MAHATMA GANDHI UNIVERSITY

B.TECH. DEGREE COURSE

8TH SEMESTER

SCHEME
&
SYLLABUS

2002

MECHANICAL ENGINEERING BRANCH

MECHANICAL ENGINEEING

SCHEME

8TH SEMESTER

Course Code	Course No.	Subject	Teaching Periods			Duration of Uty. Exam. (Hrs.)	Marks			
			Lect.	Tut.	Prac./ Proj.		Sessional	Theory	Practical	Total
A	M 801	Production Engineering	2	1	-	3	50	100	-	150
B	M 802	Automobile Engineering	3	1	-	3	50	100	-	150
C	M 803	Production Planning and Control	2	1	-	3	50	100	-	150
D	M 804	Machine Design and Drawing - II	2	-	2	3	50	100	-	150
E	M 805	Elective - II	3	1	-	3	50	100	-	150
F	M 806	Elective - III	3	1	-	3	50	100	-	150
G	M 807	Mechanical Measurements Laboratory	-	-	4	3	50	-	100	150
H	M 808	Project and Seminar	-	-	4	-	100	-	-	100
I	M 809	Viva Voce	-	-	-	-	-	-	50	50
		Total	15	5	10	-	450	600	150	1200

Sessional marks for seminar will be out of 25. Sessional marks for project will be out of 75, in which 35 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation board consisting of a minimum of 3 faculty members including the guide. Sessional marks for workshops and laboratories will be based on day to day performance assessed by faculty members. In each semester for workshops and laboratories, 60% of the sessional marks will consists of class performance, lab record and viva conducted by faculty members day to day. Out of the remaining 40%, 20% will be for attendance and 20% for final examiniation.

SYLLABUS

PRODUCTION ENGINEERING

M 801 **2+1+ 0**

Module 1

Theory of metal cutting: Historical back ground –Classification of manufacturing process – Deformation of metals (review only) – Performance & process parameters - Oblique & orthogonal cutting – Mechanism of chip formation, types, chip curl, chip control – Tool geometry: American, British, DIN, ISO systems – Mechanism of orthogonal cutting: Thin zone model, Merchant's analysis, Oxley thin shear zone analysis – Thick zone models, Palmer & Oxley analysis – shear angle relationship, Lee & Shaffer`s; relation ship etc. – Friction process in metal cutting: nature of sliding friction, effect of increasing normal load on apparent to real area of contact , columb`s law, yield stress at asperities, adhesion theory, ploughing, sublayer flow – Effect of rake angle,cutting angle, nose radius etc. on cutting force and surface finish – Empirical determination of force component.

Module 2

Thermal aspects of machining: Source of heat; temperature distribution in chip, shear plane & work piece; effect of speed, feed & depth of cut – Tool materials: carbon steel, HSS, coated HSS, ceramics, diamond etc.- Cutting fluids: effect of specific heat, etc on selection of liquids; effectiveness at tool chip interface; classification of fluids – Tool wear: flank & crater [KT] wear – Tool wear mechanisms: adhesion, abrasion, diffusion & fatigue; Taylor's equation, application at shop floor; speed, tool material & micro structure on tool life; allowable wear land [VB] ; rapid, steady & catatospheric wear on rough & finishing operations – Economics of machining – Machineability index.

Module 3

Power metallurgy: Preparation metal powers – Power characteristics: properties of fine power, size, size distribution, shape, compressibility, purity etc.- Mixing – Compaction techniques – Mechanism of sintering of single & multi phase materials - Sintering atmosphere – Finishing operations: heat treatment, surface treatment, impregnation treatment etc. – Impregnated bearings – Sintered oil-retaining bearing – Economics of p/m.

Advanced materials: Super alloys - Titanium & titanium alloys – shape memory alloys –smart materials – microstructure, properties, applications.

Module 4

Polymers*:* Polymerization – Structural features: Linear & net work molecular structure – Molecular wt, degree of polymerization, branching, cross linking – co polymers & ter polymers – Molecular architecture – effect of crystallinity – Glass transition temp: - Thrmo polymers – Thermoset polymers – Additives – Polymer

matrix composites: properties & applications. - *Elastamers*: Kinked structure - Mechanical, physical & chemical properties – Vulcanization of rubber – conductive polymers, applications. – *Ceramics*: Structure – Mechanical, physical properties & applications. – *Glasses*: Types, glass ceramics – Types, properties and application of MMC and CMC – Honey comb structure.

Module 5

Advanced production methods: Rapid prototyping: background & definitions – Process methods: Stereolithography, selective laser sintering, fused deposition modeling, laminated object manufacturing, laser engineered net shaping, 3D welding – Information processing – Indirect fabrication of metals & ceramics. – *Non traditional machining*: EDM, ECM, USM – principle, types, process parameters, control, MRR, surface finish, application etc. – Electro chemical grinding, lapping, honing; process principle & Ra only, applications – EBM, LBM, IBM, AJM, Abrasive water jet machining, LIGA process.

References

1. Armarego & Brown, The Machining of Metals, Prentice - Hall
2. Beaman, Barlow & Bourell, Solid Free Foam Fabrication: A new direction in mafg., Kluwer Academic Publishers
3. Brophy, Rose & Wulf, The Structure & Properties of Metals Vol.2, Wiley Eastern
4. Dixon & Clayton, Powder Metallurgy for Engineers, Machinery publishing co. London
5. HMT, Production Technology, Tata McGraw Hill
6. Kalpakjian, Manufacturing Engineering & Technology, Addison – Wesley, 4nd edn.
7. Lal G.K., Introduction to Machining Science, New Age publishers
8. Metcut research, Machinablity Data Center Vol.1 & 2, Metcut research associates, Cincinnati
9. Paul. H. Black, Theory of Metal Cutting, McGraw Hill

AUTOMOBILE ENGINEERING

M 802 **3+1+0**

Module 1

Engines: Types of engines in automobiles-classifications-engine components-working of various systems-CNGengines-R&D works-present and future vehicles-frame, body and engine construction-structure and mechanism forming components- carburetors, diesel fuel pumps, injector, single point and multi point fuel injection-combustion chambers-lubricating oil pumps-cooling systems-Vehicle performance-resistance to the motion of vehicle-air, rolling, and radiant

resistance-power requirement-acceleration and gradeability-selection of gear ratios.

Module 2

Transmission: prime movers-clutch-principle-friction-helical spring and conical spring clutches –centrifugal clutches and fluid couplings-Gear box-principle and necessity of manual gear box- constant mesh, sliding mesh and synchromesh gear boxes-epicyclic gearbox-overdrives-hydraulic torque converters-semi and automatic transmission-Final drive-front wheel, rear wheel and four wheel drives-transfer case-Hotchkiss and torque tube drives-universal joints-constant velocity universal joint-differential-non-slip differential-rear axles-types of rear axles.

Module 3

Steering and Suspension: Different steering mechanisms-steering gear boxes-power steering –types-suspension systems-front axle, rigid axle and independent suspensions-anti-roll bar-coil spring and leaf spring-torsion bar-Macpherson strut-sliding pillar-wish bone-trailing arm suspensions-front axle types-front wheel geometry-castor, camber, king pin inclination, toe-in toe-out. Shock absorbers-hydraulic and gas charged shock absorbers-air suspensions.

Module 4

Chassis and Body: Types of chassis and body constructions-crumble zones, air bags and impact beams-automotive air conditioning-braking mechanism and convectional brakes- booster, hydraulic and power brakes, components and attachments-mechanical, hydraulic and pneumatic brakes-anti-lock braking systems-Wheels and Tyres:tube-less tyres-ply ratings- radial tyres-hybrid vehicles-vintage cars-racing cars-automated roads-coach works-materials- safety provisions- motor vehicle act.

Module 5

Electrical systems Battery, charging and ignition systems-electronic ignition-dynamos and alternators-voltage regulators-light and horn relays-circuit diagrams-starting motor-bendix and follow through drives-power windows-electronic engine control unit for fuel injection- automotive lighting, accessories and dashboard instruments-Preventive and breakdown maintenance-engine testing, servicing-overhaul- engine tuning- wheel balancing-trouble shooting-garage tools and equipments-noise, vibration, and performance tests.

References

1. Automobile Engineering (Vol. 1 & 2) - K.M.Guptha
2. Automotive Mechanics - Joseph Heitner
3. Automobile Engineering - Harbans Singh Reyd
4. Automotive Mechanics - William H. Course

PRODUCTION PLANNING AND CONTROL

M 803 ***2+1+0***

Module 1

Introduction to PPC: need for PPC, effect, advantages, functions and problems of PPC.

Forecasting: methods of sales forecasting-forecasting for new products-forecasting for established products-time series analysis for sale forecasting – long term forecasting – methods of estimating Sales trend- problems- correlation analysis.

Module 2

Production planning: objectives-characteristics-process planning. Capacity planning- factors affecting-Master production scheduling-material requirement planning – BOM and product structure.

Production control: objectives- production control systems- principle and procedure of production Control.
Routing: objectives- procedure – route sheets.

Module 3

Sequencing assumptions: solution of sequencing problems-processing n jobs through two machines
Processing n jobs through three machines – processing n jobs through m machines – processing two
Jobs through m machines-problems

Module 4

Materials management: Components of integrated material management Purchasing management- stores management. Supply chain management – ERP-Role of I.T.

Module 5

Loading and scheduling: aim- reasons for scheduling- master scheduling or aggregate scheduling

Estimating shop loads- short term scheduling – mathematical loading and scheduling- problems-

Scheduling through PERT / CPM problems.

Despatching- duties- procedure- rules.

Follow up and reporting- types-report preparation and presentation.

References

1. Modern Production Management - E.S.Buffa
2. Principles of Production Management - J.Apple
3. Production management principles - Mcycss
4. Production Planning and Control - K.C.jani& L.N.Aggarwal
5. Manufacturing Planning &Control - Volfman, Berry, Whybark systems
6. Production and operations management - R.Paneerselvam
7. Modeling the supply chain - Jeremy F Shapiro

MACHINE DESIGN AND DRAWING - II

M 804 **2+0+2**

Module 1

Gears: Types of gears –spur gear, helical gear, bevel gear, worm and worm wheel- strength of gear teeth – gear forces and their effects – formative number of teeth – lead – lead angle-basic geometry and nomenclature of meshed spur gear set-dynamic load – endurance load-wear loads – AGMA standards – Lewis equation for strength design and Lewis form factor – design for wear – design of gears such as spur gear, helical gear, bevel gear, worm and worm wheel.

Module 2

Bearings: Bearing materials – introduction to lubrication – minimum film thickness – hydrodynamic theory of lubrication – viscosity of oil – oil seals – selection of lubricants – viscosity index – measurement of viscosity – effect of temperature on viscosity – clearance ratio – summer feld number – specifications and selection of bearing – anti friction bearing – bearing life – rating life – dynamic load capacity – equivalent dynamic load – design of journal bearing – design of rolling contact bearing such as ball and roller bearing.

Pumps: Design of centrifugal pump (Simple problems)

References

1. Mechanical Engineering Design – Joseph Shigley
2. Machine Design – Mubeen
3. Machine Design – Black
4. Principles of Lubrication – Cameron A.
5. Mechanical Seals – Mayer E.
6. Design of Machine Elements – Bhandari V. B.
7. Machine Design – Pandya and Shah

Note

Question Paper pattern same as Machine Design - I

ADVANCED MATHEMATICS (ELECTIVE - II)

CMELRTM 805-1 **3+1+0**

Module 1 Green's Function

Heavisides, unit step function – Derivative of unit step function – Dirac delta function – properties of delta function – Derivatives of delta function – testing functions – symbolic function – symbolic derivatives – inverse of differential operator – Green's function – initial value problems – boundary value problems – simple cases only

Module 2 Integral Equations

Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green's function – solution of Fredhlom integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

Module 3 Gamma, Beta functions

Gamma function, Beta function – Relation between them – their transformations – use of them in the evaluation certain integrals – Dirichlet's integral – Liouville's extension of Dirichlet's theorem – Elliptic integral – Error function.

Module 4 Power Series solution of differential equation

The power series method – Legendre's Equation – Legendre's polynomial – Rodrigues formula – generating function – Bessel's equation – Bessel's function of the first kind – Orthogonality of Legendre's Polynomials and Bessel's functions.

Module 5 Numerical solution of partial differential equations.

Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson's equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.

References

1. Linear Integral Equation - Ram P.Kanwal, Academic Press, New York
2. A Course on Integral Equations - Allen C.Pipkin, Springer – Verlag
3. Advanced Engg. Mathematics - H.K.Dass, S.Chand
4. Advanced Engg. Mathematics - Michael D.Greenberge, Pearson Edn. Asia
5. Numerical methods in Engg. &Science - B.S.Grewal, Khanna Publishers
6. Generalized functions - R.F. Hoskins, John Wiley and Sons.
7. Principles and Techniques of Applied Mathematics - Bernard Friedman, John Wiley and sons
8. Principles of Applied Mathematics - James P.Keener, Addison Wesley.
9. Numerical methods - P.Kandasamy, K.Thilagavathy, K.Gunavathy, Chand & co

EXPERT SYSTEMS IN MANUFACTURING (ELECTIVE - II)

M 805-2 ***3+1+0***

Module 1

Artificial Intelligence - expert / knowledge based systems - definition - expert system architecture: software components, knowledge base, inference engine, inference sub systems.

Module 2

Hard ware requirements - knowledge acquisition, knowledge base, knowledge representation - semantic netwoks, objects, nods; links, attributes, values - semantic net work structures: nodes, object, links, attributes, values.

Module 3

Knowledge representation: rule based system - heuristic rules - frame based knowledge representation - inference engine components - inferences strategies; modus ponens, backward & forward chaining, monotonic & non monotonic reasoning, search strategies - expert system building tools: languages, shells.

Module 4

Commercial software for manufacturing applications in CAD, CAPP, MRP - 11, adaptive control of devices, robotics, process control, fault diagnosis, failure

analysis etc; linking expert systems to other software such as DBMS, MIS, MDB, process control and office automation.

Module 5

Case studies and programming of typical applications in process planning, tool selection, Grinding wheel selection, part classification, inventory control, facilities planning etc.

References

1. Peter Jackson - Introduction to Expert systems, 3/e, by; Addison Wesley Longman, 1999.
2. Prentice - hall hand book of expert systems

AEROSPACE ENGINEERING (ELECTIVE - II)

M 805-3 ***3+1+0***

Module 1

The atmosphere: Characteristics of Troposphere, Stratosphere, Mesosphere and Ionosphere - International Standard Atmosphere – Pressure, Temperature and Density variations in the International Standard Atmosphere – Review of basic fluid dynamics – continuity, momentum and energy for incompressible and compressible flows – static, dynamic and stagnation pressures – phenomena in supersonic flows

Module 2

Application of dimensional analysis to 2D viscous flow over bodies – Reynolds number – Mach number similarity – Aerofoil characteristics – Pressure distribution – Centre of Pressure and Aerodynamic Center – Horse shoe vortex

Module 3

Momentum and Blade Element Theories – Propeller co-efficients and charts – Aircraft engines – Turbo jet, Turbo fan and Ram Jet engines – Bypass and After Burners

Module 4

Straight and Level Flight – Stalling Speed – Minimum Drag and Minimum Power conditions – Performance Curves – Gliding – Gliding angle and speed of flattest glide – Climbing – Rate of Climb – Service and Absolute Ceilings – Take off and Landing Performance – Length of Runway Required – Circling Flight – Banked Flight – High Lift Devices – Range and Endurance of Air planes.

Module 5

Air speed indicators – Calculation of True Air Speed – Altimeters – Rate of Climb meter – Gyro Compass – Principles of Wind Tunnel Testing – Open and Closed type Wind Tunnels – Pressure and Velocity Measurements – Supersonic Wind Tunnels (description only) – Rocket Motors – Solid and Liquid Propellant Rockets – Calculation of Earth Orbiting and Escape Velocities Ignoring Air Resistance and assuming Circular Orbit.

References

1. Mechanics of Flight - Kermode A. C.
2. Aerodynamics for Engineering Students - Houghton and Brock
3. Airplane Aerodynamic - Dommasch

COMBUSTION (ELECTIVE - II)

M 805-4 **3+1+0**

Module 1

Thermodynamics of reactive mixtures: Bond energy-Heat of formation-Heat of reaction-adiabatic flames temperatures-entropy changes for reacting mixtures-chemical equilibrium – equilibrium criteria –evaluation of equilibrium constant and equilibrium composition –simple numerical solutions.

Module 2

Elements of chemical kinetics: law of mass action-order and molecularity of reaction – rate equation- Arrheniuss law – activation energy – collision theory of reaction rates- Transition state theory-collision theory of reaction rates- Transition

state theory –General theory of chain reactions- combustion of carbon monoxide and hydrogen.

Module 3

Ignition and flammability: methods of ignition –self ignition – thermal theory of ignition – limits of flammability –factors affecting flammability limits- flame quenching- flame propagation- flame velocity- measurement of flame velocity – factors affecting flame speed- premixed and diffusion flames – physical structures and comparison – characteristics of laminar and turbulent flames- theory of laminar flame propagation.

Module 4

Flame stabilization: Stability diagrams for open flames- mechanisms of flame stabilization –critical boundary-velocity gradient –stabilization by eddies bluff body stabilization – effects of variables on stability limits.

Module 5

Combustion in solid an liquid propellant: Reactant motors – Classification and types of propellants – desirable properties of grain shapes – burning rates and combustion model of solid propellants- injection of liquid propellants-ignition and ignitors. Miscellaneous topics – droplet combustion – fluidized bed combustion - classification of coal – air pollution.

References

1. Fuels and combustion – Sharma S.P
2. Some fundamentals of combustion – Spalding D.B
3. Fundamentals of combustion – Strehlow . R.A
4. Elementary reaction Kinetics – Lathan J.L
5. Flames – Gaydan and wolfhard.

PROJECT MANAGEMENT (ELECTIVE - II)

M 805-5 ***3+1+0***

Module 1

Project feasibility Analysis- Marketing, Technical, and financial feasibilities-report preparation-case studies.

Module 2

Project Management- nature and scope- PERT and CPM techniques, Estimates-time, cost, resources (man, material, tool).

Module 3

Forecasting Methods-Time series analysis-method pf least square, moving average, curvilinear, correlation analysis.

Module 4

Risk Analysis-risk in economic analysis-measuring risk in investment; risk profiles, decision trees, formulation of discounted decision trees, simulation.

Module 5

MS Project: (Software Practice) Creation of task, sequencing of task, assignment of resources, finding critical path, ABC activities (discuss), breaking the activities, colouring techniques, resource balancing, allocating overtime, using different calendars (Like 8 or 12 hours shift, Friday/Sunday holiday, Special public holidays etc), cost estimates, assignment of blank fields, creation of different views on screen.

Reports: Daily reports for completed activity, lagging activities, overall progress review, Management high-level reports, individual Departmental reports.

References

1. Corter, Mastering MS Project 2000, BPB Publishers.
2. Harvey Maylor, Project Management, Pearson Education.
3. PrasannaChandra, Project Management, Tata McGraw Hill.
4. Prasanna Chandra, Projects, Tata McGraw Hill.

PROGRAMMING IN C++ AND VISUAL C++ (ELECTIVE - II)

M805-6 **3+1+0**

Module 1

Introduction to C++ - Object Oriented Approach – I/O instructions – Data types – Type Conversions – Arithmetic Operators – Relational Operators – Loops – Precedence – Conditional Operator – Logical Operators – Structures and its manipulations – Functions – Arrays.

Module 2

Classes and Objects – Specifying the Class – The private and public key words –

Defining Member Functions – Defining Objects – Calling Member Functions –

Constructors – Destructors – Overloaded Constructors – Objects as Arguments –

Returning Objects from Functions – Array of Objects.

Module 3

Operator Overloading – Operator Arguments – Operator Return Values – Postfix Notation – Overloading Binary Operators – Arithmetic Assignment Operators – Data Conversion – Inheritance – Derived Class and Base Class – Specifying The Derived Class – Accessing Base Class Members – The protected Members – Derived Class Constructors – Overriding Member Functions – Scope Resolution with Overridden Functions – Public and Private Inheritance – Levels of Inheritance – Multiple Inheritance.

Module 4

Pointers – Memory Management – The new and delete Operators – Pointers to Objects – Self Containing Classes – Virtual Functions – Accessing Normal and Virtual Member Functions with Pointers – Pure Virtual Functions – Friend Functions – The 'this' Pointer – Accessing Member Data with 'this'.

Module 5

Introduction to Windows Programming – Basic Windows Program Structure – Different Windows Messages like WM_PAINT, WM_TIMER etc. – Introduction to MFC – MFC Hierarchy - Use of Simple Foundation Classes like CTime, CString, CFile etc. – Exception Handling.

References

1. Object Oriented Programming in Microsoft C++ - Robert Lafore
2. Windows Programming Primer Plus - Jim Conger
3. Programming with ANSI and Turbo C - Kamthane. Pearson

SILICATES - STRUCTURE, PARTICLE ANALYSES AND SPRAY COATING (ELECTIVE - II)

M 805-7 **3+1+0**

Module 1

Silicate Mineralogy in General - Minerals-Definition, Classification-Silicates and non-silicates. Physical properties of minerals-Colour, lusture, transperancy, cleavage, hardness, fracture, form, specific gravity, fusibility & tenacity.

Module 2

Identification of Silicate Minerals - Physical properties, chemical composition and uses of the important silicate minerals-1. Quartz, 2. Feldspars, 3.Pyroxenes, 4.Amphiboles, 5.Micas, 6.Aluminium silicates-andalusite, sillimanite & kyanite, 7.Olivine, 8.Garnets, 9.Chlorites 10. Natrolite, 11.Clay minerals, 12.Asbestose, 13.Talc 14.Tourmaline 15. Staurolite

Module 3

Silicate Mineral Structures - Detailed study of the silicate structures with examples- 1. Nesosilicate, 2.Sorosilicate, 3.Cyclosilicate, 4.Inosilicate, 5.Phyllosilicate & 6. Tectosilicate. Ceramics and silicates.

Module 4

Particle Analyses – Coarse and powder materials- Coarse material-Size distribution- Grain size parameters, coefficient of angularity, specific surface area (actual and theoretical) by sieve analysis. Powder material-Size and area determination by various methods- Blane's methods, air jet sieve, Bacho dust classifier and BET methods.

Module 5

Spray Coating – Basic concepts and general discussion of spray coating. Binders- Ethyl orthosilicate (ETS-40), properties and hydrolysis. Slurries – Binder and different ceramic powders, consistency and determination, drying. Heat source – Plasma arc-transferred and non-transferred arcs, arrangement of spray coating.

References

1. Rutley's elements of mineralogy, H.H.Read, Thomas Murby&Co, London.
2. A text book of mineralogy, E.S. Dana, Wiley Eastern Ltd, New Delhi.
3. Mineralogy, Dier, Howie & Zussman, CBS Publishers, New Delhi.
4. Materials-Their nature, properties and fabrication, Seghal & Linderburg.

5. Material science and manufacturing process, Dhaunedrakumar, S.K.Jain & A.K.Bhargava, Vikas publishing house, New Delhi.
6. Welding and welding technology, Little, Tata McGraw hill publishing Co., New Delhi.
7. Investment casting, H.T. Bidwell, The machinery publishing Co., Ltd, UK.
8. Non-ferrous foundry metallurgy, A.J. Murphy, Pergamon Press Ltd.
9. Welding engineering and technology, R.S. Parman, Khanna publishers, New Delhi.
10. Manufacturing science, Amitabha Ghosh & Asok kumar Mallik, EWP, East West Press Pvt Ltd, New Delhi.

MANAGEMENT INFORMATION SYSTEMS (ELECTIVE - III)

M 806-1 **3+1+0**

Goals

To learn Management Information System (MIS), implementation requirements and process standardisation.

Module 1

Elements of a MIS – Levels of Management – Types of Management information – Technical dimensions of Information – System elements – Characteristics of MIS – Case Study.

Module 2

Building Business Model – Data Base – Report generation and time sharing –

Case study.

Module 3

Communication and distributed Data processing.

Module 4

Managing and controlling the MIS function. Application Development Cycle.

Module 5

Future of MIS – Architecture – reliability – Security – Intelligent Buildings.

Outcomes

Student will learn elements of MIS & steps in implementing MIS. Students will also learn hardware and software selection for MIS.

References

1. Mudric and Rose - Information System and Management.
2. Jerome Kauter - Management Information Systems, Prentice Hall India.
3. R. S. Daver - The Management Process.
4. Mudric, Rose & Callgget - Information System for Modern Management, Prentice Hall India.
5. James Obrein - Management Information Systems

CRYOGENICS (ELECTIVE - III)

M 806-2 **3+1+0**

Module 1

Introduction: Historical development- present areas involving cryogenic engineering. Basic thermodynamics applied to liquefaction and refrigeration process - isothermal, adiabatic and Joule Thomson expansion process - adiabatic demagnetization – efficiency to liquefaction and coefficient of performances irreversibility and losses.

Module 2

Low temperature properties of engineering materials: mechanical properties - thermal properties - electrical and magnetic properties. Properties of cryogenic fluids - materials of constructions for cryogenic applications.

Module 3

Gas liquefaction systems: production of low temperatures - general liquefaction

systems - liquefaction systems for neon, hydrogen, nitrogen and helium.

Module 4

Cryogenic refrigeration systems: ideal refrigeration systems- refrigerators using liquids and gases as refrigerants - refrigerators using solids as working media.

Module 5

Cryogenic storage and transfer systems - Cryogenic fluid storage vessels cryogenic fluid transfer systems. Application of cryogenics - cryo pumping - superconductivity and super fluidity - cryogenics in space technology - cryogenics in biology and medicine.

References

1. Cryogenic Systems - Barron R. F
2. Cryogenic Engineering - Scot R. W.
3. Cryogenic Engineering - Bell J.H.

NUCLEAR ENGINEERING (ELECTIVE - III)

M 806-3 ***3+1+0***

Module 1

Review of elementary Nuclear Physics: Atomic structure – Nuclear energy and nuclear forces – Nuclear fission

Nuclear reactions and radiations: Principle of radioactive decay – Interaction of α and β rays with matter – Neutron cross section and reactions – The fission process – Chain reaction – Basic principles of controlled fusion.

Module 2

Nuclear reaction principles – Reactor classifications – Critical Size – Basic

diffusion theory – Slowing down of neutrons – Neutron flux and power – Four

factor formula – Criticality condition – Basic features of reactor control

Module 3

Boiling water reactor: Description of reactor system – Main components – control and safety measures Materials of Reactor: Construction – Fuel – Moderator coolant – Structural materials – Cladding – Radiation damage.

Module 4

Nuclear fuels: Metallurgy of Uranium – General principles of solvent extraction – Reprocessing of irradicated fuel – Separation process – Fuel enrichment.

Module 5

Reaction heat removal: Basic equations of heat transfer as applied to reactor cooling – Reactor heat transfer systems – Heat removal in fast reactors

Radiation Safety: Reactors shielding - Radiation dozes – Standards of radiation protections – Nuclear waste disposal.

References

1. Nuclear Engineering - Glasstone & Sesoske
2. Sources book on Atomic Energy - Glasstone S.

INDUSTRIAL HYDRAULICS (ELECTIVE - III)

M 806-4 **3+1+0**

Module 1

Introduction to hydraulic / pneumatic devices – their application and characteristics – comparison of electric, hydraulic and pneumatic devices.

Module 2

Pumps and motors: Principle of working – range of displacement and pressures-fixed and variable discharge pumps-gear, screw, vane, piston pumps – axial piston pump-swash pump-bent axis pump. Types of hydraulic motors – their characteristics. Accessories-Hydraulic accumulators – intensifiers-filters-heater-cooler.

Module 3

Hydraulic valves: Stop valve- non return valve-relief valve-sequence valve-counter balance valve- pressure reducing valve – flow control valve –irection control valves-their principle of operation- and application-JIC symbols of hydraulic- pneumatic components.

Module 4

Properties of commonly used hydraulic fluids-Typical hydraulic circuits like those used in machine tools –Rivetter- pneumatic Hammer, hydraulic press, and power steering.

Module 5

Fluidics: Introduction of fluidics devices –Principles of working of common fluidics devices like wall attachment devices – proportional amplifiers-turbulent amplifiers- fluidic logic devices – examples of applications of fluidics devices like edge control of steel plate in rolling mills tension control.

References

1. Daniel Bonteille -Fluid Logic and Industrial automation.
2. John Pippenger & Tyler Hicks - Industrial Hydraulics

MACHINE VISION AND APPLICATION (ELECTIVE - III)

M 806-5 **3+1+0**

Module 1

Introduction to machine vision – basics of picture processing, Binary and grey scale images.

Preprocessing concepts – Digital image, Geometrical correction, Grey scale modification, Sharpening and smoothing images.

Module 2

Edge detection and line finding – Spatial differentiation, extraction of line descriptions.

Types of cameras for Machine vision and their principles.

Module 3

Software for measurement and pattern recognition applications with examples – two and three-dimensional measurements. Fourier transformation for pattern recognition applications.

Module 4

Image operation studies, interfacing a robot with a vision system. Basics of hardware for vision system

Module 5

Machine vision applications in engineering – dimension measurement, flaw detection, identification, verification, sorting - co ordinate measuring machines, non-contact type – case studies.

Reference

1. Sonaka M, Hlavac V & Boyle. R. - Image processing, analysis & machine vision

FINITE ELEMENT ANALYSIS (ELECTIVE - III)

M 806-6 **3+1+0**

Goals:

This course is designed to acquaint students with the basic principles of the finite element method, to provide experience with its use in engineering analysis and design, and to provide an opportunity to work with finite element programs used in industry. Computer programming may be involved.

Module 1

Introduction: Structural analysis objectives, static, dynamic and kinematic analysis, skeletal and continuum structures, modeling of infinite d.o.f system into infinite d.o.f system, basic steps in finite element problem formulation, general applicability of the method.

Element types and characteristics: Discretization of the domain, basic element shapes, aspect ratio, shape functions, ganeralised co-ordinates and nodal shape functions, 1D spar and beam elements, 2D rectangular and triangular elements, axisymmetric elements.

Module 2

Assembly of elements and matrices: Concept of element assembly, global and local co-ordinate systems, band width and its effects, banded and skyline assembly, boundary conditions, solution of simultaneous equations, Gaussian elimination and Cholesky decomposition methods, numerical integration, one and 2D applications.

Module 3

High order and isoparametric elements :One dimensional quadratic and cubic elements, use of natural co-ordinate system, area co-ordinate system, continuity and convergence requirements, 2D rectangular and triangular elements.

Module 4

Static analysis: Analysis of trusses and frames, analysis of machine subassemblies, use of commercial software packages, advantages and limitations.

Module 5

Dynamic analysis: Hamilton`s principle, derivation of equations of equilibrium, consistent and lumped mass matrices, derivation of mass matrices for 1D elements, determination of natural frequencies and mode shapes, use of commercial software packages.

Course Outcomes:

1. The students will understand the fundamental principles of finite element theory and applications.
2. The students will be able to built finite element models correctly for various engineering problems and solve the model using existing finite element codes

Text Book

Rao S.S., "The Finite Element Method in Engineering", 2nd edition, Pergamon Press, Oxford, 1989.

References

1. Robert D. Cook, David S. Malkins and Michael E. Plesha, "Concepts and Application of Finite Element Analysis", 3rd edition, John Wiley and Sons, 1989.
2. Chandrupatla T.R. and Belegundu, A. D.," Introduction to Finite Elements in Engineering", Pearrson Pvt. Ltd., 3rd edition 2002.

TOTAL QUALITY MANAGEMENT (ELECTIVE - III)

M 806-7 **3+1+0**

Goal

To give the detailed information on TQM Tools and Techniques for TQM will be known.

Module 1

Introduction – Leadership Concepts – Customer Satisfaction – employee involvement

Module 2

Continuous Process Improvement – Kaizen, Reengineering, PDSA cycle, Juran

Trilogy – Supplier Partnerships – Quality Cost

Module 3

Statistical Process Control (SPC) – Pareto Diagram, Cause – and – Effect diagram, check sheet, histogram.

Benchmarking – Quality Function Development – Failure mode and Effect Analysis (FMEA)

Module 4

Total Quality Control (TQC) – Quality Circles – Poka – Yoke- Just–in-Time (JIT)- KANBAN - '5-5'

Module 5

Implementing procedure of TQM - case studies

Learning Objective

1. Student will clear principles and practices of TQM
2. Student will learn tools and Techniques used in TQM.
3. Students will learn the procedure of implementation of TQM

References

1. Besterfield, Total quality Management, Person Education
2. Besterfield, Quality Control, Prentice - Hall
3. Arora K.C, TQM & 1S0 14000, S K Kataria & Sons
4. Jain & Chitale, Quality assurance and Total quality management, Khanna Publishers.
5. Mitra, Quality control & improvement, Person Education

MECHANICAL MEASUREMENTS LABORTAORY

M 807 **0+0+4**

1. Study of use of laser interferometer for calibration of linear measurements
2. Measurement of temperature:
   Calibration of thermometers and pyrometers
   Preparation and calibration of thermocouple and resistance temperature detectors (TTD & RTD)
3. Measurement of pressure:
   Calibration and use of pressure measuring instruments-Pressure Gauge, Micro manometer, Pressure Transducers, Dead weight pressure gauge calibrator
4. Measurement of speed:
   Calibration and use of tachometers & stroboscope
5. Measurement of linear and angular dimensions:
   Micrometer, Vernier caliper, dial gauge feeler gauge, comparator, interferometer, angle gauge, sine bar, plug gauge and wire gauge
6. Measurement of Flow: Rotameter, watermeter, Anemometer; calibration and use
7. Measurement of surface roughness using subtonic tester
8. Measurement of gear and screw thread profiles- gear tooth calipers, screw thread calipers
9. Measurement of strain and force – calibration of strain gauges and load cells
10. Measurement of vibration – use of vibration pick ups, accelerometer and vibration indicator
11. Acoustic measurements-sound level meter – preparation of noise contours
12. Measurement of PH value
13. Measurement of psychometric properties of air
14. Analysis of Automobile Exhaust gas and Flue gas -Use of instruments like oxygen analyser. Orsat gas analyzer, Gas chromatography.

PROJECT & SEMINAR

M808 **0+0+4**

At the beginning of the seventh semester, students must submit an abstract of their undergraduate project. They must submit a preliminary report at the end of the semester. They will complete the project in the eighth semester**.**

Sessional marks for seminar will be out of 25. Sessional marks for project will be out of 75, in which 35 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation board consists of a minimum of 3 faculty members including the guide.

VIVA -VOCE

M809

A comprehensive Viva-voce examination will be conducted to assess the student's overall knowledge in the specified field of engineering. At the time of viva-voce, certified reports of seminar and project work are to be presented for evaluation.