

MATERIAL SCIENCE

COURSE OBJECTIVE

The aim of the course is to give knowledge and proficiency in construction as regards to material technology.

COURSE CONTENTS

UNIT I

Introduction:

Introduction to Material Science and Engineering: Type of Materials- Metallic Materials, Polymeric Materials, Ceramic Materials, Composite Materials, Electronic Materials, Magnetic Materials, Photonic/Optical Materials, Construction Materials, Recent advances in Materials Science- Smart Materials, Nano Materials, Selection of Materials

Atomic Structure and Bonding: Structure of Atoms, Atomic Numbers and Atomic Masses, Electronic structure of Atoms, Quantum Numbers of Electrons of Atoms, Crystal and Amorphous Structure in Materials-Crystalline and Amorphous Materials. Type of Atomic Bonds- Metallic Bonds, Covalent Bonds, Ionic Bonds, Vander Walls Bond, Primary and Secondary Bonds.

UNIT II

Properties and Failure of Materials:-

Mechanical Properties of Materials, Thermal properties of Materials, Electrical and Magnetic Properties of Materials, Failure of Materials –Fracture, Fatigue and Creep , Corrosion and Wear

UNIT III

Construction Materials I- Masonry and Concrete

Stones, Bricks, Their properties, Mortar-Cement and Lime mortar, Proportion, Mixing and Properties of Mortar, Properties of Masonry, Concrete Proportioning, Properties of Fresh & Hardened Concrete

UNIT IV

Construction Materials II- Steel , Wood & Polymers

Structural Steel, Reinforcing Steel –Grades and Types, Properties of Reinforcing Steel , Structural Wood, Physical Properties of Wood, Wood Products- Plywood, Particle Board, Fibre Board, Polymers-Thermoplastics, Thermosets, Elastomers, General Properties of Polymers, Common Polymers and their Properties, Modified Polymers, Uses of Polymers.

UNIT V

Construction Materials III- Bituminous Materials and Mixtures

Bitumen, Tar, Pitch and Asphalt, Asphalt Cement, Cut back Asphalt, Emulsified and Blown Asphalt, Properties of Asphalts, Consistency, Rate of Curing, Resistance to Action of Water, Ductility and Adhesion etc., Grades of Asphalt, Viscosity and Penetration Grading, Performance based Grading, Cut back Asphalt Grades, Asphalts Concrete, Asphalt Pavement, Applications of Asphalt.

COURSE OUTCOME

The student will be able to identify the use of different materials used in civil engineering.

REFERENCES

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