3
AAE105.12	CLO 12	Testing the practical knowledge of students by conducting internal and external examinations.	PO 1, PO 2, PO 3	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO 1	3	1	2										2		2	
CLO 2	3	1	3										2		2	
CLO 3	3	1	2										2		2	1
CLO 4	2	1	2										1		2	1
CLO 5	3	1	2										2		2	1
CLO 6	3	1	2										2		1	1
CLO 7	2	1	1										2		2	1
CLO 8	3	1	2										2		1	1
CLO 9	3	1	2										2		2	1
CLO 10	3	1	2										2		2	1

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO 11	3	1	3										2	2		1
CLO 12	3	1	2										2	2		1

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 3	SEE Exams	PO 1, PO 2, PO 3	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2, PO 3	Student Viva	PO 1, PO 2, PO 3	Mini Project	-	Certification	-

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

LIST OF EXPERIMENTS	
Week-1	**BASIC METALLURGY -I**
Preparation and study of microstructure of pure materials like Cu and Al. Hardenability of steels by Jominy End Quench test	
Week-2	**BASIC METALLURGY -II**
Study of microstructures of non-ferrous alloys. Study of microstructure of heat treated steel.	
Week-3	**LATHE OPERATIONS**
Introduction- lathe machine, plain turning, Step turning & grooving, Taper turning-compound rest/offset method & Drilling using lathe, External threading-Single start	
Week-4	**SHAPING & SLOTTING**
Shaping-V-Block & Slotting-Keyways.	
Week-5	**GRINDING & MILLING**
Grinding-Cylindrical /Surface/Tool & cutter. Milling-Polygon /Spur gear, Gear hobbing-Helical gear.	
Week-6	**DRILLING**
Drilling, reaming, counter boring, Counter sinking Taping.	
Week-7	**CNC MACHINING**
Basic operations, Introduction to CNC programming.	
Week-8	**WELDING PROCESSES I**
Gas Welding, Brazing, Electric and Black smithy, Soldering.	

Week-9	**WELDING PROCESSES II**
Arc welding. Spot welding, Seam welding, TIG welding and MIG Welding.	
Week-10	**BASIC CASTING**
Casting of plaster of Paris using different dies.	
WeeK-11	**RIVETING ALUMINUM SHEETS**
Spot and Blind Rivets on aluminium sheets.	
Week-12	**EXAMINATIONS**
Internal and external examinations.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Preparation of materials for finding microstructure to ferrous materials	CLO 1	T1:1.4 R1:1.2
2	Preparation of materials for finding microstructure to non-ferrous materials and heat treated materials.	CLO 2	T1:1.5 R1:2.4
3	Lathe machine and their operations	CLO 3	T1:2.5 R1:2.5
4	Shapping and slotting machine and operations	CLO 4	T1:2.5 R1:2.6
5	Grinding and milling machine operations.	CLO 5	T1:22.7
6	Drilling machine operations.	CLO 6	T1:6.3 R1:5.3
7	Basic operations of CNC machining.	CLO 7	T1:7.5 R1:6.3
8	Gas welding, brazing and soldering operations	CLO 8	T1:8.5 R1:6.8
9	ARC welding, spot welding, TIG and MIG operations.	CLO 9	T1:12.2 R1:13.1
10	Mould preparation and pattern making for sand casting and metal casting.	CLO 10	T1:12.3 R1:13.2
11	Riveting for aluminum sheets	CLO 11	T1:12.10 R1:13.7
12	MIG welding exercises and Riveting of a plates.	CLO 12	T1:11.2 R1:10.2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Class room teaching, Video Lecture	PO 1, PO 3	PSO 1

Prepared by:
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HOD, AE