

16AE205**MATERIALS FOR AUTOMOBILE INDUSTRY**

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/SHS	CS	SA	S	BS
45	-	30	2	40	2	5	2	2

Course Description and Objectives:

This course is aimed at offering the basic classification of materials and different materials used in automotive industry for different components. The objective of this course is to provide the knowledge of properties and applications of Ferrous, Non-Ferrous metals, polymers and composite materials used in automotive industry and their production processes. It also provides the knowledge of micro structures of different materials.

Course Outcomes:

The student should be able to:

- recognize and understand the different materials used in automotive industry.
- understand fundamentals related to production methods of metals and processing of materials for automotive applications.
- evaluate mechanical properties of solids, factors affecting such properties in order to gain materials information.
- prepare samples and study the various micro structures of steels.
- understand the various micro structures of the metals.

SKILLS:

- ü *Identify difference between metals, ceramics, polymers and composites.*
- ü *Analyze the micro structure of Mild steels, low carbon steels, high carbon steels*
- ü *Identify the Micro Structures of Cast Iron, Non-Ferrous alloys, and Heat treated steels.*
- ü *Measure the hardness of steels.*

UNIT-1**L-9**

INTRODUCTION : Classification and characteristics of metals, Ceramics, Polymers and composites.

Iron and Steels: Cast iron – Austempered ductile iron, Compacted graphite iron, Steels -Plain carbon steels, Low alloy steels, HSLA steels, IF steels, Bake hardening steels, TRIP steels, Ultra high strength steels, Stainless steels - production, Properties and applications.

UNIT-2**L- 9**

NON-FERROUS ALLOYS :Aluminium alloys – Cast alloys, Wrought alloys, Age hardenable alloys, Working and heat treatment, Applications in automobiles, Magnesium alloys – Cast and wrought alloys, Working and heat treatment, Applications. Titanium alloys.

UNIT-3**L- 9**

POLYMERS AND CERAMICS :Processing of polymers, Brief description of equipment and process details of extrusion, Injection moulding, Thermoforming, Blow moulding, Concept of polymer design and selection criteria. Preparation and forming of ceramics, Applications.

UNIT-4**L- 10**

COMPOSITE MATERIALS :Production of composite materials and products, Moulding and forming of composites, Machining and joining of composites, Application of composites in automobiles, Metal matrix composites, Polymer matrix composites and ceramic matrix composites, Applications.

UNIT-5**L- 8**

POWER METALLURGY :Powder metallurgy – principle, Materials and techniques. Automotive applications of powder metallurgical products.

LIST OF EXPERIMENTS:

Total hours: 30

1. Preparation and study of the Micro Structure of pure metals like Iron, Copper and Aluminium.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high carbon steels.
3. Study of the Micro Structures of Cast Iron.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

TEXT BOOKS:

1. Balram Gupta, "Aerospace Materials", S.Chand and Co., 2015.
2. Dieter G.E, "Mechanical Metallurgy", McGraw Hill, 1997.

REFERENCE BOOKS:

1. American Society for Metals "Volume 1, 2, 4, 7, 20 and 21", 1998.
2. John Brown, "Foseco Ferrous and Non Ferrous Foundryman's Handbook" Butterworth-Heinemann, 1999.

ACTIVITIES:

- o *Conduct tests to evaluate micro structures of different materials*
- o *Design project on hardenability of steels*
- o *Design projects on Composite materials.*