SCHEME –THIRD YEAR

SEMESTER - V						
S. NO.	**CODE**	**SUBJECT**	**L**	**T**	**P**	**CREDITS**
1	MED-311	MACHINE DESIGN – I	3	1	0	3
2	MED-312	HEAT TRANSFER	3	1	0	3
3	MED-313	MACHINING SCIENCE	3	1	0	3
4	MED-314	DYNAMICS OF MACHINES	3	1	0	3
5	MED-315	INDUSTRIAL ENGINEERING	3	1	0	3
6	MEO-316	OPEN ELECTIVE – I *	3	1	0	3
7	MED-317	HEAT TRANSFER LAB	0	0	3	1
8	MED-318	MACHINING SCIENCE LAB	0	0	3	1
9	MED-319	DYNAMICS OF MACHINES LAB	0	0	3	1
	TOTAL		**H = 33**			**21**

SEMESTER - VI						
S. NO.	**CODE**	**SUBJECT**	**L**	**T**	**P**	**CREDITS**
1	MEH-321	MANAGERIAL ECONOMICS	3	1	0	3
2	MED-322	MACHINE DESIGN – II	3	1	0	3
3	MED-323	THERMAL ENGINEERING	3	1	0	3
4	MED-324	MEASUREMENT & CONTROL	3	1	0	3
5	MEO-325	OPEN ELECTIVE – II *	3	1	0	3
6	MED-326	COMPUTER AIDED MANUFACTURING	3	1	0	3
7	MED-327	THERMAL LAB	0	0	3	1
8	MED-328	MEASUREMENT & CONTROL LAB	0	0	3	1
9	MED-329	COMPUTER AIDED MANUFACTURING LAB	0	0	3	1
10	MED-320	SEMINAR	0	0	3	1
	TOTAL		**H = 36**			**22**

*** OPEN ELECTIVES: ROBOTICS, MODELLING & SIMULATION**

MED-311 **MACHINE DESIGN-I**

L	T	P/D	Cr
3	1	0	3

1. DESIGN PRINCIPLES

Mechanical Engg. design, phases of Design, design considerations, factor of safety, stress concentration, methods of reducing stress concentration, Notch sensitivity, Types of loading, S.N curves Determination of fatigue strength, Soderberg's line for design, Goodman's line for design, Gerber's curves for design.

2. DESIGN OF SHAFTS AND COUPLINGS

Design of solid and hollow shafts, design of shafts for strength and deflection, combined loading due to torsion and bending of shafts, Principal stress and maximum stress, equivalent bending moment and twisting moment, design of Muff coupling, flange coupling, bushed pin type of flexible coupling.

3. DESIGN OF FASTENERS

Pins, keys, splines, knuckle joint, cotter joint, design of threaded joints, initial tension, riveted joints, joints for pressure vessels, welded joints: types.

4. DESIGN OF LEVERS

Introduction, Design procedure, weight reduction of levers, handles and paddles, hand levers and foot levers, cranked levers.

5. DESIGN OF SPRING

Closed and open coiled springs, strength and stiffness, optimum design of helical springs, helical torsion springs, multileaf springs, and helical springs of non-circular wires.

6. DESIGN OF ELEMENTS

Hooks, I C Engine parts: cylinder, piston, connecting rod and crankshaft.

TEXT BOOKS:-

1. Design of M/c Elements : V.B.Bhandari
2. Machine Design : Patel, Sikh. and Pandya
3. Machine Design : Pandya & Shah
4. Machine Design : Sharma & Aggarwal
5. Machine Design : Shigley
6. Machine Design : Kulkarni
7. Machine Design : Sadhu Singh
8. Machine Design : R.K.Jain

HAND BOOK:

Design Data Book PSG College of Technology Coimbatore. Use of this hand book permitted in the examination.

MED-312 HEAT TRANSFER

L	T	P/D	Cr
3	1	0	3

1. INTRODUCTION

Basic Concepts and Modes of heat transfer; Relationship to thermodynamics.

2. CONDUCTION

Mechanism; Fourier's general conduction equation in 3-D; 1-D steady state conduction with heat generation: composite plane wall and cylinders, thermal resistance network, critical thickness of insulation; extended surface heat transfer. 2-D steady state conduction: solution for simple boundary conditions, unsteady heat conduction: lumped parameter system, semi-infinite wall with convection boundary condition, Use of Heisler charts.

3. CONVECTION

Mechanism, forced convection, basic concepts of hydrodynamic and thermal boundary layers, similarity conditions of heat transfer processes, equations of motion and energy, application of dimensional analysis, Laminar boundary layer analysis on flat plate, Fully-developed heat transfer through smooth pipes, Relation between fluid friction and heat transfer, forced convection empirical correlations, Free convection: laminar free convection on a vertical flat plate; empirical correlations, Boiling and condensation: mechanism, laminar film condensation on a vertical plate, empirical correlation.

4. RADIATION

Thermal radiation, monochromatic and total emissive power absorptivity, reflectivity and transmissivity, black, grey and real surfaces, Planck's distribution- law, Wien's displacement law, Stefan -Boltzmann's law, Kirchhoff's law, heat transfer by radiation between black surface and grey surfaces, heat transfer in the presence of reradiating surface, electrical network method of solving radiation problems, radiation shields, shape factors.

5. HEAT EXCHANGERS

Basic type of heat exchangers, fouling factor, overall heat transfer co-efficient, logarithmic mean temperature difference, effectiveness –NTU, Methods of design of single and multiple pass heat exchangers.

RECOMMENDED BOOKS

1. Heat Transfer – A practical Approach : Yunus A. Cengel
2. Fundamental of Heat and Mass Transfer : Incropera & Dewitt
3. Heat Transfer : J.P.Holman
4. Heat and Mass Transfer : Eckert & Drake
5. Heat and Mass Transfer : R.K. Sachdeva

MED-313 **MACHINING SCIENCE**

L	T	P/D	Cr
3	1	0	3

1. MATERIALS AND GEOMETRY OF CUTTING TOOLS

Introduction, Desirable Properties of Tool Materials, Characteristics of Cutting Tool Materials, Cutting tool geometry, Chip flow direction, Tool angles specification systems, Cutting parameters and Tool geometry, Indexable inserts, chip breakers, Tools of unusual geometry.

2. MECHANICS OF METAL CUTTING

Merchant's circle diagram- determination of cutting and thrust forces; Coefficient of friction; shear plane angle, Velocity and force relationship, shear stress and strain and strain rate in orthogonal cutting, stress distribution along rake face, theories of Lee and Shaffer's, Oxley's, etc. Cutting force measuring techniques i.e. dynamometer.

3. THERMAL ASPECTS IN MACHINING AND CUTTING FLUID

Regions of heat generation; Heat In the Primary Shear Zone, Heat at the Tool/work Interface, Heat Flow at the Tool Clearance Face, Average shear plane temperature; Average chip-tool interface temperature; method of tool temperature measurement, temperature distribution in tool, Cutting Fluid: Types and composition of cutting fluids, selection of cutting fluid.

4. TOOL WEAR, TOOL LIFE AND MACHINABILITY

Tool wear mechanisms, Types of tool damage during cutting, Wear and chipping characteristics of different tool materials, Tool wear equations, tool failure criteria, Tool life equations, Effect of process parameters on Tool life, Tool life testing, Machinability, Surface finish and surface integrity.

5. ABRASIVE MACHINING PROCESSES

Introduction, Classification of grinding processes and Mechanics of Centerless grinding, Gear grinding, surface grinding and cylindrical grinding processes, Mechanics of wheel wear, Effect of grinding parameters on grinding wheel performance, creep feed grinding, Honning and lapping and machining with controlled contact tool.

6. ECONOMICS OF MACHINING PROCESSES

Introduction, Cost of single pass turning operation, Optimization of cutting speed for minimum cost in turning, Maximum rate of production and Maximum profit rate in turning; Effect of feed on cutting speed for minimum cost in turning, Restriction on optimum cutting conditions, Economics of facing operations, Economics of Interrupted cutting, optimization of multistage Batch Machining.

TEXT BOOKS:

1. Fundamental of Metal cutting and Machine tools : B.L.Juneja
2. Engineering Metrology : R.K.Jain.
3. Manufacturing Engineering and Technology : Kalpakjian; Pearson Pub.
4. Manufacturing Engineering and Technology : Groover; TMH Pub.
5. ASM Hand Books on Machining
6. Metal Cutting Trent
7. Metal cutting theory and practice : Bhattacharya

MED-314 DYNAMICS OF MACHINES

L	T	P/D	Cr
3	1	0	3

1. INERTIA FORCE ANALYSIS

D-Alembert's Principle, dynamic analysis of slider crank mechanism, velocity and acceleration analysis of plane mechanisms, velocity & acceleration of piston, piston effort, crank effort, inertia of connecting rod.

2. FLYWHEEL

Turning Moment diagram, Inertia force calculations of turning moment in reciprocating engines, Co-efficient of Fluctuation of Energy, Co-efficient of Fluctuation of Speed, Dimensions of the Flywheel Rim, flywheels for punch press and I.C. engines.

3. BALANCING OF MACHINERY

Necessity of balancing, balancing of rotating masses in one plane, in different planes, static and dynamic balancing, balancing of reciprocating masses, partial primary balance, condition of balance in multi cylinder in-line engines, balancing of V-engine, direct & reverse crank method of balancing.

4. GOVERNORS

Functions, Difference between Governor and Flywheel, Types of Governor-Watt, Porter, Proell, Hartnell, Wilson-Hartnell & Pickering; Inertia Governor, Sensitiveness and Stability of Governors; Isochronous Governors, Hunting, Effort and Power of a Porter Governor, Controlling Force Diagrams for Porter and Spring Controlled Governor, Coefficient of Insensitiveness.

5. GYROSCOPE

Gyroscopic couples, gyroscopic stabilization, gyroscopic couple of a plain disc, gyroscopic effect on movement of a naval ship, ship stabilization, stability of automobile taking turn, Couple for a body fixed rigidly at certain angle to a rotating shaft.

6. CAMS

Cam Mechanism and its Uses, Types of cams and followers, main considerations affecting choice of cam profile, SHM for follower, uniformly accelerated and decelerated motions, parabolic motion, uniform motion for follower, profile of cam operating an oscillating roller follower, profile of cam operating a flat faced follower, Cams with specified contours.

TEXT BOOKS:-

1. Theory of Machines : S. Rattan (TB)
2. Theory of Machines : Ballaney (TB)
3. Theory of Machines & Mechanisms : Rao & Dukkipati (TB)
4. Theory of Machines : Jagdish Lal (RB)
5. Theory of Machine : V.P.Singh
6. Vibration : S.S.Rao

MED-315 INDUSTRIAL ENGINEERING

L	T	P/D	Cr
3	1	0	3

1. INTRODUCTION

Concept of Industrial Engineering; Functions of I.E.; Role of Industrial Engineering in the plant; Concept of Productivity, Productivity measures, Productivity measurement models, Principles and types of Organization—Line, functional, line and staff; Organization Chart.

2. SALES FORECASTING AND INVENTORY CONTROL

Introduction; importance; long and short term forecasting, methods of sales forecasting; time series analysis for sales forecasting; least squares method of forecasting, Exponential smoothing, Forecasting of new and established products, Use of Information Technology, Functions and types of inventories; Inventory costs, zero inventory, economic long size, ABC analysis; Inventory classification systems: ABA, FMS, VED etc.

3. PRODUCT DEVELOPMENT AND DESIGN

Concept of product development and design; Product life cycle, steps of new product development, product design considerations; standardization, simplification and specialization; ergonomic considerations in product design; product cost considerations, Design for manufacturing (DOM), Economies of product development, Concept, advantages, Concurrent Engineering.

4. QUALITY AND RELIABILITY

Introduction and definition of quality, Evolution of Quality: Inspection, Quality Control, Customer Orientation: Internal & External Customer Concept, Life cycle approach to quality cost- Prevention; Appraisal and Failure costs. Seven QC tools (Histogram, Check sheets, Ishikawa diagrams, Tareto, Scatter diagrams, Control charts). Reliability evaluation, Maintainability, and availability concepts.

5. BREAK EVEN ANALYSIS & DEPRECIATION

Concept of Brake-Even analysis; Assumptions in Break-Even analysis, Important terms and Definitions; Calculations of Break-Even Points, Advantages, Limitations, and Application of Break-Even analysis; Concept of Depreciation, Purpose of Calculating Depreciation; Types of Depreciation; Methods of Calculating Depreciation.

6. WORK STUDY AND VALUE ANALYSIS

Concept of Work Study, Advantages; Techniques of Work Study, Scope & Procedure of Method Study; Elements of Method Design; Flow Process Chart, Flow Diagram; String Diagram, Multiple Activity Charts; Work Sampling; Objectives of Work Measurement, Basic Procedure of Time Study; Concept & Objectives of Value Engineering/Analysis; Value Engineering; Function Analysis System Techniques; Factors to be Considered for Value Determination; Value Analysis procedure.

7. LATEST TOOLS OF INDUSTRIAL ENGINEERING

MRP; Computer Aided MRP; ERP; JIT Production System; TQM, Bench marking; ISO and TQM; Supply chain Management, Business Process Reengineering, Kanban System.

TEXT BOOKS:-

1. Production Planning and Control : Samuel Eilon
2. Production and Operations Management : Adam Ebert
3. Production Management : Buffa
4. Production Planning & Inventory Control : Narsimhan
5. Fundamentals of Quality Control : Mitra
6. Product Design and Development : Ulrich, K.T. and Eppinger

MEO – 316 **ROBOTICS**

L	T	P/D	Cr
3	1	0	3

1. FUNDAMENTAL OF ROBOTICS

Introduction, automation and robotics, history of robotics, Advantages and disadvantages, investment on robot, economic analysis of robot, social impact, management and robotics, characteristics and application of the present robot, The characteristics and applications of robot of future industrial robot.

2. THE STRUCTURE OF ROBOTIC SYSTEM

Anatomy of robot, classification of robot, robot configurations, robotic systems, robot specifications, performance parameters, robot drive systems, wrist and motions, Robot end effectors, force analysis of gripper mechanisms, Gripper design considerations, selection consideration of grippers, robot control system and components.

3. ROBOT MOTION ANALYSIS

Introduction to manipulator kinematics, Homogeneous transformation and robot kinematics, Manipulator parameters, The D-H representation, Kinematics arm equations, inverse kinematics problems, Robot arm dynamics, dynamics equations, Trajectory planning.

4. ROBOT SENSORS AND VISION

Introduction, classification of sensors and their functions, Position, velocity, acceleration sensors, proximity and range sensors, Touch and slip sensors, force and Torque sensors, Vision: Introduction to machine vision, Image processing and analysis, Robotic applications.

5. ROBOT PROGRAMMING

Introduction, methods of programming, Motion interpolations, Robot programming languages, Language structure, Programming languages-features and applications, Introduction to artificial Intelligence and robotics.

6. ENGINEERING APPLICATIONS FOR MANUFACUTRING

Robot cell design and control, Robot as peripheral device, Material transfer, machine loading and unloading, processing operations applications, Assembly and applications.

7. IMPLEMENTATION PRINCIPLES, SOCIAL ISSUES AND FUTURE OF ROBOTICS

Plant survey to identify potential applications, planning and engineering. The installation, safety, training and maintenance issues, social and labor issues, robotic technology of the future and future applications.

TEXT BOOKS:

1. Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.
2. Industrial Robotics : Gordon M. Mair
3. Introduction to Robotics : Craig
4. Introduction to Robotics- Analysis, Systems Application : Nikku
5. Robotics & Automated Manufacturing : Richard C.Dort
6. Industrial Robotics : Mikell P.Groover, Nicholas
7. Fundamentals of Robotics : Robert J. Schilling

MED- 322 MACHINE -DESIGN-II

L	T	P/D	Cr
3	1	0	3

1. SPUR GEARS

Nomenclature, involute gears, Lewis equation and Lewis form factors, working stress in gear teeth, dynamic loads on gear teeth, design of spur gears for wear.

2. BEVEL GEARS

Straight bevel gears - nomenclature, virtual number of teeth, endurance load, dynamic load, wear load – AGMA standards, design of gears whose axis are intersecting at right angle.

3. WORM GEARS

Nomenclature, Lewis equation for strength design, design of worm gears-given approximate center to center distance, dynamic load, endurance load, wear load, AGMA- Power reducing equations, efficiency of worm gears, check for wear load and heat dissipation.

4. HELICAL GEARS

Nomenclature - virtual number of teeth, helix angle, free width, velocity factors, strength design, limiting endurance, beam strength load, dynamic loading, wear loads.

5. JOURNAL BEARINGS

Introduction to lubrication, hydrodynamic bearings, Somerfield number, l/d ratio, clearance ratio, minimum film thickness, design procedure, bearing materials.

6. BALL AND ROLLER BEARINGS

Types, static and dynamic load capacity, bearing life, selection of bearings for steady and variable loading.

7. DESIGN OF MULTISPEED GEAR BOX

Use of preferred numbers, design with speed diagrams for gear boxes.

TEXT BOOKS:

1. Design of M/c Elements : V.B. Bhandari
2. Machine Design : Patel, Sikh and Pandya
3. Machine Design : Pandya & Shah
4. Machine Design : Sharma & Aggarwal
5. Machine Design : Shigley
6. Machine Design : Kulkarni
7. Machine Design : Sadhu Singh
8. Machine Design : R.K.Jain

HANDBOOK:

Design Data Book PSG College of Technology Coimbatore Use of this hand book permitted in the examination.

MED-323 **THERMAL ENGINEERING**

L	T	P/D	Cr
3	1	0	3

1. POWER CYCLES

Vapor power cycles, Rankine cycle with reheat, regeneration, bleeding of steam, binary vapor cycles. Deviation of actual cycles from ideal cycles, internal and stage efficiencies, reheat factor, Ericsson cycle, Steam power Plant.

2. BOILERS

Types, water tubes and fire tube boilers, high pressure boilers, mounting and accessories, natural and forced circulation, Boiler draught, Boiler trial and heat balance, Fluidized bed boilers.

3. COMPRESSOR

Single and multistage reciprocating compressor, effect of intercooling, volumetric efficiency.

4. CONDENSER

Jet and surface condenser, condenser vacuum and vacuum efficiency, cooling towers, Air ejectors.

5. STEAM NOZZLES

Steady flow energy equation and its application to steam nozzles, isentropic expansion of steam through convergent and divergent nozzles, critical pressure, condition for maximum discharge, choking of nozzles, effect of back pressure, super saturated flow through nozzles, flow with friction nozzle efficiency.

6. STEAM TURBINES

Principle and working of impulse and reaction turbines, pressure and velocity compounding; velocity triangles for various types, efficiency, diagram efficiency, steam speed to blade speed ratio for optimum performance, losses in steam turbine, performance and governing of steam turbines.

7. GAS TURBINE PLANTS

Brayton cycle, regeneration and reheating, open and closed cycle gas turbine plants.

TEXT BOOKS:

1. Thermal Engineering : P.L.Ballaney
2. Thermal Engineering : R.K.Rajput
3. Thermal Power Engineering : R.Yadav
4. Thermal Engineering : Domkundwar

MED – 324 MEASUREMENT & CONTROL

L	T	P/D	Cr
3	1	0	3

1. GENERAL BACKGROUND

Instrument Classification, Characteristics of Instruments-Static and dynamic, experimental error analysis, Systematic and selection of measuring instruments Reliability of instruments, Classification of Transducers.

2. DATA ACQUISITION & SIGNAL CONDITIONING

Analog Devices, Resistance Measurements Amplification, Analog filters, Digital Devices, Digital signals, Analog to digital, Amplifiers, Operational Amplifiers, Differentiating and integrating elements, Terminology and conversions, Data Transmission elements, Indicating, recording and display elements, Data acquisition Systems.

3. MEASUREMENT METHODS &APPLICATIONS

Motion measurement, Force measurement, torque measurement by various dynamometers, High &Low pressure measurement, temperature measurement by non-electrical and radiation methods, Flow measurements, Measurement of humidity & moisture, Biomedical measurements/Biometrics.

4. CONTROL SYSTEM

Block diagram of automatic control system, closed loop system, open loop system feedback control system, feed forward control servomotor mechanism, comparison of hydraulic, pneumatic, electronic control system, proportional control action, Stability of control systems, Applications of measurements and control for setup for boilers, air conditioners motor speed control.

5. DIGITAL TRANSDUCERS-INTERFACE SYSTEM AND STANDARDS

Computer automated measurements and controls (CAMAC) standards –IEEE 488 standard interface – Remote monitoring and control of boiler horses –D-DAC (Distributed Data acquisition and Control Systems) – Microprocessor based temperature control system-Introduction to Microcontrollers-Process

6. Control system –Pneumatic systems.

Text Book:

1. K.Ogata, Modern Control System Engineering, Pearson education
2. Measurement system Applications and Design, E.O Doeblin, Tata- McGraw Hill
3. Instrumentation, Measurement &analysis, B.C Nakra & K.K Chaudhary, Tata McGraw Hill
4. Morris. A.S,Principles of Measurements and instrumentation Prentice Hall of India, 1998

Reference Books:

1. Fundamentals of Temperature, Pressure, and Flow Measurements, R.P.Benedict, John-Wiley
2. Measurement and Control Basics 2nd Ed.,T.A hughes,
3. Instrumentation for process Measurement and control, N.A Anderson,
4. George C Barney, Intelligent Instrumentation Microprocessor and Applications in Measurements and control, Prentice Hall, New Delhi,

MEO-325 MODELLING AND SIMULATION

L	T	P/D	Cr
3	1	0	3

1. INTRODUCTION

System, continuous and discrete system, types of simulation models, advantages and disadvantages of simulation, areas of application, systems and system environment, components of a system.

2. MONTE CARLO METHOD

Introduction, normally distributed random numbers, Monte Carlo vs. stochastic simulation Concepts in discrete event simulation, time advance algorithm, manual simulation using event scheduling, basis properties and operations.

3. MODELS IN SIMULATION

Terminology and concepts, statistical models: queuing systems; inventory systems; reliability and maintainability, limited data, discrete distributions: Bernoulli distribution; Binomial distribution; Geometric distribution, continuous distribution: Uniform distribution; Exponential distribution; Gamma distribution; Normal distribution; Weibull distribution; Triangular Distribution; Lognormal distribution, Poisson process.

4. SIMULATION OF QUEING SYSTEMS

Characteristics of queuing systems, the calling population, system capacity, arrival process, service mechanism, queuing notations, long run measures of performance of queuing systems.

5. APPLICATIONS OF SIMULATIONS

Applications of Simulation in Inventory Systems, Project evaluation and review technique, counter service, Maintenance and replacement problems.

TEXT BOOKS

Simulation Modelling and Analysis by Law and Kelton, Mc Graw Hill, 1991

REFERRENCE BOOKS

1. Simulation Model Design& execution by Fishwich, Prentice Hall, 1995
2. Discrete event system simulation by Banks, Carson, Nelson and Nicol

MED-326 **COMPUTER AIDED MANUFACTURING**

L	T	P/D	Cr
3	1	0	4

1. INTRODUCTION

Historical background, role of computers in manufacturing, automation, Types of automation, Automation strategies, fundamentals of NC, Need of NC machine tool, Elements of NC machine tools, Axes of NC machines, NC machine tools, tooling for NC machines, Steps in NC manufacturing, advantages of NC system, applications of NC systems, economic of NC manufacturing, machining centers.

2. COMPUTER NUMERICAL CONTROL

Principle of operation of CNC features of CNC systems, development in CNC systems, adaptive control, direct numerical control (DNC), standard communication interfaces, programmable logic controllers (PLCs), communication networks, configuration of CNC system.

3. CNC PART PROGRAMMING

Introduction, Manual part programming: structure and format of part program NC programming codes, programming for two axis control system, programming for three axis control system, Computer aided CNC part programming: Need of Computer aided part programming, computer aided Part Programming languages: Automatically programmed tools programming (APT) and Compact-II, CAD/CAM-Based part programming.

4. GROUP TECHNOLOGY AND CELLULAR MANUFACTURING

Introduction to industrial robotics, Introduction, Group technology: Part families, parts classification and coding, production flow analysis, machine cell design, Computer aided process planning (CAPP): Types of process planning system, Advantages of CAPP.

5. COMPUTER AIDED QUALITY CONTROL (CAQC)

Use of computers in QC, Computer aided inspection (CAI): contact inspection methods, non-contact inspection, in process gauging, online inspection and quality control, Machine Vision system, Computer aided testing (CAT).

6. FLEXIBLE MANUFACTURING SYSTEM

Introduction to FMS (building blocks of FMS), different types of flexibilities in FMS, type of FMS, Machining system of FMS, Tool management systems, work piece handling system, FMS Control, Lay out considerations in FMS Advantages of FMS. Introduction to computer integrated manufacturing systems (CIMS), the future automated factory; trends in manufacturing, human factors in future automated factory, the social impact.

TEXT BOOKS:

1. Automation: Production Systems & CAM : Groover, Eaglewood
2. An introduction to Automated Process Planning : Chand & Wysk , T.K.Kundra
3. System approach to Computer Integrated Design and Manufacturing : Nanua Singh
4. FMS : R.Maleki
5. CNC Machines : Pabla, BS & Adinathan
6. CAD/CAM : Suresh Dalela & PK Jain.