

**DE ME SEM-6 Detail Syllabus of Computer Aided Manufacturing (3361901)**

**TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
2	0	2	4	70	30	20	30	

**Unit – I. Fundamentals of CAM.**

1.1 CAM -concept and definition.1.2 NC(Numerical Control),CNC(Computerized Numerical Control) and DNC(Direct Numerical Control) -concept, features and differences.1.3 Advantages and limitations of CNC.1.4 Selection criteria for CNC machines.

**Unit- II Constructional features of CNC machines.**

2.1 CNC machines: Types, classification, working and constructional features. 2.2 Spindle drives and axes drives on CNC machines.2.3 Machine structure-Requirements and reasons.2.4 Elements of CNC machines - Types, sketch, working and importance of: i. Slide ways. ii. Re-circulating ball screw. iii. Feedback devices (transducers, encoders).iv. Automatic tool changer (ATC).v. Automatic pallet changer (APC).2.5 CNC axes and motion nomenclature. 2.6 CNC tooling: i. Tool presetting-concept and importance. ii. Qualified tools-definition need and advantages. iii. Tool holders- types and applications

**Unit – III CNC machines**

3.1 CNC turning centers: i. Types. ii. Features. iii. Axes nomenclature. iv. Specification. v. Work holding devices -types, working and applications. vi. Tool holding and changing devices - types, working and applications. 3.2 CNC machining centers: i. B Types. ii. Features.iii.Axes nomenclature. iv. Specification. v. Work holding devices-types, working and applications. vi. Tool holding and changing devices- types, working and applications.3.3 Types and applications of CAD/CAM interfacing standards

**Unit – IV CNC part programming.**

4.1 Definition and importance of various positions like machine zero, home position, work piece zero and program me zero. 4.2 CNC part programming: programming format and structure of part program me. 4.3 ISO G and M codes for turning and milling-meaning and applications of important codes. 4.4 Model and non-model G and M codes. 4.5 Need and importance of various compensations: i. Tool length compensation. ii. Pitch error compensation.iii. Tool radius compensation. iv. Tool offset. 4.6 Simple part programming for turning using ISO format having straight turning, taper turning (linear interpolation) and convex/concave turning (circular interpolation). 4.7 Simple part programming for milling using ISO format. 4.8 Importance, types, applications and format for: i. Canned cycles. ii. Macro. iii. Do loop IV. Subroutine. 4.9 CNC turning and milling part programming using canned cycles, Do loops and Subroutine.

**Unit – V Recent trends in CAM.**

5.1 Adaptive control- definition, meaning, block diagram, sources of variability and applications. 5.2 Flexible Manufacturing System (FMS) - concept, evaluation, main elements and their functions, layout and its importance, applications. 5.3 Computer Integrated Manufacturing (CIM) - Concept,

definition, areas covered, benefits. 5.4 Robotics- definition, terminology, classification and types, elements and applications. 5.5 Rapid prototyping - Concept and application.

**DE ME SEM-6 Detail Syllabus of Tool Engineering (3361902)**

**TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**Unit – I. Introduction**

1.1 Concept, meaning and definitions of tool, tool design and tool engineering. 1.2 Tools-types, classification, features & applications. 1.3 Tool engineering-functions and importance to enhance productivity and quality. 1.4 Importance of process planning in tool engineering. 1.5 Economy-concept, meaning, importance and principles in tool engineering. 1.6 Universal acts & their elements of a manufacturing operation with suitable simple example.

**Unit – II Cutting tools and tool holders**

2.1 Cutting tool materials-types, composition, properties and applications. 2.2 Carbide inserts-types, ISO-designation and applications. 2.3 Re-sharpening methods of following cutting tools: i. Drill. ii. Side and face milling cutter. iii. End mill. iv. Centre drill, type A and B. v. Gear hob. 2.4 Tool holders for turning and milling carbide inserts-types, ISO-designation and applications. 2.5 Tool holding and tool mounting systems for conventional milling and drilling machine tools.

**Unit – III Locating and clamping devices**

3.1 Concept, meaning and definitions of location and clamping. 3.2 Use of locating and clamping principles in day-to-day supervision on shop floor. 3.3 Degree of freedom-concept and importance. 3.4 3-2-1 principle of location. 3.5 Locators: i. Types- ii. Sketches with nomenclature.iii. Working. iv. Applications. 3.6 Fool proofing and ejecting. 3.7 Clamping devices: i. Types ii. Sketches with nomenclature. iii. Working. iv. Applications

**Unit – IV Jigs and fixtures**

4.1 Concept, meaning, differences and benefits of jigs and fixtures. 4.2 Types, sketches with nomenclature, working and applications of jigs. 4.3 Types, sketches with nomenclature, working and applications of fixtures. 4.4 Steps to design jigs and fixture. 4.5 For given simple component: i. Select type. ii. Develop locating method. iii. Develop clamping method. iv. Design jig and fixture (as applicable). v. Prepare details and assembly sketches.

**Unit – V Press tools**

5.1 Press working processes-types, sketches and applications. 5.2 Press tools: types, working, components and their functions. 5.3 Concept, meaning, definitions and calculations of press tonnage

and shut height of press tool. 5.4 Shear action in die cutting operation. 5.5 Centre of pressure: Concept, meaning, definition, methods of finding and importance. 5.6 Die clearance: Concept, meaning, definition, reasons, effects and methods of application. 5.7 Cutting force: Methods to calculate and methods of reducing. 5.8 Shear angle- concept, need and method to give shear angle on punch and die. 5.9 Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization. 5.10 Types, working, and applications of stock stop, pilots, strippers and knockouts. 5.11 Cutting dies-types and applications. 5.12 Design of progressive cutting die: i. Sketch the component. ii. Prepare scrap strip layout. iii. Calculate tonnage. iv. Determine centre of pressure. v. Determine dimensions of punches die block and die shoe. vi. Prepare sketch of stripper plate. vii. General assembly sketch of punches arrangement, die block, die shoe and stripper plate.

### Unit – VI Dies

6.1 Bending: i. Types. ii. Parts and functions of bending die. iii. Definition, calculations and factors affecting bend radii, bend allowance and spring back. iv. Method to compute bending pressure. v. Types, sketch, working and applications of bending dies. 6.2 Drawing dies-types and method to determine blank size for drawing operation. 6.3 Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging. 6.4 Forging dies- terminology, types, sketch, working and applications. 6.5 Sketch, working and applications of following dies: i. Extrusion. ii. Plastic injection.

## DE ME SEM-6 Detail Syllabus of Industrial Management (3361903)

### TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
3	0	0	3	70	30	0	0	

### Unit – I. Introduction

1.1 System- concept, definition, types, parameters, variables and behavior. 1.2 Management – definition and functions. 1.3 Organization structure: i. Definition. ii. Goals. iii. Factors considered in formulating structure. iv. Types. v. Advantages and disadvantages. vi. Applications. 1.4 Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation of authority, centralization and decentralization in industrial management. 1.5 Organizational culture and climate –meaning, differences and factors affecting them. 1.6 Moral factors affecting moral. 1.7 Relationship between moral and productivity. 1.8 Job satisfaction- factors influencing job satisfaction. 1.9 Important provisions of factory act and labor laws.

### Unit – II Critical path method (CPM) and pre evaluation review technique (PERT).

2.1 CPM & PERT- meaning, features, difference, applications. 2.2 Understand different terms used in network diagram. 2.3 Draw network diagram for a real life project containing 10-15 activities,

computation of LPO and EPO.(Take minimum three examples). 2.4 Determination of critical path on network. 2.5 Floats, its types and determination of floats. 2.6 Crashing of network, updating and its applications.

**Unit – III Materials management**

3.1 Material management-definition, functions, importance, relationship with other departments. 3.2 Purchase - objectives, purchasing systems, purchase procedure, terms and forms used in purchase department. 3.3 Storekeeping- functions, classification of stores as centralized and decentralized with their advantages, disadvantages and application in actual practice. 3.4 Functions of store, types of records maintained by store, various types and applications of storage equipment, need and general methods for codification of stores. 3.5 Inventory control: i. Definition. ii. Objectives. iii. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. iv. ABC analysis and other modern methods of analysis. v. Various types of inventory models such as Wilson’s inventory model, replenishment model and two bin model. (Only sketch and understanding, no derivation) . 3.6 Material Requirement Planning (MRP)-concept, applications and brief details about software packages available in market

**Unit – IV Production planning and control (PPC)**

4.1 Types and examples of production. 4.2 PPC: I . Need and importance. ii. Functions. iii. Forms used and their importance. iv. General approach for each type of production. 4.3 Scheduling- meaning and need for productivity and utilization. 4.4 Gantt chart- Format and method to prepare. 4.5 Scheduling techniques: I. Critical ratio scheduling.4.6 Given the data prepare scheduling using Gantt chart. Suggested format is given in Annexure – I. Take at least two examples. 4.7 Numerical examples on critical ratio scheduling. 4.8 Bottlenecking- meaning, effect and ways to reduce

**Unit – V Value analysis (VA) and cost control.**

5.1 VA-definition, terms used, process and importance. 5.2 VA flow diagram. 5.3 DARSIRI method of VA. 5.4 Case study of VA-at least two. 5.5 Waste-types, sources and ways to reduce them. 5.6 Cost control-methods and important guide lines.

**Unit – VI Recent trends in IM**

6.1 ERP (Enterprise resource planning) - concept, features and applications. 6.2 Important features of MS Project. 6.3 Logistics-concept need and benefits. 6.4 Just in Time (JIT)-concept and benefits.

**DE ME SEM-6 Detail Syllabus of Manufacturing Systems (3361904)**

**TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**Unit – I Introduction**

1.1 Evolution of transformation & manufacturing systems.1.2 Need of attitude, knowledge & skill required for application of manufacturing systems. 1.3 Need for system approach. 1.4 Role of

computers and information technology in manufacturing and manufacturing systems. 1.5 Product life cycle & its importance. 1.6 Technology life cycle. 1.7 Scope, importance and challenges in Indian context to manufacture products at international competitive price with better quality& innovation

## **Unit – II Group Technology (GT) & cellular layout**

2.1 GT - concept, definition, need, scope, & benefits. 2.2 Production layout-types, features and applications. 2.3 GT Layout -concept, need, benefits, comparison with conventional layout with examples. 2.4 GT- codification systems- types, method of coding and examples. 2.5 Part features-concept, types and examples. 2.6 Part family- concept, method to form and approach to form cell using part families. 2.7 Types and comparison of cell: manual and automatic cell, assembly cell. 2.8 Steps of cell design and cell layout.

## **Unit – III Flexible Manufacturing System (FMS) .**

3.1 Flexible Manufacturing System (FMS) –concept, definition and comparison with other manufacturing systems. 3.2 Major elements of FMS and their functioning: i. Tool handling system. ii. Material handling system. iii. Automated guided vehicles (AGV). iv. Automated storage and retrieval system (AS/RS). v. Main frame computer. 3.3 FMS layout - concept, types and applications. 3.4 Data required developing an FMS layout. 3.5 Signal flow diagram and line balancing in FMS. 3.6 FMS layout illustrations (Minimum two).

## **Unit – IV Robotics**

4.1 Robots-concept, definition, benefits and various areas of application in manufacturing systems. 4.2 Terminology used in robotics. 4.3 Robots-types, physical configuration, classification and selection criterion. 4.4 Axes nomenclature. 4.5 Types and uses of Manipulators & Grippers. 4.6 Sensors- types, classifications, working principle and applications of position, force & torque, proximity, vision, velocity & acceleration sensors. 4.7 Overview of robot programming methods & languages.

## **Unit – V Programmable**

5.1 Role of control system in instrumentation 5.2 Open and close loop control system, types and block diagram. 5.3 Servomechanism and regulators with suitable examples. 5.4 Basic control actions - on-off, proportional, derivative, integral control, proportional derivative (PD), proportional integral (PI), p proportional integral and derivative (PID) control. 5.5 Basic digital logic gates: symbol, operation, truth-table and examples of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates. 5.6 PLC: Concept, general constructional features, types of diagrams, working and major applications in manufacturing systems. 5.7 Use of SCADA (Supervisory Control and Data Acquisition) in PLC design. 5.8 Microcontrollers: introduction, hardware components, I/O pins, ports; selection of micro controllers & embedded controllers, applications.

## **Unit – VI Recent trend**

6.1 Computer Aided Process Planning (CAPP) - concept, types, features, methods and importance. 6.2 Computer Integrated Manufacturing (CIM): need, block diagram, functional areas covered and their importance. 6.3 Protocols in CIM- their features, functions and applications. 6.4 Computer Aided Inspection (CAI) - concept, benefit, types, working and examples. Coordinate Measuring Machine (CMM) - its working and applications. 6.5 Rapid Prototyping (RP): working principles, methods, applications and limitations, rapid tooling, techniques for rapid prototyping. 6.6 Artificial neural network: working principles, applications and limitations. 6.7 Lean manufacturing - concept, benefits and applications. 6.8 Factory of future (FOF).

## DE ME SEM-6 Detail Syllabus of Fabrication Technology (3361905)

### TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

#### **Unit – I Introduction to Fabrication Technology**

1.1 Need and scope of fabrication technology in industries. 1.2 Weld ability-concept, meaning, definition and factors affecting it and its importance. 1.3 Power source-classification, advantages, limitations, features, applications and selection criteria. 1.4 List of national and international fabrication industries and third party inspection agencies

#### **Unit – II Drawing interpretation**

2.1 Welding location of elements, welding general nomenclature, welding symbols as per IS: 696-1972, welding supplementary symbols, abbreviations used for welding processes and welding position. 2.2 Interpretation and method to work out bill of material for following types of drawings: I. Welding / fabrication. ii. Process and instrumentation. iii. Piping isometric. 2.3 Types, sketch, edge preparation and applications of weld - square butt, groove, fillet, plug, Types of joint butt, lap, corner, tee and edge, Types of weld edge preparation 2.4 Welding documents - Weld Test Plan (WTP), Shop Weld Plan (SWP), etc. 2.5 Introduction to ASME section IX Welding Procedure Specification (WPS), and Welder Performance Qualification (WPO). 2.6 Need and application areas of different codes used in fabrication industries remaining ASME sections, ASTM, AWS, IS, BIS, JIS, EN, DIN, TEMA, EJMA

#### **Unit – III Fabrication processes and safety**

3.1 Equipment/machines used for edge preparation, their working & features. 3.2 Preheating and inter-pass: need, method and applications. 3.3 Post heating-need, method and applications. 3.4 Post Weld Heat Treatment (PWHT)-need, methods, applications and selection criteria. 3.5 Methods of relieving thermal stresses. 3.6 Arc welding parameters-setting criteria: i. Voltage. ii. Current. iii. Welding speed. iv. Welding feed. v. Arc length. 3.7 Advance welding methods and their applications. I. Ultrasonic welding. ii. Laser beam welding. iii. Electron beam welding. iv. Friction stir welding. 3.8 Welding automation. 3.9 Process equipment fabrication procedures: i. Plate edge bending and rolling. ii. Weld edge preparation. iii. Marking procedures of shell and dish end. iv. Plate cutting by gas and plasma arc with automation. v. Shell alignment by string and laser beams. vi. Orientation marking on shell for nozzles. vii. Reference line marking by dumpy level. viii. Ovality measurement of shell and it's rectification by spiders. ix. Profile checking by template. x. Circularity measurement by swing arm method. xi. Offset rectification by wedge. xii. Strip cladding and overlay 3.10 Fabrication steps/stages of: I. Electrical power/communication transmission tower. ii. Pressure vessel. iii. Heat exchanger. 3.11 Need precautions and safety norms during welding and fabrication process.

#### **Unit – IV Inspection and testing.**

4.1 Common welds defects, their causes and remedies; 4.2 Thermal distortion-concept, meaning, definition, causes, effect and types. 4.3 Methods and equipments used to control thermal distortion. 4.4 Weld quality-concept, meaning, definition, importance and affecting factors 4.5 Introduction to inspection and testing. 4.6 Stages of inspection. 4.7 Types, methods of testing and importance of

destructive testing (DT).(tensile test, compressive test, impact test, bend test, hardness test.) 4.8 Types, methods of testing and importance of Non Destructive Testing (NDT). ( Liquid penetrate testing, Magnetic Particle Testing, Ultrasonic Testing, Radiography Testing, Eddy Current Testing) 4.9 Special types of test like Hydro test, Pneumatic test, and Leak test by soap water and helium gas.

#### **Unit – V Surface preparation, finishing and coating methods**

5.1 Surface preparation methods, sand blasting and ball blasting. 5.2 Surface finishing methods, brushing and grinding. 5.3 Surface color coating by brush, roller and spray applications.

#### **Unit – VI Installation, erection and commissioning**

6.1 Erection steps for common fabrication structure. 6.2 Erection steps for equipment to be fabricated. 6.3 Erection steps for piping. 6.4 Installation and commissioning procedures for plant machineries and fabricated equipment.

### **DE ME SEM-6 Detail Syllabus of Project II (3361910)**

#### **TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	100
0	0	6	6	0	0	40	60	

#### **Work allocation matrix:**

Prepare work allocation matrix along with provision of follow-up remarks and notes.

#### **Project execution:**

Execute project preparation activities as per work allocation matrix

#### **Documentation and presentation:**

Documentation of final project report which includes following in sequence.

- a. Title page-(Suggested as per Annexure-II.)
- b. Certificate –As per Annexure-III.
- c. Index.
- d. Preface/Acknowledgement.
- e. Course outcomes.
- f. Project title.
- g. Assembly and detail production drawings.
- h. List of activities (suggested as per Annexure – IV) and work allocation matrix.
- i. Plant layout with dimensions.
- j. List and specifications of machineries, equipments and tools.
- k. Bill of material with make or buy decision.
- l. Specifications of bought out parts.
- m. Process sheets-As per format given in course Industrial engineering.
- n. Flow process charts.

- o. Specification and consumption of consumables.
- p. Details of inspection / testing carried out.
- q. Details of rework / rectifications carried out.
- r. Cost estimation.
- s. Monitoring and control report/sheet.
- t. Notes on troubleshooting.
- u. Notes on individual achievement of skills / experience /problems / solutions.
- v. References.
- w. Day to day logbook as per Annexure-V.
- x. Presentation including moments at work-photographs in action.