

## **FUNDAMENTALS OF DESIGN AND MANUFACTURING**

### **Group A**

Engineering design process and its structure. Identification and analysis of need, product designs specifications, standards of performance and constraints.

Searching for design concepts; morphological analysis, brainstorming. Evaluation of design concepts for physical reliability, economic feasibility and utility.

Detailed design; design for manufacture, assembly, shipping, maintenance, use, and recyclability.

Design checks for clarity, simplicity, modularity and safety. Standardization and size ranges. Reliability and robust design. Design organization and communication, technical reports, drawings, presentations and models.

Concept of manufacturing: classification of manufacturing process. Fundamentals of casting. Basic understanding of commonly used casting process (sand casting, investment and permanent mould casting process).

Fundamentals of metal forming. Hot and cold working; basic understanding of primary metal forming process(rolling, forging, extrusion and drawing process, punching and blanking)

### **Group – B**

Fundamentals of metal cutting: tool-work interaction for production of machined surfaces. Classification of machining process. Basic machining operations. (Turning, shaping, planning, drilling and milling processes.)

Fundamentals of grinding and finishing; overview of unconventional machining process; fundamentals of welding process; introduction to primary welding and allied process, selection of manufacturing processes. Design for manufacturability.

Need for integration- commercial, economic and technological perspective; basic tools of integration; concept of a system. Introduction to information technology and its elements.

Introduction to group technology; introduction to simulation and data base management systems.

Elements of integration – controllers, sensors, robots, automated machines; AGVs, AS, RS, etc.

Product and process design for integration; design for economic manufacturing; design for manufacturing integration.

Introduction to computer aided process planning; selection of machine tools.

## **MATERIAL SCIENCE AND ENGINEERING**

### **Group A**

Introduction to materials. Metals and alloys, ceramics, polymers and semi conducting materials-introduction and application as engineering materials.

Defects in solids. Point, line and surface defects. Diffusion in solids.

Phase diagrams. Monocomponent and binary systems, non-equilibrium system, phase diagram and application in crystalline and non-crystalline solids.

Mechanical properties. Tensile strength, yield strength, elastic and visco-elastic properties, creep, stress relaxation and impact .Fracture behaviour. Ductile fracture, Griffith theory, effect of heat treatment and temperature on properties of metal.

Deformation of metals. Elastic and plastic deformation, slip, twin, dislocation theory, critical resolved shear stress, deformation in polycrystalline materials, season cracking, Bauchinger's effect, strengthening mechanisms, work hardening recovery, recrystallization and grain growth, cold and hot working.

#### Group B

Heat treatment. Iron-carbon system. Annealing, normalising, hardening, critical cooling rate, hardenability, age hardening, surface hardening, tempering.

Thermal properties. High temperature materials, materials for cryogenic application, thermally insulating materials.(Specific heat, thermal conductivity, thermal expansion).

Ceramic materials and polymers. Silicon structures, polymerism fraction in glass, electrical properties of ceramic phased, rocks, building stones, refractories.

Polymerisation mechanism, structural properties of polymer, thermoplastics, thermosets, elastomers, resins, composites, particle and fiber reinforced composites. Composite material including nano-material.

Electronic properties. Magnetism, diamagnetism, paramagnetism, ferromagnetism, magnetic energy, zone theory of solids, zones in conductors and insulators.

### **COMPUTING AND INFORMATICS**

#### **Group A**

Programming languages. C including C++; Languages-declaration, expressions, control statements, arrays, function, pointers and structures; Algorithms and flow-charts. Introduction to Pascal.

Informatics. Information systems for decision making; Data management and database management technology; Office automation system for business; Strategic information systems; Information resources management.

#### **Group B**

Computer basics. History, generations and classification of computers. Number systems. Boolean algebra.

Hardware. Introduction to logic gates and flip flops. Components of a computer. input/output devices. CPU unit and memory unit. Secondary storage.

Softwares. System software; application software; compilers and translators.

Operating systems. Introduction to operating systems; types of operating systems and their function; popular operating systems- MS-DOS, UNIX and Windows; file management.

## **SOCIETY AND ENVIRONMENT**

### **Group A**

#### ***Society***

##### **Societal Structures and Dynamics**

An analysis of basic sociological concepts and their applications to contemporary society; social stratification. Caste, class, cultural heritage, occupation, mobility and income distribution. Social tensions and their causes, societal responsibilities and social institutions.

##### **Development Process**

Parameters for development. Interrelationship between social, economic and scientific factors. Role of science and technology in development. Planning-its objectives and assessment.

##### **Technology Assessment**

Historical development of science and technology. Criteria for assessment of appropriate technology and technology adaptation.

### **Group B.**

#### ***Environment***

##### **Ecosystems**

Natural ecosystems. Principles of ecobalance. Biosphere cycle, carbon dioxide cycle. Causes for eco-imbalance,-its effects and remedies.

##### **Environmental Degradation**

Causes for degradation-its effects. Control of air, water, soil and noise pollutions. Protection of ozone layer.

##### **Waste Management**

Agricultural, Urban and industrial wastes.

##### **Sustainable Development.**

Definition and concept. Technology for sustainable energy and materials.

---

***Compiled by ENGINEERS ACADEMY Calicut, the leaders in AMIE postal coaching***

**Email [passamie@gmail.com](mailto:passamie@gmail.com)**

**Phone +91 93 8888 7363**

---