

SEVENTH SEMESTER

Course Title	L	P	M
THEORY			
Finite Element Methods	4	0	100
Engineering Management	4	0	100
CAD/ CAM	4	0	100
Mechatronics	4	0	100
Elective - II	4	0	100
Elective - III	4	0	100
PRACTICAL			
Comprehension	0	3	100
CAD / CAM Lab	0	3	100

FINITE ELEMENT METHODS

1. INTRODUCTION - VARIATIONAL FORMULATION 9

General field problems in Engineering - Modelling - Discrete and Continuous models - Characteristics - Difficulties involved in solution - The relevance and place of finite element method - Historical comments - Basic concept of FEM. Boundary and initial value problems - Gradient and divergence theorems - Functionals - Variational calculus - Variational formulation of VBPS. The method of weighted residuals - The Ritz method.

2. FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 9

One dimensional second order equations - discretisation of domain into elements - Generalised coordinates approach - derivation of elements equations - assembly of element equations - imposition of boundary conditions - solution of equations - Cholesky method - Post processing - Extension of the method to fourth order equations and their solutions - time dependant problems and their solutions - example from heat transfer, fluid flow and solid mechanics.

3. FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 9

Second order equations involving a scalar-valued function - model equation - Variational formulation - Finite element formulation through generalised coordinates approach - Triangular elements and quadrilateral elements - convergence criteria for chosen models - Interpolation functions - Elements matrices and vectors - Assembly of element matrices - boundary conditions - solution techniques.

4. ISOPARAMETRIC ELEMENTS AND FORMULATION 9

Natural coordinates in 1,2 and 3 dimensions - use of area coordinates for triangular elements in - 2 dimensional problems - Isoparametric elements in 1,2 and 3 dimensions - Lagrangean and serendipity elements - Formulation of element equations in one and two dimensions - Numerical integration.

5. APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS 9

Equations of elasticity- plane elasticity problems - axisymmetric problems in elasticity - Bending of elastic plates - Time dependent problems in elasticity - Heat - transfer in two dimensions - incompressible fluid flow.

Total hours: 45

TEXT BOOK:

1. J.N.Reddy, " An Introduction to Finite Element Method ", McGraw Hill, Intl. Student Edition, 1985.

REFERENCES:

1. Rienkiewics, " The finite element method, Basic formulation and linear problems ", Vol.1, 4/e, McGraw Hill, Book Co.
2. S.S.Rao, " The Finite Element Method in Engineering ", Pergaman Press, 1989.
3. C.S.Desai and J.F.Abel, " Introduction to the Finite Element Method ", Affiliated East

ENGINEERING MANAGEMENT

- 1. ENGINEERING ECONOMICS** **9**
Introduction - Demand and Revenue Analysis - Demand Forecasting - Production Analysis - Cost and Supply Analysis, Price and output Determination - Investment Analysis - Plant Location - Economic Optimization.
- 2. MANAGEMENT OF WORK** **9**
Types of Business Organisation, Forms, Planning - Organising - Coordination , Directing.
- 3. THE MANAGEMENT OF ENGINEERS** **9**
Human Resource Development – Motivation- Leadership - Team working and Creativity - Managerial Communication - Personal Management – Time Management - Stores Management - Career Planning.
- 4. THE MANAGEMENT OF ENGINEERING** **9**
Financial Management - Product development - Management techniques in product development - Nature of controlling - Operations Management - Just-in-Time.
- 5. CONTEMPORARY MANAGEMENT ISSUES** **9**
Managing World Economic Change - The global environment - Multinational Strategies - Economic Cycles - Organisation Change and Organisation Development - Managerial Ethics and Social responsibilities.

Total hours: 45

TEXT BOOKS:

1. Gail Freeman - Bell and Janes Balkwill, " Management in Engineering - Principles and Practice ", Prentice Hall of India Pvt.Ltd., 1998.
2. Gene Burton and Manab Thaker, " Management Today Principles and Practice ", Tata McGraw Hill, 1995.

REFERENCES:

1. M. Joesph, Putti Management - " A Functional Approach ", McGraw Hill, 1999.
2. R.R. Barathwal, " Engineering Economics ", McGraw Hill, 1997.

CAD / CAM

UNIT-I: THE DESIGN PROCESS AND INTERACTIVE COMPUTER GRAPHICS 9

The Design process- Role of Computers- Morphology of design- Computer aided Product cycle.

Creation of graphic primitives- Graphical input techniques- Display transformations in 2D and 3D- Viewing transformation- Clipping- Hidden line elimination- mathematical formulation for graphics- Curve generation techniques- Model storages and Data structures.

UNIT-II: SOLID MODELING 9

Geometric modeling – Wireframe, Surface and Solid models – CSG and B-REP techniques – Features of Solid Modeling Packages – Parametric and features – Interfaces to drafting, Design Analysis – Benefits of CAD.

UNIT – III: CAD / CAM INTERFACE 9

Current trends in Manufacturing Engineering – Group Technology – Design for Manufacturing and Assembly – Computer Aided Process Planning Techniques – Sequential and Concurrent Engineering - Rapid prototyping.

UNIT – IV: FUNDAMENTALS AND CONSTRUCTIONAL FEATURES OF CNC MACHINES 9

CNC Technology – Functions of CNC control in Machine Tools – Classification of CNC systems – Contouring System – Interpolators – Direct Numerical Control(DNC)- Design considerations of CNC machines for improving machining accuracy-Structural members-Slideways - Sides linear bearings - Ball screws - Spindle drives and feed drives - work holding devices and tool holding devices -Automatic Tool changers. Feedback devices - Principles of Operation-Machining Centres - Tooling for CNC machines.

UNIT – V: PART PROGRAMMING FOR CNC MACHINES 9

Numerical control codes – Standards – Manual Programming – Canned cycles and subroutines – Computer Assisted Programming, CAD/CAM approach to NC part programming – APT language, machining from 3D models.

Total: 45

TEXT BOOK:

1. Ibrahim Zeid, " CAD - CAM Theory and Practice ", TMH Publishing Co. Ltd., 1991.

REFERENCES:

1. Sadhu Singh,"Computer Aided Design and Manufacturing",Khanna Publishers,New Delhi, 1998.
2. Groover and Zimmers, " CAD / CAM : Computer Aided Design and Manufacturing ", Prentice Hall of India, New Delhi, 1994.
3. Yoram Koren, " Computer Control of Manufacturing Systems ", McGraw-Hill Book Company, 1986.
4. MC Mahon and J. Browne, " CAD / CAM ", Addison - Wesley, 1998.
5. P.Radhakrishnan, " Computer Numerical Control ", New Central Book Agency, 1992.

MECHATRONICS

1. INTRODUCTION	9
Introduction to Mechantronics-Systems-Measurement Systems-Control Systems	
2. SENSORS AND TRANSDUCERS	9
Introduction-Performance Terminology-Displacement, Position and Proximity-Velocity and Motion-Fluid Pressure-Temperature Sensors-Light Sensors-Selection of Sensors-Signal Processing.	
3. 8055 MICROPROCESSOR	9
Introduction-Architecture-Pin Configuration-Instruction set-Programming of Microprocessors using 8085 instructions-Interfacing input and output devices-Interfacing D/A converters and A/D converters-Applications- Temperature control-Stepper motor control-Traffic light controller.	
4. PROGRAMMABLE LOGIC CONTROLLERS	9
Introduction-Basic structure-Input/Output Processing-Programming-Mnemonics-Timers, Internal relays and counters-Data handling-Analog Input/Output-Selection of a PLC.	
5. DESIGN AND MECHATRONICS	9
Stages in Designing mechatronic systems - Traditional and Mechatronic design -Possible design solutions-Case studies of mechatronic systems - Pick and place robot - automatic car park system -engine management system.	

Total hours: 45

TEXT BOOK:

1. W.Bolton, Mechatronics,Longman,Second Edition, 1999.

REFERENCES:

1. Michael B. Histan and David G.Alciatore, " Introduction to Mechatronics and Measurement Systems ", McGraw Hill International Editions, 1999.
2. HMT Ltd., " Mechatronics ", Tata McGraw Hill Publishing Co. Ltd., 1998.
3. D.A.Bradley, D.Dawson, N.C.Buru and A.J.Loader, " Mechatronics ", Chapman and Hall, 1993.
4. K.Ram, " Fundamentals of Microprocessors and Microcomputers ", Dhanpat Rai Publications, Fourth Revised Edition, 1999.
5. Ramesh S. Gaonkar, " Microprocessor Architecture ", Programming and Applications, Wiley Eastern, 1997.
6. Dan Neculescu, "Mechatronics",Pearson Education Asia,2002(Indian reprint).

COMPREHENSION

1. The objective of "Comprehension" is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real-life problems which he/she may have to face in future as an engineer. While learning as to how to solve real life problems, the student will receive guidance from teachers and also review various courses (subjects) learnt earlier.
2. The comprehension assessment will consist of 3 to 5 tests in each Thermal, Design and Manufacturing Streams covering all the subject of study in the respective streams under B.E. Mechanical Engineering Course.

Total hours: 45

CAD/CAM LAB

1. GEOMETRY CREATION AND DRAWING STANDARDS

Creation of simple geometric bodies using basic primitives (line, arc, circle) and editing the drawing. Dimensioning and text writing - concept of layers (creation and setting) line types and forms.

2. ADVANCED CONCEPTS OF CAD SOFTWARE AND DRAFTING

Creation of blocks, attributes for standard parts and inserting them in the drawing. Preparation of 2-D drawings for machine components (bolts, nuts, flange coupling, connecting rod, cam profile) - 3-D modeling - solid, surface, wire frame using standard CAD packages - Assembly of standard parts created using 3-D model - creation of 2-D drawings from 3-D models using CAD packages, different views, sections, isometric view and dimensioning them - Parametric modeling, creating standard machine parts, connecting rod, flange coupling, bearings.

3. Manual Part Programming for CNC Machines using Stand G and M Code - Simulation of tool path - Machining piratical on Trainer Type CNC Machines.

4. Computer Assisted Part Programming - APT Programming Language Part Programming using APT and other NO Programming languages.

5. Exposure to Component Modeling and CL data generation using CAD / CAM Software like Unigraphics Pro/E Smart CAM etc.

6. NC code generation using CAD / CAM software - Post processing for standard CNC control like FANUCSINUMERIC etc.

Total hours: 45

ELECTIVE – II & III CRYOGENIC ENGINEERING

- 1. CONSTRUCTION DETAILS AND HEAT TRANSFER: 9**
Introduction to Cryogenic Systems Low Temperature properties of Engineering Materials. Cryogenic fluids and their properties. Applications in space, Food Processing, super Conductivity, Electrical Power, Biologymedicine, Electronics and Cutting Tool Industry.
- 2. LIQUEFACTION AND LOW TEMPERATURE REFRIGERATION: 9**
Liquefaction systems ideal system, Joule Thomson expansion, Adiabatic expansion, Linde Hampson A Cycle, Claude & Cascaded System, Magnetic Cooling, Stirling Cycle Cryo Coolers.
- 3. SEPARATION AND PURIFICATION SYSTEMS: 9**
General characteristics of mixtures-composition diagrams. Gas separation-principles of rectification-flash calculations - Rectification column analysis, Flash calculations.
- 4. INSULATION AND VACUUM TECHNOLOGY: 9**
Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation, Powder insulation, Cryopumping Applications.
- 5 STORAGE AND INSTRUMENTATION 9**
Cryogenic Storage vessels and Transportation, Transfer devices. Pressure flow-level and temperature measurements.

Total hours: 45

TEXT BOOK:

1. Klaus D.Timmerhaus and Thomas M.Flynn, " Cryogenic Process Engineering " Plenum Press, New York, 1989.

REFERENCES:

1. Randal F.Barron, " Cryogenic Systems ", McGraw Hill, 1986.
2. R.B.Scott, " Cryogenic engineering ", Van Nostrand Company Inc., 1985.
3. J.H.Bell, " Cryogenic Engineering ", Prentice Hall Inc., 1963.

ENERGY ENGINEERING AND MANAGEMENT

- 1. ENERGY AND ENVIRONMENT** **9**
Introduction - Fossil fuels reserves-World energy consumption - Green house effect, Global warming- Renewable energy sources - Environmental aspects utilization - Energy prizes - Energy policies.
- 2. ENERGY CONSERVATION** **9**
Energy conservation schemes - Industrial energy use - Energy surveying and auditing - Energy index – Energy cost - Cost index - Energy conservation in engineering and process industry, in thermal systems, in buildings and non-conventional energy resources schemes.
- 3. ENERGY TECHNOLOGIES** **9**
Fuels and consumption - Boilers - Furnaces - Waste heat recovery systems - Heat pumps and refrigerators - Storage systems - Insulated pipe work systems - heat exchangers.
- 4. ENERGY MANAGEMENT** **9**
Energy management principles - energy resource management - Energy management information systems - Instrumentation and measurement - Computerized energy management.
- 5. ECONOMICS AND FINANCE** **9**
Costing techniques - Cost optimization - Optimal target investment schedule - Financial appraisal and profitability-Project management.

Total hours: 45

TEXT BOOK:

1. W.R. Murphy and G.Mc KAY " Energy Management " Butterworths, London.

REFERENCES:

1. O.Callaghn. P.W. " Design and Management for Energy Conservation ", (1981) Pergamon Press, Oxford.
2. David Merick, Richard Marshal, " Energy, present and future options, Vol. I and II ", (1981) John Wiley and Sons.
3. Chaigier N.A. " Energy Consumption and Environment ", (1981), McGraw-Hill.
4. Ikken P.A. Swart R.J and Zwerves.S, " Climate and Energy ", (1989).
5. Ray D.A. " Industrial Energy Conservation ", (1980) Pergamaon Press.

ENVIRONMENTAL POLLUTION

- 1. INTRODUCTION** **9**
Environmental aspects - Impact of environment - Environmental quality - Role of environmental engineer.
- 2. AIR POLLUTANTS** **9**
Air quantity - Definition, Characteristics and prospective - Types of our air pollutants - effect of air pollution on men and environment - Formation of air pollutants from combustion of fossil fuels and parameters controlling the formation.
- 3. WATER POLLUTANTS** **9**
Water pollution from tanneries and other industries - Engineered systems for waste water treatment and disposal - Control systems and instrumentation for pollution control.
- 4. SOLID WASTE** **9**
Definition, characteristics - Types and sources of solid waste - Solid waste management - generation, collection, storage and processing techniques - Solid waste disposal.
- 5. INDUSTRIAL POLLUTION** **9**
Methods and equipment's for industrial waste treatment - Pollution thermal power plants and nuclear power plants - Sources and control methods - Emission from SI and CI engines - Evaporative emission control - Exhaust treatment devices - Noise pollution and their control.

Total hours: 45

TEXT BOOK:

1. Howard S. Peavy, Donald R. Rowe, and George Tchobanoglous, " Environmental Engineering ", (1985), Mc Graw Hill, New Delhi.

REFERENCES:

1. A.C. Stern, H.C. Woner, R.W. Boubce and W.P. Lowry " Fundamental of Air Pollution ", (1973), Academic Press.
2. Ikken P.A. Swart R.J. and Zwerves. S, " Climate and Energy ", (1989). Mc Graw Hill, New Delhi.
3. Metcalf and Eddy Inc, " Waste Water Engineering Treatment and Disposal Second Edition ", (1979), Mc Graw Hill, New York.
4. Wark, Kenneth and Cecil F. Warner, " Air Pollution: its Origin and Control ", (1976), Dun Dunnellers, New York.
5. Tchobanoglous. G, H. Theisan and R. Elaisen, " Solid Water: Engineering Principles and Management Issues ", (1977), Mc Graw Hill, New York.

COMPOSITE MATERIALS TECHNOLOGY

- 1. INTRODUCTION** **9**
Limitations of conventional materials - definition of composite materials - types and characteristics - applications.
- 2. MATERIALS** **9**
Fibbers - Materials - Fibber reinforced plastics - thermoset polymers - Coupling agents, fillers and additives - Metal Matrix and Ceramic composites.
- 3. MANUFACTURING** **9**
Fundamentals - bag moulding - compression moulding pultrusion-filament winding - other manufacturing process - quality inspection and non-destructive testing.
- 4. MECHANICS AND PERFORMANCE** **9**
Introduction to micro-mechanics-unidirectional lamina - laminates - interlaminar stresses - static mechanical properties - fatigue properties - impact properties - enviromental effects - fracture mechanics and toughening mechanisms, damage prediction, failure modes.
- 5. DESIGN** **9**
Failure predictions - design considerations - joint design - codes - design examples. Optimization of laminated composites - Application of FEM for design and analysis of laminated composites.

Total hours: 45

TEXT BOOKS:

1. Ronald Gibson, " Principles of Composite Material Mechanics ", Tata McGraw Hill, 1994.
2. Micael hyer, " Stress Analysis of Fiber - Reinforced Composite Materials ", Tata McGraw Hill, 1998.

REFERENCES:

1. P.K.Mallicak, " Fiber-reinforced composites ", Monal Deklar Inc., New York, 1988.
2. B.D. Agarwal and L.J.Broutman, " Analysis and Performance of Fiber Composites ", John Wiley and Sons, New York, 1980.
3. F.L.Matthews & R.D.Rawlings, " Composite Materials, Engineering and Sciences ", Chapman & hall, London, 1994.

UNCONVENTIONAL MACHINING PROCESSES

1. INTRODUCTION

9

The need of the process – classification – Energies employed in the processes - EDM, ECM, USM, LBM, PAM, AJM, WJM etc.

2. ELECTRICAL DISCHARGE MACHINING

9

Process, operating principles-Breakdown mechanism-Dielectric fluid-Electrode material-Tool wear – Power generator circuits- Process parameters - Metal removal rate - wire out EDM - Applications – Recent Developments in EDM.

3. ELECTRO CHEMICAL MACHINING

9

Process-principles-Equipment-Analysis of metal removal-tool material-Insulation-Process parameters-ECH,ECG etc. - Applications.

4. ELECTRON BEAM, LASER BEAM AND PLASMA ARC MACHINING

9

EBM Process, Principle-gun construction - Types of gun - Vacuum and non-vacuum technique-Applications. LBM Process, principles, pumping processes, emission types-beam control-applications.

5. ULTRASONIC MACHINING & ABRASIVE JET AND WATER JET MACHINING

9

Process-working principles-types of transducers-concentrators-nodal point clamping-feed mechanism-metal removal rate-Process parameters- Applications. AJM Processes-Principle-Equipment-Metal removal rate process parameters-Applications.

WJM Process-Principle-Equipment-Applications.

Total hours: 45

TEXT BOOK:

1. " Non Conventional Machining ", P.K.Mishra, The Institution of Engineers (India) Text Books: Series, 1997.

REFERENCE:

1. A Text Books: of Production Engineering, P.C.Sharma, 1995.

ENTREPRENEURSHIP DEVELOPMENT

1. ENTREPRENEURSHIP

9

Entrepreneur - Traits of Entrepreneurs - Types of Entrepreneurs - Intrepneur Diffenernce between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors affecting Entrepreneurial Growth.

2. MOTIVATION

9

Major motives influencing Entrepreneur- Achivement Motivation Training, Self Rating, Business game, Thematic Apperception Test - Stress Management. Entrepreneurship Development Programs - Need, objectives.

3. BUSINESS

9

Small Enterprises-definition, Classification - Characteristics, ownership structure-Project Formulation – Steps involved in setting up a Business - Identifying, Selecting a good business opportunity Market survey and Research, Techno economic Feasibility Assessment - Preliminary Project Report-Project Appraisal-Sources of information-Classification of needs and Agencies.

4. FINANCING & ACCOUNTING

9

Need-Sources of Finance, Term Loans, Capital structure, Financial Institutions, Management of working capital, Costing Break Even Analysis, Network analysis Techniques of PERT/CPM - Taxation - Income Tax, Excise Duty - Sales Tax.

5. SUPPORT TO ENTREPRENEURS

9

Institutional Support to Entrepreneurs-Sickness in small Business - Concept, Magnitude, Causes and Consequences, Corrective measures - Government Policy for small Scale Enterprise - Growth strategies in small Industry - Expansion, Diversification, Joint venture, Merger, sub-contracting.

Total hours: 45

TEXT BOOK:

1. S.S. Khanka, Entrepreneurial Development, S.Chand & Co. Ltd, Ram Nagar , New Delhi, 1999.

REFERENCE:

1. EDII - " Faculty & External experts - A Hand Book for new Entrepreneurs. publishers : Entrepreneurship Development ", Institute of India, Ahmedabad, 1986.

MARKETING MANAGEMENT

1. BASICS

9

Definition, Marketing Process, Dynamics, Needs, Wants & Demands, Marketing Concepts, Environment, mix, types, philosophies, Selling Vs. Marketing, organisation, Industrial Vs. Consumer Marketing, Consumer goods, Industrial goods, Product hierarchy.

2. BUYING BEHAVIOUR & MARKET SEGMENTATION

9

Cultural, Demographic factors, Motives, types, Buying decisions, segmentation factors, Demographic, Psychographic & Geographic Segmentation, Process, Patterns.

3. PRODUCT PRICING & MARKETING RESEARCH

9

Objectives, pricing, Decisions and Pricing methods, Pricing Management. Introduction, Uses, process of Marketing Research.

4. MARKETING PLANNING & STRATEGY FORMULATION

9

Components of a marketing plan, strategy formulations and the marketing process, implementation, Portfolio analysis, BCG, GEC grids.

5. ADVERTISING, SALES PROMOTION & DISTRIBUTION

9

Characteristics, Impact, goals, types, Sales promotion-Point of Purchase, Unique Selling proposition. Characteristics, Wholesaling, Retailing, channel design, logistics, Modern Trends in retailing.

Total hours: 45

TEXT BOOK:

1. Govindarajan.M. 'Modern Marketing Management', Narosa Publishing House, New Delhi, 1999.

REFERENCES:

1. Philip Kotler, " Marketing Management: Analysis, Planning, Implementation and Control ", 1998.
2. Green Paul.E. and Donald Tull, " Research for Marketing Decisions ", 1975.
3. Ramaswamy.V.S. and S.Namakumari, " Marketing Environment: Planning, Implementation and Control the Indian Context ", 1990
4. Jean Plerre Jannet Hubert D Hennessey Global Marketing Strategies.

DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

1. LOCATING AND CLAMPING DEVICES

9

Principles of Jigs and Fixtures design-Locating principles-Locating elements-Standard parts-Clamping devices- Mechanical actuation-Pneumatic & hydraulic actuation-Analysis of clamping forces-Tolerance and error analysis.

2. JIGS

9

Drill bushes-Different types of Jigs-Plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs- Automatic drill jigs-Rack & Pinion Operated, Air operated Jigs Components.

3. FIXTURES

9

General principles of boring, lathe, milling and broaching fixtures-Grinding, planing and shaping fixtures, Assembly, Inspection and Welding fixtures-Modular fixtures. Design and development of Jigs and fixtures for given components.

4. PRESS TOOLS

9

Press working terminology-Presses and Press accessories-Computation of capacities and tonnage requirements- Strip layout-Design and development of various types of cutting, Forming and drawing dies-Blank development for Cylindrical and non cylindrical shells - Compound progressive, combination dies.

5. TERM PROJECT

9

Submission of an Industrial report on observation training in Jigs, Fixture and Press Tools.

(Not for end-semester examination; to be considered for internal assessment only).

Total hours: 45

TEXT BOOKS:

1. "ASTME Handbook of Fixture Design".
2. "Design Data compiled by the Faculty of Mechanical Engineering", P.S.G.Tech. Coimbatore.

REFERENCES:

1. "Fundamentals of Tool Design", ASTME, 1983.
2. A.K. Goroshkin, "Jigs and Fixtures Handbook", Mix Publishers, Moscow, 1983.
3. "Die Design Handbook", McGraw Hill Book Co., 1965.
4. P.Eugene Ostergaard, "Basic Die Making" - Mc Graw Hill Book, 1963.

PROFESSIONAL ETHICS

1. ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - professions and professionalism – professional ideals and virtues - theories about right action - self-interest-customs and religion - uses of ethical theories

2. ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics-a balanced outlook on law-the challenger case study

3. ENGINEER'S RESPONSIBILITY FOR SAFETY

9

Safety and risk - assessment of safety and risk - risk benefit analysis-reducing risk-the three mile island and Chernobyl case studies.

4. RESPONSIBILITIES AND RIGHTS

9

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - intellectual property rights (IPR)-discrimination.

5. GLOBAL ISSUES

9

Multinational corporations - environmental ethics-computer ethics-weapons development-engineers as managers-consulting engineers-engineers as expert witnesses and advisors-moral leadership-sample code of conduct.

Total hours: 45

TEXT BOOK:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York 1996.

REFERENCES :

1. Charles D. Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. Laura Schlesinger, "How Could You Do That: The Abdication of Character, Courage, and Conscience", Harper Collins, New York, 1996.

3. Stephen Carter, "Integrity", Basic Books, New York, 1996.
4. Tom Rusk, "The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life", Viking, New York, 1993

MEASUREMENTS AND CONTROLS

1. MEASUREMENTS

9

General Concepts - Units and Standards - Measuring instruments - Sensitivity, readability, range of accuracy, precision - Static and dynamic response - Repeatability hysteresis - Systematic and random errors – Correction calibration.

2. INSTRUMENTS

9

Transducer, modifying (intermediate) and terminal stages - Mechanical and Electrical transducers - Preamplifiers-Charge amplifiers – Filters – Attenuators - D'Arsonval – CRO –Oscillographs – Recorders – Microprocessor based data logging, processing and output.

3. PARAMETERS FOR MEASUREMENT

9

Dimensions, displacement, velocity, acceleration, impact - Force, torque, power-Strain - Pressure - Humidity - Temperature - Flow-Time, frequency and phase angle - Noise and sound level; Radio tracer techniques-Flow visualization-Shadow graph, interferometer, schlieren, laser - Doppler - Anemometer.

4. AUTOMATIC CONTROL SYSTEMS

9

Basic elements - Feedback principle, implication of measurements - Error detectors - Final actuating Elements - Two Position, multiposition, floating proportional controls - Relays - Servo amplifiers - Servo motors - Mechanical, Electrical, magnetic, electronic, hydraulic, pneumatic systems.

5. APPLICATION OF CONTROL SYSTEMS

9

Governing of speed - Kinetic and Process Control - Pressure, temperature, fluid level, flow - Thrust and flight control - Photoelectric controls.

Total hours: 45

TEXT BOOK:

1. T.G.Beckwith and N. Lewis Buck, "Mechanical Measurements ", Addison Wesley, 1991.

REFERENCES:

1. J.P.Holman, "Experimental Methods for Engineers ", McGraw Hill Book Company, 1971.
2. L.F.Adams, "Measurement and Instrumentation ", The English Language Book Society, 1975.
3. R.S.Sirhi and H.C.Radhakrishna, "Mechanical Measurements ", Wiley Eastern Limited, 1983.

4. Pearson, Bric B, "Technology of Instrumentation ", English University Press Ltd., 1957.
5. Donald P. Eckman, "Industrial Instrumentation ", Wiley Eastern, 1985.

