ME 434

PROJECT SEMINAR

Instruction 3 Periods per week
Sessional 25 Marks

The objective of the project seminar is to actively involve the student in the initial work required to undertake the final year project. It may comprise of:

- Problem definition and specifications.
- A broad understanding of the available techniques to solve a problem of interest.
- Presentation (Oral and Written) of the project.

The Department can initiate the work related to project allotment at the end of III year II semester and complete it in the first two weeks of the fourth year I semester.

First 4 weeks of IV year 1st semester will be spent on special lectures by faculty members, research scholar speakers from industries and R&D institutions. The objective of these talks is to be expose students to real like / practical problems and methodologies to solve them.

A seminar schedule will be prepared by the coordinator for all the students. It should be from the 5th week to the last week of the semester and should be strictly adhered to,

Each student will be required to

1. Submit a one page synopsis of the seminar to be delivered for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write up on the talk delivered.

At least two teachers will be associated with the evaluation of the project seminar for the award of the Sessionals marks which should be on the basis of performance on all the three items stated above.

Note: Three periods of contact load will be assigned to each project guide

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(PRODUCTION ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	ME 409	Tool Design	4	-	3	75	25
2.	ME 461	Production and Operations Management.	4	-	3	75	25
3.		ELECTIVE – II	4	-	3	75	25
4.		ELECTIVE – III	4	-	3	75	25
		PRACTICALS					
1.	ME 481	Seminar	-	3	-	-	25
2.	ME 482	Project*	-	6	Viva Voce	Gr*	50
		Total	**16**	**9**	**-**	**300**	**175**

Excellent / Very Good / Good / Satisfactory / Unsatisfactory.

M.J.C.E.T.

ELECTIVE-II

EC 441 Microprocessor Applications
ME453 Artificial Intelligence and Expert Systems
ME454 Machine Tool Design
ME455 Manufacturing Systems and Simulations
ME456 Mechatronics
LA 454 Intellectual Property Rights
ME462 Nano Materials &Technology
ME463 Power Plant Engineering
CS 403 Information Security

ELECTIVE –III

ME457 Robotics
ME458 Product Design and Process Planning
ME459 Modern Machining and Forming Methods
ME460 Plastics Engineering & Technology
CS 452 Computer Graphics
CS 408 Internet Programming
ME465 Rapid Prototyping Technologies
ME466 Material Handling
ME468 Non-Destructive Testing

ME 409

TOOL DESIGN
(ELECTIVE - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Cutting tool materials and processes: Desired properties, Types, major constituents, relative characteristics, latest developments, ISO: Classification and coding of carbide tools, Coated tools. Principles of working and applications of USM, EDM, ECM, AJM, LBM, and EBM. Superfinishingprocesses: Honing, Lapping Burnishing, Ballizing, Polishing.

Unit-II

Design of single point cutting tools, Form Tools: Design of flat and circular Form Tools and tool holding methods.

Design of Multi Point Cutting tools: Milling Cutters: Major types, design and manufacturing of peripheral, end and face milling cutters, forces and power estimation. Grinding of milling cutters.

Broaches: Pull and Push types. Internal and External broaches, geometry and design and manufacturing of Pull type and push type broaches.

Unit-Ill

Multi point cutting tools:

Twist Drill geometry, Design and manufacturing of twist drill. Effect of variation of different angles on torque and thrust forces. Types and design of shanks. Sharpening of twist drill.

Reamers: Types, geometry, Reaming allowance, tolerance disposition, Design and manufacture of twist drills.

Taps and Dies: Types, Geometry, Design and manufacturing of Taps and Dies.

Unit-IV

Design of Press tools: Die set elements. Design of Die Set for simple components in Blanking, Piercing, bending, Drawing, Forging and Spinning. Plastic Tools; Plastic Dies for simple components.

M.J.C.E.T

Unit-V

Jigs & Fixtures: Design principles and construction features. Locating methods associated with flat, cylindrical, internal and external surfaces. Type of locating pins. Requirements and choice of locating systems. Redundant location, fool proofing. Setting blocks, types of clamping devices and theirbasic elements. Quick action clamps and nuts. Equalising and multiple clamping pneumatics. Hydraulic, magnetic, electrical and vacuum clamping. Types of drill jigs and their classification. Types of jig bushes, jig feet, Indexing jigs. Design of Fixtures for Turning, grinding, welding and Milling. Economic analysis of Jigs and Fixtures.

Suggested Reading:

1. Donaldson, Leain and Goold, *Tool Design,* Tata Me Graw Hill, New Delhi, 1983.
2. Rodin, Design *of Cutting Tools,* Mir Publications, Moscow.
3. AmitabhaBattacharya and Inyong Ham, *Design of Cutting Tool,* Use Of Metal Cutting Theory, ASTME Publication Michigan USA, 1969.
4. Surender Keshav & Umesh Chandra, *Production Engineering* Design (Tool Design), Satya Prakashan, New Delhi-1994.

ME 461

PRODUCTION AND OPEARATIONS MANAGEMENT

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Production & Operations Management: Introduction, Types of Production Systems - Job shop, Batch, Flow shop.

Plant location and Layout: Factors affecting plant location, Break even analysis, Plant layout objectives, Types of layouts, Merits and demerits.

Work Study: Introduction to Method study and Work measurement, Standard time calculations, Methods of rating, Work sampling, Wages and Incentives, Types of incentive plans.

UNIT-II

Forecasting: Introduction, Forecasting objectives and uses, Demand patterns, Qualitative models - Market survey, Delphi, Quantitative models – Moving average, Weighted moving average, Simple exponential smoothing, Trend adjusted exponential smoothing, Least square method, Simple regression, multiple regression.

Forecast Errors: Mean Absolute Deviation (MAD), Mean Square Error (MSE), Mean Forecast Error (MFE), Mean Absolute Percentage Error (MAPE)

UNIT-III

Aggregate planning and master scheduling: Introduction, Objectives of aggregate planning, Cost in aggregate planning, Strategies in aggregate planning, Master production scheduling

Materials requirement planning (MRP_1): Importance of MRP, MRP system inputs and outputs, MRP calculations

Manufacturing Resource Planning (MRP_2) & Enterprise Resource Planning (ERP): features of ERP packages like SAP, BANN, People soft etc.,

M.J.C.E.T

UNIT-IV

Inventory Control: Importance of inventory control, types of inventory models, Inventory costs Deterministic inventory models – basic EOQ model, Production model without shortages, Purchase model with instantaneous replenishment and with shortages, Production model with shortages, Inventory model with price breaks, Fixed order quality system, Periodic review system, Inventory model with probabilistic demand.

UNIT-V

Project Management: Network fundamentals, Differences between PERT and CPM, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of ES and EF in forward path, LS & LF in backward path, Determination of critical path, Free float, Independent float, Total float, Program evaluation and review technique, Crashing of network.

Suggested Reading :

1. Joseph Monk, *Operations Management*, TMH Publishers, New Delhi, 2004.
2. Buffa Elwood S, *Modern Production /Operations Management* , John Wiley Publishers, Singapore, 2002
3. Everett E Adam, Jr and Ronald J. Ebert, *Production and Operations Management- Concepts, Models and Behavior,* 5th Ed. 1998, (EEE), Prentice Hall of India(P) Ltd., New Delhi.
4. Panneer Selvam R, *Production and Operations Management* , Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2006.
5. S.D. Sharma, *Operations Research*, Kedarnnath, Ramnath & Co., Meerut, 2009

EC 441

MICROPROCESSOR APPLICATIONS

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Basic Concepts: Evolution of microprocessors - organization of microcomputers - microprocessor programming - digital logic - timing diagram conventions.

Data Representation: Introduction- positional number systems - the binary number system - representation of integers - Representation of real number - Binary arithmetic - other number systems - Character representation.

Unit-II

Programming microprocessor: Introduction - organization of the 8085 Instruction set of the 8085 - programming the 8085 - Assembler Programming -language for writing. Algorithms - programming examples - the ZilogSO.

Unit-III

Semi conductor memories: Introduction - characteristics of memories static rams - dynamic RAMS.

Reprogrammable ROMS - Memory system reliability.

Microprocessor Timings: Introduction - timing and control unit - timings of Intel 8085 - timing of Zilog Z80 - register organization.

Unit-IV

Interfacing memory and 1/0 Devices: Introduction address space partitioning - memory interfacing -data transfer schemes - programmed data transfer - direct memory access data transfer - serial data transfer. Interfacing Devices: Introduction - types of interfacing devices - address decoding for I/O - INPUT/OUTPUT ports - programmable interrupt controller - programmable DMA controller - communication interface -analog input devices - analog output devices - analog input subsystems -analog output subsystems.

Unit-V

Application of micro processors: Temperature monitoring system - Automotive applications- closed loop process control.

M.J.C.E.T

Suggested Reading:

1. Aditya P. Mathur, *Introduction to Microprocessors,* Tata Me Graw Hill Publisher company Ltd.,New Delhi.2002
2. Ram B, *Fundamentals of Microprocessors and Micro-computers ,* Dhanpat Rai & Sons -2000.
3. M. Rafiq - uz - Zamon, *Microprocessors theory and applications .,* PHI, 2001.

ME 453

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction: Intelligence, definition, types, cognitive aspects approach, measuring intelligence, early efforts. IQ and AI, aspects of intelligence, learning, problem solving, creativity, behaviour and biology.

Unit-II

Cognitive Psychology: The mid, information and cybermatics, components for thought, modes of perception, visual, auditory and other systems, memory mechanisms, problem solving - planning search, the GPS systems, types of learning - route parameters methods and concept, game playing, reasoning.

Unit-III

Knowledge Engineering: Introduction, role of knowledge engineer, knowledge representation, psychology, production rules, logic and programming, common sense and fuzzy logic, semantic networks, learning systems.

Unit-IV

Visual Perception: Introduction, biology of vision, computation aspects, towards artificial vision, picture processing - identifying real objects; vision programmed, factory vision systems. Robotics: AI impact, robot sensors, factory robots, personal robots, future robot.

Unit-V

Expert Systems: Introduction, knowledge acquisition for expert systems; features of expert systems, system structure, inference engines, uncertainties; memory mechanism, range of applications, actual expert systems - VP expert.

Suggested Reading:

1. E. Rich, KevinKnight, *ArtificialIntelligences*, 2nd Edition, TMH.
2. Charnaik E. and McDermott D., *Introduction to Artificial Intelligence*, Addison Wesely, 1995.
3. *Artificial Intelligence in Business Science and Industry*, Vol.2 Applications, PH. 1985.
4. PH Winston, *ArtificialIntelligence,* Addison Wesely.

M.J.C.E.T

ME 454

MACHINE TOOL DESIGN

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-1

Classification of machine tools. Mechanisms used for converting rotary to linear motion and intermittent motion. Kinematic structures of machine tools - general purpose, special purpose, automatic screw cutting machines. Basic features of transfer machines. Numerical Control of machine tools, advantages and limitations. Schematic diagrams of NC systems.

Unit-II

Drives of machine tools; selection of range of speeds and feeds. Speed layout in GP, AP and logarithmic progression. Standardization of speeds and feeds. Productivity loss.

Selection of highest and lowest speeds, range ratio. Design of ray diagram and structural diagrams for machine tool gear boxes. Determination of number of teeth and module of gears in gear box design. Rules for layout of gear box having sliding clusters. Sliding cluster and clutched drives, Ruppert drive.

Unit-III

Feed gear boxes: Norton and Meander gear boxes. Stepped and step less regulation of speeds.

Strength and Rigidity design analysis. Design of beds, frames, Columns and Guide ways.

Materials for structures. Methods to improve the rigidity of structures. Overall compliance of machine tool. Thermal effects - functional accuracy of machine tool.

Unit-IV

Spindle units; Spindles of lathe, Drilling, Milling and Grinding machines materials for spindles. Spindle design. Effect of clearance on the rigidity of spindle.

Hydro-dynamic and Hydro-static bearings; Requirements of spindle bearings.

Unit-V

Hydraulic controls: various controls used in machine tools. Hydraulic and Pneumatic systems used in machine tools. Positive displacement pumps. Power pack. Relief valves, check valves, flow control valves, multi position direction control valves, Filters, Accumulators. Speed regulation of surface grinding machine. Hydro- copying systems.

Suggested Reading:

1. G C Sen & Bhattacharya, *Principles of machine tools,* New Central Book Agency, Calcutta.
2. N K Mehta, *Machine Tool Design and Numerical Control,* Tata McGraw-Hill Publishing co. Ltd.
3. S.K.Basu, *Design of machine tools*, Allied Publishers
4. S R Majumdar, *Hydraulic Systems- Principles & Maintenance*, Tata Mc.Graw-Hill Publishing Company *Limited; New* Delhi

M.J.C.E.T

ME 455

MANUFACTURING SYSTEMS AND SIMULATIONS

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Manufacturing Systems: Definition of systems; basic concepts and problems concerning systems; Systems design: Decision making procedures; Structural, Transformational and procedural aspects of manufacturing; Modes of production. Process systems for manufacturing; logistic systems; material flow & technological information flow. Management and information systems for manufacturing: Managerial information flow in manufacturing systems.

Unit-II

Information Systems: Fundamentals of information technology, information systems, information networking, parts oriented production information systems, and computerized production scheduling, online production control systems. Computer based production management systems. Automation systems for manufacturing: Industrial automation, kinds of automation, principles of CIM, effectiveness of CIM, factory automation, automatic machine tools for mass production, NC machine tools, computer controlled manufacturing systems, FMS, automated assembly, automatic material handling, automatic inspection and testing, computer integrated automation systems - unmanned factory.

Unit-III

System Models: Concepts, continuous and Discrete systems, systems modeling, type of models, subsystems, corporate model, system study. System simulation: Techniques, comparison of simulation and analytical methods, types of simulation, distributed log model, cobweb models.

Unit-IV

Continuous system simulation: Numerical solution of differential equation, analog computers, hybrid computers, continuous system simulation languages CSMP, system dynamic growth models, logistic curves. Discrete systems simulation: Events generation of arrival patterns, simulation programming tasks, analysis of simulation output. Queuing theory: Arrival pattern distribution, service times, queuing disciplines, and measure of queues.

Unit-V

GPSS and SIMSCRIPT: General description of GPSS and SIMSCRIPT, programming in GPSS Simulation Programming Techniques: Data structures, implementation of activities, event and queues, event scanning, simulation algorithms in GPSS and SIMSCRIPT.

Suggested Reading:

1. David Bedworth & James Bailey, *Integrated production control system management, analysis & design*, 2nd ed., John Wiley & Sons Ltd.
2. Ronald Zskin & Charles Standridge, *Modeling and Analysis of Manufacturing Systems*, John Wiley & Sons Ltd.
3. Geofery Gordan, *Systems Simulation*, Prentice Hall, 1980.
4. Deo. N., *System Simulation with Digital Computers*, Prentice Hall, 1980.

M.J.C.E.T

ME 456

MECHATRONICS
(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction to mechanization & automation. Need of interface of electrical & electronic devices with mechanical elements. The concept of Mechatronics: Flow chart of mechatronics system, elements of mechatronics system, drive mechanisms, actuators, feedback devices and control system. Application in industries and systems development.

Unit-II

Drive mechanisms: Feeding and indexing, orientation, escapement and sorting devices, conveyor systems. Introduction to electrical actuators: A.C servo motors, D.C. servomotors, stepper motors.

Unit-III

Introduction to fluid power systems: Industrial pneumatics and hydraulics. Merits of fluid power. Pneumatic and hydraulic elements symbols. Study of hydraulic control values, pumps & accessories. Hydraulic circuits and mechanical servo control circuits, Electro-hydraulic and Hydro-pneumaticcircuits

Unit-IV

Introduction to industrial electronic devices: Diodes, Transistors, Silicon controlled Rectifiers (SCR), Integrated Circuits (1C), Digital Circuits. Measurement systems & Data acquisition systems: sensors, digital to analog and analog-to-digital conversion. Signal processing using operational amplifiers. Introduction to micro processor & micro controller. Temperature measurement interface and LVDT interface. Systems Response.

Unit-V

Design of Modern CNC machines and mechatronics elements: machine structures, guide ways, spindles, tool monitoring systems, adaptive control systems. Flexible manufacturing systems. Multipurpose control machines. PLC programming

Suggested Reading:

1. W.Bolton Mechatronics Pearson Education Ltd.
2. HMTLimited, *Mechatronics,* 1998TataMc.Graw-Hillpublishing Company *Limited; New* Delhi,
3. Michaels Histand & David G, Alciatore, *Introduction to Mechatronics and Measurement Systems,* Tata McGraw-Hill International edition.
4. S RMajumdar, *Oil hydraulic systems- Principles & Maintenance,* Tata Mc.Graw-Hill Publishing Company *Limited; New* Delhi.

M.I.C.E.T.

LA 454

INTELLECTUAL PROPERTY RIGHTS

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction: Meaning of Intellectual property - Nature of I.P. Rights -Kinds of Intellectual property rights -International conventions of Intellectual property rights. Patent Treaty 197O, GATT 1970, GATT 1994, TRIPS & TRIMS International organization for protection of IPR-WTO,WIPO, UNESCO.

Unit-II

Patents: Meaning of Patents -Commercial significance -Obtaining of patent Patentable subject- matter-rights and obligations of patentee -Specification Registration of patents -Compulsory licensing and licenses of rights Revocation.

Unit-III

Industrial Designs: Definition of designs -Registration of design -Rights and duties of Proprietor of design -Piracy of registered design.

Unit-IV

Trade Marks -Meaning of trade marks -Purpose of protecting trademarks, Registered Trademark -Procedure -passing off-Assignment and licensing of trade marks -Infringement of trademarks.

Unit-V

Copy Right -Nature, scope of copy right -subject matter of copyright -rights conferred by copyright -Publication- Broad-Casting, telecasting -Computer programme -Database write -Assignment -Transmission of copyright, Infringement of copy right.

Suggested Reading:

1. Cronish W.R1 *Intellectual Property; Patents, copyright, Trad and Allied rights,* Sweet & Maxwell, 1993,
2. P.Narayanan, *Intellectual property law,* Eastern Law Edn.,1997.
3. Robin Jacob and Daniel Alexander, *A Guide Book to Intellectual property patents, Trade Marks, Copy rights and designs* , Sweet, Maxwell 4th Edition. 1993.

ME 462

NANO MATERIALS AND TECHNOLOGY

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction: Nanoscale, Properties at Nanoscale, advantages and disadvantages, importance of Nano Technology, Bottom-up and Top-down approaches, challenges in Nano Technology, Proximal probe technologies.

Unit-II

Materials of Nano Technology: Introduction-Si-based materials, Ge-based materials, metals, Ferroelectric materials, Polymer materials, GaAs & InP (Hl-V) group materials, Nano tribology and Materials, characterization using Scanning Probe Microscope, AFM, FFM.

Unit-III

Nano Structures: Zero dimensional Nano structure (Nano Particles)-Synthesis procedure, characterization techniques, properties and applications of Nano Particles

One dimensional Nano structures (Nano Wires, Nano Tubes)- Various Synthesis procedure, characterization procedure and principles involved, properties and applications of Nano Wires, Types of Nano Tubes, Synthesis procedure, characterization properties and applications of Nano Tubes.

Unit-IV

Nano Fabrication: Introduction, Basic fabrication techniques (Lithography, thin film deposition, and doping) MEMS fabrication techniques, Nano fabrication techniques (E-beam Nano-imprint fabrication, Epitaxy and strain engineering, Scanned probe techniques).

Unit-V

Special Nano Materials Nano Composites: Introduction, Synthesis procedures, various systems (metal-polymer, metal-ceramics and polymer-Ceramics), Characterization procedures, applications. Nano Biomaterials: Introduction, Biocompatibility, anti-bacterial activity, principles involved, applications.

M.J.C.E.T.

Suggested Reading:

1. A.K.Bandyopadyay, *Nano Materials,* New Age Publications.
2. T. Pradeep, *Nano Essentials,* TMH
3. Carl C. Koch, *Nano Materials Synthesis, Properties and Applications,* Jaico Publishing House.
4. Willia Tllsey Atkinson, *NanoTechnohgy*, Jaico Publishing House.
5. George W. Hanson, *Fundamentals of Nanoelectronics*, Pearson Education, 2009.

ME 463

POWER PLANT ENGINEERING

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-1

Introduction to Sources of Energy-Resources and Development of Power in India.

Steam Power Plant: Plant layout, working of different Circuits, Fuel and handling equipment, types of coal, coal handling, choice of handling equipment, coal storage, ash handling systems.

Unit-II

Combustion Process: Properties of coal- overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers, and heat rejection, corrosion and feed water treatment.

Gas Turbine Power Plant: Introduction -classification-Layout with auxiliaries-Principles of working of closed and open cycle gas turbines

Unit-Ill

Hydro Electric Power Plant: Water power-Hydrological cycle, flow measurement- drainage area characteristics-Hydrographs-storage and pondage- classification of dams and spill ways.

Unit-IV

Nuclear Power Station: Nuclear fuel-breeding and fertile materials -Nuclear reactor-reactor operation-Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas-cooled reactor.

Radiation hazards and shielding -radio active waste disposal.

Unit-V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, average load and load factor, delivery factor-related

M.J.C.E.T

exercises Effluents from power plants and impact on environment -Pollutants and Pollution Standards -Methods of pollution control

Suggested Reading:

1. Rajput, RK, *A Text Book of'Power Plant Engineering* , 3rd Edition. Laxmi Publications, New Delhi, 2005.
2. Arora SC, Domukundwar S, *A Course in Power Plant Engineering,* DhanapatRai & Sons, New Delhi, 2005.
3. YadavR, *Steam & Gas Turbines and Power Plant Engineering,* 7th Edition, Central Publishing House, Allahabad, 2007.
4. Nag P K, *Power Plant Engineering,* 2nd Edition, Tata Mc Graw Hills Co. Ltd, New Delhi, 2002.
5. Wakil M M, *Power Plant Technology*, Me Graw Hill Publications, New york, 2005.

CS 403

INFORMATION SECURITY

(ELECTIVE-II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-ll

Legal, Ethical and Professional Issues: Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security

Risk Management: Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices

UNIT-lll

Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies, Security Technology: Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

UNIT-IV

Security Technology: Intrusion detection, Access control and other security tools:

Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

Cryptography: Foundations of cryptology, cipher methods, crypryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems

M.J.C.E.T

UNIT-V

Implementing Information Security: information security project management, technical topics of implementation, Non- technical aspects of implementation, Security certification and accreditation Security and Personnel: Positioning and staffing security function, Employment policies and practices, internal control strategies. Information security Maintenance: Security management models. The maintenance model, Digital forensics

Suggesting Reading:

1. Michael E. Whitman and Hebert J Mattord, *Principles of Information Security,* 4th editionEd. Cengage Learning 2011
2. Thomas R Peltier, Justing Peltier, John Blackley, *Information Security. Fundamentals,* Auerbacj Publications 2010
3. Detmar W Straub, Seymor Goodman, Richard L Baskerville, *Information Security. Policy Proceses and Practices,* PHI 2008.
4. Marks Merkow and Jim Breithaupt, *Information Security. Principle and Practices,* Pearson Education, 2007.

ME 457

ROBOTICS

(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Robots: History and evolution of robots, Laws of robotics, Basic configuration, degree of freedom, work envelope, motion control methods! Application in industry - material handling, loading & unloading, processing, welding & painting applications, assembly and inspection, Robot specification requirements.

Unit-II

Rotation matrix: Homogenous transformation matrix. Denavit - Hartenberg convention. Euler angles, RPY reprensation. Direct and inverse Kinematics for industrial robots for position and orientation. Redundancy.

Unit-III

Manipulator Jacobian: Joint - End effector velocity - direct and inverse velocity analysis, Trajectory planning, interpolation, cubic polynomial, linear segments with parabolic blending, static force and moment transformation, Solvability, Stiffness, Singularities.

Unit-IV

Robot dynamics: Lagrangian formulation, link Inertia tensor and manipulator Inertia tensor, Newton - Euler formulation for RR & RP Manipulators. Control: Individual joint, computed torque.

Unit-V

End effectors, Position and velocity measurement. Sensors: Proximity and range, tactile, force and torque. Drives for robots; Electrical, hydraulic and pneumatic. Robot vision: Introduction to technique, image acquisition and processing. Introduction to robot programming languages.

Suggested Reading:

1 Spong and Vidyasagar, *Robot Dynamics and Control,* John Wiley and Sons, 1990

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2. R.K. Mittal, IJ. Nagrath, *Robotics and Control,* Tata McGraw- Hill 2003.
3. Groover, *IndustrialRobotics*, McGraw-Hill.
4. Asada and Siotine, *Robot Analysis and Intelligence,* Wiley Interscience, 1986.
5. Fu.K.S. GonZalezRC.,LeeC.S.G., *Robotics, Control Sensing Vision and Intelligence,* McGraw Hill, Int. Ed., 1987.

ME 458

PRODUCT DESIGN AND PROCESS PLANNING

(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Product Design and Process Design functions. Selection of right product. Systematic procedure of product innovation. Factors contributing to successful technological innovation - need for creativity and innovation. Techniques of innovation like brain storming and Delphi techniques.

Unit-II

Project Selection and Evaluation: Function of design - Design with Human Machine Interaction (HMI). Collection of ideas and purpose of project. Selection criteria - screening ideas for new products using evaluation techniques. Principles of ergonomics.

Unit-Ill

New Product Development: Research and new product development. Patents, definitions, patent search, patent laws, international code for patents -Intellectual Property Rights (IPR).

Unit-IV

New **Product Planning** : Interaction between the functions of design, manufacture, quality, testing and marketing. Steps for introducing new products after evaluation.

Unit-V

Process Planning : Process planning, process sheets, selection of manufacturing process, estimation of machining time in various cutting operations - estimation of costs for manufacture. Value engineering in product design, group technology, concepts of concurrent engineering.

Suggested Reading:

1. Niebel BW & Draper AB: *Production Design & Process Engg,* McGraw Hill, Kogakusha, 1974.
2. Harry Nystrom, *Creativity and Innovation,* John Wiley & Sons,
3. Brain Twiss, *Managing Technological Innovation,* Pittrnan Publications, 1992.
4. Harry, B.Waton, *New Product Planning,* Prentice Hall Inc., 1992.
5. Chitale, A. K. & Gupta RC., *Product Design & Manufacturing,* PHI, 1997.

M.J.C.E.T

ME 459

MODERN MACHINING AND FORMING METHODS

(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Ultrasonic Machining (USM): Introduction, process description, abrasive slurry, Abrasive materials and their characteristics. Functions of liquid medium in slurry, Types of Transducers, effect of process parameters, applications and limitations. Abrasive Jet Machining (AJM): Principle of operation, process details, process variables and their effect on MRR and accuracy.

Equation for MRR. Advantages, disadvantages and applications. Water Jet Machining (WJM): Schematic diagram, equipment used, advantages and applications.

Unit-II

Electro Discharge Machining (EDM): Process description with schematic diagram, process parameters, functions and characteristics of dielectric medium, dielectric fluids, over cut and side taper' Flushing, Mechanism of metal removal, crater volume, types of power supply circuits, mathematical analysis of metal removal rate (MRR), characteristics of spark eroded surfaces, advantages, disadvantages and applications. Wire EDM: Process description and applications. Electro-Chemical Machining (ECM): Schematic of the process parameters, function and characteristics of electrolyte, chemistry of the process, Equation for specific MRR and electrode feed rate, advantages, limitations and applications., Rotary Machining, Hot machining, high speed machining, description of each process, process parameters, advantages and applications.

Unit-Ill

LASER Beam Machining (LBM): Principle of LASER Beam production, materials used, thermal analysis of the process, process parameters, equations for power density and machining rate, advantages, limitations and applications. Plasma Arc Machining (PAM): Introduction equipment used, process description and parameters, types of plasma arc; Transferred arc and non transferred arc and process applications. Electron Beam Machining (EBM): Schematic of the process, process parameters, principle of production of Electron beam, equipment used, Advantages, disadvantages and applications. ION Etching: Process description and applications.

Unit-IV

Rubber Pad Forming: Principle of the process, process details and its types; Guerin, wheelon, Marfoming and Hydro forming processes and applications. Electro-Hydraulic forming (EHF): Schematic of the process description and its applications. High Energy Rate Forming (HERF): HERF hammers, principle of explosive forming, Explosive materials, types of explosive forming, stand off operation and contact operation, the pressure pulse, Gas bubble and the process applications.

Unit-V

Stretch Forming: Introduction, types of stretch forming: stretch draw forming, rotary stretch forming or stretch wrapping, compression forming, radial draw forming. Stretch forming equipment and accessories, accuracy and surface finish, process variables and limitations. Tube spinning: Introduction, methods of tube spinning, Backward spinning, Forward spinning, machines and tools used. Machine variables, speeds and feeds, effect of tube spinning on work metal properties and applications. Hydrostatic Forming: Process principle, description and applications. Water Hammer Forming (WHF): Schematic diagram of the process, principle of operation, process variables, work materials, process limitations and applications.

Suggested Reading:

1. P.C. Pandey andH.S. Shah, *Modern Machining Process,* Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1980.
2. A. Bhatacharya, *New Technology*, The Institution of Engineers (India), 1984.
3. Davies and Austin, *Developments in High Speed Metal Forming,* The Machinery Publishing Co. Ltd., 1985.
4. *Production Technology,* HMT.

M.J.C.E.T.

ME 460

PLASTIC ENGINEERING AND TECHNOLOGY

(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

General properties of plastics: Polymeric Materials, Plastics available to the designer, Engineering Plastics, Thermosets, composites, structural foam, Polymer alloy, selection of plastics, Mechanical properties, Impact Enhancement, Degradation, wear resistance and frictional properties, special properties processing, costs -selection for strength at minimum cost.

Unit-II

Mechanical properties of plastics -Deformation, Viscoelastic behaviour of plastics, short term testing of plastics, long term testing of plastics, Design methods of plastic using deformation data, Mathematical models of viscoelastic behaviour, Intermittent loading, Deformation behaviour of reinforced plastics.

Unit-Ill

Mechanical properties of plastics -Fracture.

The concept of stress concentration, Energy approach to fracture, Stress Intensity Factor approach to fracture, J-integral approach, General fracture behaviour of plastics, creep failure of plastics. Fatigue of plastics, Impact behaviour of plastics.

Unit-IV

Processing of plastics.

Extrusion -Mechanism of flow, analysis of flow in extruder, Extruder volumetric efficiency, power requirements.

Injection Moulding: Moulds, CAD of moulds, structural foam Injection moulding, Reaction injection moulding, Injection blow moulding, injection moulding of thermosets.

Thermoforming, calendering, Rotation moulding, compression moulding, transfer moulding, automatic processes, die design of plastics, Joining process -Hot air, ultrasonic, and solvent welding.

Unit-V

Analysis of polymer melt flow. General behaviour of polymers melts, Isothermal flow of polymers Melts, Residence and Relaxation times, Experimental Methods used to obtain flow data.

Suggested Reading:

1. Plastics and Rubber, *Engineering Design and Application*, R.J. Crawford.
2. N.A. Waterman, *The selection and use of Engineering Materials.*
3. Rossi, *WeldingEngineering*, McGrawHill.

M.J.C.E.T

CS 452

COMPUTER GRAPHICS

(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Overview of Graphics Systems: Refresh CRT, Raster - Scan Displays, random-Scan Systems, Color CRT, Flat Panel Displays, Three Dimensional Viewing Devices, Input Devices, Graphics Software. **Output Primitives:** Line drawing algorithms, Circle Generating Algorithms, Ellipse Generating Algorithm, Pixel Addressing, Fill Area Primitives, Character generation.

Unit-II

Getting Started Drawing Figures Using OpenGL: Getting started making pictures, Drawing basic Graphics Primitives, Making line drawing, Simple interaction with Mouse and Keyboard.

Two Dimensional Geometric Transformations: Basics Transformation, Homogeneous Coordinates, Composite, transformations, other transformations, Transformation between coordinates, Affine transformations, Transformation functions, Raster methods of transformations.

Unit-III

Two Dimensional viewing: Viewing Pipeline, Viewing Transformations & Functions. Clipping operations, Point Clipping, Line Clipping, Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.

Graphical User Interface & Interactive Input, Methods : The user dialogue, logical classification of input devices, Input functions & modes, Interactive picture construction techniques.

Unit-IV

Three Dimensional Concepts : Three Dimensional Display Methods. Three Dimensional Object Representations: Polygon surfaces, Curved line and surfaces, Spline representations, Bezier Curves & Surfaces, B-Spline curves and surfaces, Constructive solid-Geometry Methods, actress, BSP tress, Fractal geometry methods.

Unit-V

Three Dimensional Geometric and Modeling Transformations.

Three Dimensional Viewing: Projections

Visible Surface Detection Methods: Back face detection method, depth buffer method.

Basic illumination methods: Phong & Gourand Shading, Texture Mapping.

Computer Animation: Design of Animation Sequences, General Computer Animation, Raster Animation, Computer - Animation Languages, Key frame systems, Motion specifications.

Suggested Reading :

1. D. Heara, P. Baker, *Computer Graphics - C Version*, 2nd Edition, Pearson Education, 2004.
2. F.S.HuT, *Computer Graphics Using Open GL,* 2nd Edition, Pearson Education, 2003.
3. S.Harrington, *Compter Graphics,* McGraw Hill.
4. James D. Foley, Steven K. Feiner, Adam, F.Hughes John, *Computer Graphics: Principles & Practice,* 2nd Edition, Pearson Education.

M.J.C.E.T

CS 408

INTERNET PROGRAMMING
(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction to Internet and Intranet HTTP protocol. TCP/IP - Concepts, addressing routing, web application building blocks, HTML, CGI, Integrating ODBC and CGI.

Unit-II

Java programming - Overview of Java, Data types, Variables, Arrays, Operators, Control structures, Classes, Inheritance, packages and interface.

Unit-III

Java programming - Exception handling, multithreaded programming, I/O Applets Networking, AWT, AWT Controls.

Unit-IV

Internet Concepts - Cross - Platform client browser setup, corporate information models, structuring company information resources, document management, workflow software, groupware, case studies.

Unit-V

Information servers - DNS, Mail Servers, News Servers, Chat, FTP Servers, proxy servers, security and firewalls, search engines.

Suggested Reading:

1. John Desborough, *Intranet Web Development,* New Riders Publ. 1996.
2. Partrik Naughton, Robert Schildt, *The complete reference Java,* TataMc Graw HilL, 1997.

ME 465

RAPID PROTOTYPING TECHNOLOGIES
(ELECTIVE-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages of Rapid Prototyping, Commonly used Terms, Rapid Prototyping Process Chain, 3D Modeling, Data conversion and Transmission, Checking and Preparing, Building, Postprocesing, RP Data formats, Classification of RP process.

Unit-II

Liquid-based Rapid Prototyping Systems: Stereolithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photopolymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Unit-III

Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Unit-IV

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Unit-V

Applications ofRapid Prototyping Technology: Functional models, Pattern for investment and vacuum casting, Medical Models, Art Models, Engineering Analysis Models.

M.J.C.E.T.

Suggested Reading:

1. Chua C.K., Leong K.F. and LIM C.S, *World Rapid prototyping: Principles and Applications,* Scientific Publications, Second edition, 2004.
2. D.T. PhamandS.S.Dimov, *Springer Rapid Manufacturing,* 2001
3. Terry Wohlers, *Wholers Report 2000,* Wohlers Associates, 2000.

ME 466

MATERIAL HANDLING
(For Production only)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

Unit-I

Mechanical Handling Systems: Construction, Operation and Maintenance of Belt Conveyors and Design, Bucket Elevators, Package conveyors, chain and Flight Conveyors, Screw Conveyors, Vibratory Conveyors, Cranes and Hoists.

Unit-II

Pneumatic and Hydraulic Conveying Systems: Modes of Conveying and High pressure conveying systems Low Velocity Conveying System. Components of Pneumatic Conveying Systems: General Requirements, Fans and Blowers, Boots-Type Blowers, Sliding-Vane Rotary Compressors, Screw Compressors, Reciprocating Compressors, Vacuum Pumps.

Unit-III

Bulk Solids Handling: Particle and Bulk Properties. Adhesion, Cohesion and Moisture Content. Gravity Flow of Bulk Solids: Static and Dynamic Pressure Distribution in Bulk Solids. Modes of Flow: Mass Flow, Funnel Flow and Expanded Flow from Hoppers, Bins and Silos.

Unit-IV

Modern Material Handling Systems: Constructional features of (i) AGV (ii) Automated storage and retrieval systems. Sensors used in AGVsandASRS.

Bar Code Systems and RFID systems: Fundamentals and their integration with computer-based information systems

Unit-V

Total MH Throughput: Calculation for no. of MH systems; storage space estimation based on no. of aisles. Maintenance of MH equipment, spare parts management, cost of materials handling, cost per unit load computations.

M.J.C.E.T.

Suggested Reading :

1. Dr. Mahesh Varma, *Construction Equipment and its Planning & Application,* Metropolitan Book Co. (P) Ltd., New Delhi, India 1997.
2. James M. Apple, *Material Handling Systems Design,* The Ronald Press Company, New York USA, 1972.
3. Woodcock C.R. and Mason J.S., *Bulk Solids Handling: An Introduction to Practice Technology,* Leonard Hill USA, Chapman and Hall, New York.
4. M.P. Groover etal. *Indus trial Robotics,* McGrawHill. 1999.

ME 468

NON-DESTRUCTIVE TESTING

(For Production only)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Liquid Penetrant Inspection: Principles of penetrant inspection, characteristics of a penetrant, water-washable system, post-emulsification system, solvent-removable system, surface preparation and cleaning, Penetrant application, Development, Advantages limitations, and applications.

Magnetic Particle Inspection: Principle, Magnetisation methods, continuous and residual methods, sensitivities, Demagnetisation, Magnetic particles, Applications, Advantages and limitations.

UNIT-II

Eddy Current Testing: Principle, Lift-off factor, and edge effects, Skin effect, Inspection frequency, coil arrangements, inspection probes, types of circuit, reference pieces, phase analysis, display methods and applications.

UNIT-III

Ultrasonic Testing: Generation of ultra sound, characteristics of an ultrasonic beam, sound waves at interfaces, sound attenuation, Display systems, Probe construction, type of display, Inspection techniques, Identification of defects, Immersion testing, Sensitivity & calibration. Reference standards. Surface condition, Applications.

UNTT-IV

Radiography: Principle and uses of Radiography, limitations, Principle, Radiation sources, Production of X-rays, x-ray spectra, Attenuation of radiation, Radiographic equivalence, Shadow formation, enlargement and distortion, Radiographic film and paper, Xeroradiography, fluoroscopy, Exposure factors, Radiographic screens, identification markers and image quality indicators, Inspection of simple shapes, inspection of complex shapes, viewing and interpretation of radiographs, Radiation hazard, Protection against radiation, measurement of radiation received by personnel.

M.J.C.E.T

UNTT-V

Acoustic Emission: Physical Principles, Sources of emission, instrumentation and applications. Other NDT Techniques: Neutron radiography, Laser induced Ultrasonics, Surface analysis, Thermography.

Suggested Reading :

1. Barry Hull & Vernon John, *Non Destructive Testing,* 1988.
2. HJ.Frissell (Editorial Co-Ordinator), *Non-Destructive Evaluation and Quality Control,* ASM Hand Book - International Publication, USA, 1989.
3. Dove and Adams, *Experimental stress analysis and motion measurement*, Prentice Hall of India, Delhi.

ME 481 **SEMINAR**

Instruction	3 Periods per week
Sessional	25 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of state of the art topics in a broad area of *h is I* her specialization.

Seminar *topics* may be chosen by the students with advice from the faculty members. Students are to be exposed to following aspects of seminar presentations.

- Literature survey Organisation of material
- Preparation of OHP slides /PC presentation Technical writing

Each student will be required to

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Give a 20 minutes presentation through OHP, PC, Slide projector followed by 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The Sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussions.

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ME 482

PROJECT

Instruction	6	Periods per week
Duration of University Examination		Viva Voce
University Examination		Gr*
Sessional	50	Marks

Solving a real life problem should be the focus of U.G. project. Faculty members should prepare project briefs well in advance. They should be made available to the students at the Department Library. A project may be classified as hardware / software / modeling / simulation. It should involve elements such as analysis, design and synthesis.

The Department will appoint a project coordinator who will be in-charge of the following

- Grouping of students (Maximum of three in a group).
- Allotment of projects and project guide.
- Project monitoring at regular intervals.

A project allotment is to be completed by the 4th week of 1s1 semester of IV year so that students get sufficient time for completion of their project.

All the projects are to be checked for progress at least twice in a semester. It should be on the basis of presentation of the students.

Sessionals marks to be based on the Grade / Marks awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts to be made so that some of the projects are carried out in industries. Projects may also be invited from industries.

Norms of final documentation of the project report are to be provided by the Department.

**** Excellent / Very Good / Good / Satisfactory / Unsatisfactory.***

Note : Three periods of contact load will be assigned to each project guide.

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