



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AEROSPACE MATERIALS AND PRODUCTION TECHNOLOGY								
IV Semester: AE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAED10	Core	L	T	P	C	CIA	SEE	Total
		3	0	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisite: Mechanics of Solids								

I. COURSE OVERVIEW:

The subject aircraft Production Technology encompasses on providing good theoretical background and a sound practical knowledge of Aircraft materials and Manufacturing process used for producing aircraft components to the engineering students. It plays a vital role for producing aircraft components with minimum cost and with longer service. The subject deals with combination of materials and heat treatment process, fabrication of composite materials, manufacturing process such as casting, welding, sheet metal forming, riveting process, machining process, automation and jigs and fixtures which are widely employed in industries.

II. COURSES OBJECTIVES:

The students will try to learn

- I. Applications of Aircraft materials and their alloys in aerospace industry.
- II. The manufacturing process employed for different materials and quality inspection techniques.
- III. The working principles and applications of different machining processes and their advantages and disadvantages.
- IV. The importance of composites and their applications for aerospace applications

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- CO1 Identify the properties of flight vehicle materials and their significant for producing parts of airplanes.
- CO2 Use of principles and techniques of casting and metal joining for determining their suitability.
- CO3 Identify the types of heat treat treatment process and quality inspections methods for improving life of aircraft parts.
- CO4 Demonstrate the riveting and forming process in making fuselage and wings of aircrafts.
- CO5 Make use of suitable machining process to achieve the specified product performance and design criterion by considering cost and time
- CO6 Identify the suitable fabrication process for composite materials to have high strength to its weight

IV. COURSE CONTENT:

MODULE – I: AIRCRAFT MATERIALS (10)

Classification of aircraft materials, properties of materials and their significance, Factors affecting the selection of material for different parts of airplanes,

Metals And Alloys applications; Aluminum Titanium and Steel alloys, Effect of alloying elements, Nickel and cobalt based alloys, refractory materials, ceramics, and super alloys.

Heat Treatment of Materials: annealing, normalizing, hardening and tempering of Aluminum and steel,
Corrosion - Types of Corrosions - Prevention - Protective Treatments

MODULE –II: AIRCRAFT COMPOSITES (09)

Classification, characteristics of composite materials, volume fraction, laminated composites, particulate composites and fibrous composites. Types of reinforcements, their shape and size, production and properties of fiber and glass reinforced plastics. Application of Composite materials in aerospace industries.

MODULE – III: CASTING AND WELDING AND INSPECTION TECHNIQUES (09)

General principles of various casting processes Sand casting, die-casting, centrifugal casting, investment casting, Shell molding types; Principles and equipment used in arc welding, gas welding, resistance welding, solid, laser welding, and electron beam welding, soldering and brazing techniques. NDT, testing.

MODULE –IV: CONVENTIONAL AND UNCONVENTIONAL MACHINING PROCESSES (10)

General working principles, applications and operations of lathe, shaper, milling machines, grinding, drilling machine, computer numeric control machining;

Working principles and applications of abrasive jet machining, ultrasonic machining, Electric discharge machining and electro chemical machining, laser beam, electron beam, plasma arc machining.

MODULE –IV ADDITIVE MANUFACTURING (10)

Introduction to Additive Manufacturing (AM)- Evolution, Steps and Classification of AM processes, advantages and disadvantages, Types of materials for AM, Stereo lithography (SL), AM Manufacturing processes- Fused Deposition Modelling (FDM), Selective laser Sintering (SLS) and Direct Metal Deposition (DMD). Postprocessing- Support Material Removal, Surface Texture, Accuracy and Aesthetic Improvement.

V. TEXT BOOKS:

1. S. Kalpakjian, Steven R. Schmid, “Manufacturing Engineering and Technology”, Addison Wesley, 5th Edition, 1991.
2. G. F. Titterton, Aircraft Materials and Processes, 5/e, Sterling Book House, 1998.
3. S. C. Keshu, K. K Ganapathy, “Aircraft production technology and management”, Interline Publishing House, Bangalore, 3rd edition, 1993.
4. C. P. Paul, A. N. Jinoop, “Additive Manufacturing”, 1st edition-2021, McGraw Hill India

VI. REFERENCE BOOKS:

1. S. C. Keshu, K. K Ganapathy, “Air craft production techniques”, Interline Publishing House, Bangalore, 3rd edition, 1993.
2. R. K. Jain, “Production technology”, McGraw Hill, 1st edition, 2002.
3. O. P. Khanna, M. Lal, “Production technology”, DhanpatRai Publications, 5th edition, 1997.
4. L. Gupta, Advanced Composite Materials, 2/e, Himalayan Books, 2006.

VII. ELECTRONICS RESOURCES:

1. <https://nptel.ac.in/courses/112107145/>
2. <https://nptel.ac.in/courses/112105126/>
3. https://books.google.co.in/books?id=6wFuw6wufTMC&redir_esc

4. <https://royalmechanicalbuzz.blogspot.in/2015/04/manufacturing-engineering-by-kalpakjian.html>

VIII. MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation