

## ATGE -327 Automotive Metallurgy

(02 credits – 50 marks)

### Course Outcomes:

After completion of the course, students are expected to be able to:

CO1	Define Selection criteria for various components and importance
CO2	Sate different class of materials and their applications
CO3	Select heat treatment and surface modification technique for specific component
CO4	Select material for automotive component

### Module I: Metallic Materials

(04 hours)

Effect of alloying additions, classifications of steels and cast irons, High Strength Low Alloy Steels (HSLA), copper base alloys, aluminum base alloys, zinc base alloys, titanium alloys, typical properties of alloy grades, methods of identification of alloy grades steel melting practices,

### Module II: Heat Treatment and Surface Modification of Materials

(07 hours)

Hear treatment- Definitions, Techniques of Heat treatment, Isothermal transformation diagrams, cooling curves, Hardenability, importance of heat treatment in design of components.

Mechanical surface treatment and coating - Case hardening and hard facing - thermal spraying – vapour deposition- - Diffusion coating - Electroplating and Electro-less - Conversion coating - Ceramic coatings – laser based surface modification, Diamond coating.

### Module III: Non-metallic materials, Composites & Other Materials

(06 hours)

Types of polymer, Properties and auto applications, Types of elastomers, properties and auto applications, Fiber reinforced plastics (FRP), engineering ceramics, metal matrix composites, nano composites, Automotive glasses, Electrical insulating materials. Sound insulating materials, Protective coating materials, Sealant and adhesives, Smart & Refractory materials

### Module IV: Automotive Fluids & Selection of Materials

(07 hours)

Type of fluids, its properties, importance and effects on vehicle performance  
Selection criteria for auto components – cylinder block, Cylinder head, piston, piston ring, Gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valve, gear wheel, clutch plate, axle, bearings, chassis, spring, shock absorber, propeller shaft, body panel, radiator, brake liners and brake pads, batteries, fuel tank, seats, application of non-metallic materials such as plastics, composites, ceramics, etc.

### Module -V Tutorials, case studies and presentation based on Module I to IV

(06 hours)

## **References:**

1. Kenneth G.Budinski and Michael K.Budinski “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.
2. Raghavan.V.Materials Science and Engineering, Prentice Hall of India Pvt. Ltd., 1999.
3. Sydney H.Avner “Introduction to Physical Metallurgy” McGraw-Hill Book Company, 1994.
4. C. Daniel Yesudian, D. G. Harris Samuel “Material Science and Metallurgy”, SPI Publication, 2006  
Donald R Askeland, P. P. Phule “Essentials of Materials Science and Engineering, Cengage Learning, 2008