MAHATMA GANDHI UNIVERSITY

B.TECH. DEGREE COURSE

8TH SEMESTER

SCHEME
&
SYLLABUS

2002

ELECTRICAL
&
ELECTRONICS
ENGINEERING BRANCH

ELECTRICAL & ELECTRONICS ENGINEEING

SCHEME

8TH SEMESTER

Course Code	Course No.	Subject	Teaching Hours				Duration of Univ. Exam(Hrs.)	Maximum Marks		
			L	T	Prac./ Proj.	Total		Sessional	University	Total
A	E 801	Power System Analysis	3	1		4	3	50	100	150
B	E 802	Switch Gear and Protection	3	1		4	3	50	100	150
C	E 803	Instrumentation	2	1		3	3	50	100	150
D	E 804	Electrical System Design	3	1		4	3	50	100	150
E	E 805	Elective - II	3	1		4	3	50	100	150
F	E 806	Elective - III	2	1		3	3	50	100	150
G	E 807	Electrical Machines Lab -II			4	4	3	50	100	150
H	E 808	Project and Seminar**			4	4		100		100
I	E 809	Viva Voce							50	50
		Total	16	6	8	30	21	450	750	1200

**Sessional Marks for Seminar will be out of 25 and that for Project will be out of 75 in which 40 marks will be based on day to day performance assessed by the Guide. The remaining 35 marks are to be awarded based on the presentation of the project by the student in the presence of 2 staff members one of which shall be the Guide.

SYLLABUS

POWER SYSTEM ANALYSIS

E 801 **3+1+0**

Module 1

Power System Model: Representation – Single Line Diagram – per unit system – per unit impedance diagram – network model formulation – bus admittance matrix – formation of Y bus and Z bus using singular transformation – symmetrical components – sequence impedance and networks

Module 2

Power Flow Studies: Load flow problem – Gauss Siedal method – Newton Raphson method – algorithm for load flow solution – handling of voltage controlled buses, off nominal transformer ratios and phase shifting transformers

Module 3

Economic Load Dispatch: System constraints – Economic dispatch neglecting losses – optimal load dispatch including transmission losses – physical interpretation of co ordination equations – exact transmission loss formulae – modified co ordination equation – automatic load dispatching

Module 4

Symmetrical and unsymmetrical short circuit analysis: Different types of faults in power systems – symmetrical fault analysis – selection of circuit breakers – use of reactors

Unsymmetrical faults – analysis of single line to ground, line to line and double line to ground faults in power system – analysis of unsymmetrical fault using Z bus.

Module 5

Stability Analysis: Swing equation – power angle equation and power angle curve – inertia constant – steady state stability - transient stability – equal area criterion – application – numerical solution of swing equation – critical clearing time and angle – effect of clearing time on stability –methods of improving system stability – modified Euler's method – Rangakutta method – application to the solution of swing equation and computational algorithms

References

1. Power System Engineering: Nagrath and Kothari, TMH
2. Electrical Power Systems: C. L. Wadhwa, New Age Int'l
3. Power System Analysis: Bergen, Pearson Education Asia, LPE
4. Elements of Power System Analysis: William D. Stevenson
5. Power System Stability Vol. I: Kimbark E. W.

SWITCHGEAR AND PROTECTION

E 802 **3+1+0**

Module 1

Switchgear: Circuit breaker – basic principle of operation – arc phenomenon – initiation and maintenance of arc - arc interruption methods – arc voltage and current waveform in AC circuit breaking – re-striking and recovery voltage – current chopping – DC breakers – rating of circuit breakers - breaking capacity – making capacity – short time rating – working principle and important features of oil CB, minimum oil CB, air blast CB, vacuum CB and SF6 CB – auto high speed re-closing.

Module 2

Protective relaying: Main and back up protection – basic requirements of protective relaying – classification of relays – induction type – principle - inverse time characteristics – directional over-current and power relays – distance relays – definite distance and distance time relays – differential relays - negative phase sequence relay – static relays – basic static relay – block diagram of static over-current, static directional, static distance and static differential relays.

Module 3

Generator Protection: External and internal faults – differential protection – biased circulating current protection – self balance system – over-current and earth fault protection – protection against failure of excitation

Transformer protection: Differential protection – self-balance system of protection – over-current and earth fault protection – buchholz' s relay and its operation.

Module 4

Feeder protection: Protection of radial feeders – protection of parallel feeders – protection of ring mains – differential pilot protection for feeders – Merz Price voltage balance system – transley system

Transmission Line Protection: Definite distance and time distance protection – phase and earth fault protection – carrier current protection

Module 5

Surge Over-voltages: Causes – lightning and switching surges – protection against over-voltages – surge diverters thyrite and horn gap types – use of ground wires – insulation coordination.

Wave propagation:

Wave propagation on OH lines and UG cables – transmitted and reflected waves – surge impedance – velocity of propagation

References

1. Power System Protection and Switchgear: Ravindranath and Chander
2. Electrical Power Systems: C. L. Wadhwa, New Age Int'l

3. A Course in Electrical Power Systems: Sony, Gupta, Bhatnagar
4. Elements of Power System Analysis: William D. Stevenson
5. Traveling Waves on Transmission Systems: Bewsley L. V.
6. Power System Protection: M. A Date, B. Oza and N.C Nair,

INSTRUMENTATION

E 803 **2+1+0**

Module 1

Transducers: Classification – characteristics – static and dynamic characteristics – Instrumentation System – Functional description – input / output configuration – interfering and modifying inputs – Methods of correction – Loafing effect – Instrumentation amplifiers – Isolation amplifier – charge amplifier.

Module 2

Displacement Transducers: Resistance potentiometer – linearity and sensitivity – types – Resistance strain gauges – working principle – gauge factor – strain gauge circuitry – temperature effect and its compensation – load cells – LVDT – working principle – equivalent circuit – LVDT circuitry – Capacitive transducers – different types – piezoelectric transducers – working principle – piezoelectric crystal equivalent circuit.

Module 3

Temperature Measurement: Thermo electric effects – Laws – thermocouples – thermo electric circuits – Resistance Temperature Detector (RTD) – Bridge circuits – Thermistors – characteristics – pyrometer – radiation and optical pyrometers.

Module 4

Absolute acceleration – null type and servo type – strain gauge Accelerrometer – piezo electric accelerometer – Electromagnetic flow meter – ultrasonic flow meter – transit type and Doppler flow meter – Ultrasonic flaw detector – Optical transducers.

Module 5

PH measurement – Low Pressure measurement – McLaud gauge – Pirani gauge – ionisation gauge – thermal conductivity gauge – spatial encoder for angular measurement – wave analyser and spectrum analyser (block schematic) – scintillation counter – Hygrometer.

References

1. Measurement Systems – Application and Design: E.O Doeblin, TMH
2. Principles of Industrial Instruments: D. Patranabi, TMH
3. Industrial Instruments Fundamentals: E. Fribance, TMH

4. Electronic Instruments: H.S Kalsi
5. Instrumentation Devices and Systems: V. Rangan, G.R Sharma and V.S.V Mani

ELECTRICAL SYSTEM DESIGN

E 804 **3+1+0**

Module 1

Design of D.C Machines: Design specifications – output equation – output coefficient – specific loadings – choice of speed and number of poles – calculation of D and L – Armature design – choice of type of winding – number of sots – number of conductors per slot – current density – cross sectional area – slot insulation – length of air gap – field winding design – field ampere turns – excitation voltage per coil – conductor cross section – height of pole – design of ventilating ducts – design of commutator and brushes – Carter's coefficient – real and apparent flux density.

Module 2

Transformers: Design **–** single phase and three phase – output equation – specific magnetic loading – core design – single, stepped core - windings – number of turns – current density – area of cross section of conductors – types of coils – insulation – window area – window space factor – overall dimensions – cooling – design of cooling tank with tubes – design of distribution and power transformers – design of small transformers like 230V/6-0-6V.

Heating, cooling and temperature rise calculation – Continuous, short time and intermittent rating.

Module 3

Design of Synchronous Machines: Specific loading – output equation – output coefficient – main dimensions – types of winding – design of field system – turbo alternator – main dimensions – stator design – rotor design – damper winding design – comparison of water wheel and turbo alternators, cooling of turbo alternator.

Design of three phase Induction motors: output equation – output coefficient – main dimensions – rotor bar currents.

Module 4

Estimate the quantity of materials required and draw the electrical wiring layout of (a) residential building (b) Multi-storied building using rising mains (c) factory with one number of small and high rating motor at LT ot HT supply and many number of connected loads with suitable starters/switches and control panels (d) Cinema hall

Module 5

a. Design, layout and estimation of power supply arrangement for (1). A bulk Industrial consumer (2) An under ground power supply (3) An Over head line to a rural consumer.
b. Estimate and draw the layout of (1) indoor (2) outdoor 11KV transformer station with all accessories – single line diagram and physical layout
c. Design and draw the typical earthing installation like (1) pipe earthing (2) Plate earthing (3) earth mat / grid
d. Study the electrical wiring diagram of a typical automobile clearly showing all connected loads/ sources with specifications.

References

1. Electrical Machine Design: A.K Sawhney
2. Performance and Design of D.C Machine: Clayton
3. Performance and Design of A.C Machines: M.G Say
4. Design of Electrical Machines: V. N Mittal
5. Electrical Design Estimating and Costing: Raina & Bhattacharya

ELECTIVE - II

E 805 **3+1+0**

List of Electives:

E 805.01 CMELR Advanced Mathematics
E 805.02 Computer Aided Design of Induction Machines
E 805.03 Robotics
E 805.04 Advanced Power Systems
E 805.05 Advanced Microprocessors
E 805.06 System Software
E 805.07 Advanced Power Electronic Systems

Note

New Electives may be added according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

ADVANCED MATHEMATICS

CMELRT 805-1

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. Numrical methods in Engg. &Science: B.S.Grewal, Khanna Publishers
6. Generalized functions: R.F. Hoskins, John Wiley and Sons.
7. Principles and Techniques of Bernard Friedman: John Wiley and sons Applied Mathematics
8. Principles of Applied Mathematics: James P.Keener, Addison Wesley.
9. Numerical methods: P.Kandasamy, K.Thilagavathy, K.Gunavathy

COMPUTER AIDED DESIGN OF INDUCTION MACHINES

E 805-2

Module 1

CAD Orientation of Engineering design problems to computers. Design by analysis and synthesis approach – simulation of non-linearity – stator windings for 3 phase and single phase induction motors

Module 2

Main dimensions of three phase induction motors – standard specification – constructional features – specific electric and magnetic loading – output coefficient – main dimensions – computer programmes

Module 3

Core design – leakage reactances – rotor winding design – equivalent resistances – computer programmes

Module 4

Calculations from design data – Carters coefficient – no load current – equivalent circuit parameters – torque – efficiency and temperature rise – computer programmes

Module 5

Main dimensions of single phase induction motors – auxiliary winding and capacitor design – equivalent circuit parameters - torque – efficiency and temperature calculations using design data – computer programmes

References

1. Computer Aided Design of Electrical Equipments – Ramamoorthy M, Affiliated East-West press pvt. Ltd., New Delhi
2. Performance and Design of A.C Machines – M.G Say
3. Computer Aided Design of Electric Machinery – Venott C. G, MIT Press, London

ROBOTICS

E 805-3

Module 1

Introduction: Historical development-classification of robots-applications-robots kinematics- joints and links-degree of freedom-description of position, orientation, frames-mapping from one frame to another-compound transformations-inverse of transform matrix-transform equations-kinematics of three degree of freedom

manipulators-Description of links-intermediate links in chain-First and last links in chain -Link parameters-affixing frames to links-derivation of link transformation matrix-Description of an industrial robot.

Module 2

Inverse manipulator kinematics - Workspace-solvability-multiple solutions-Algebraic solution.

Drive and control systems for robots: hydraulic systems and DC servomotors

Position control for robots-simple position control system-position control along a trajectory

Module 3

Robot end- effectors: Classification of end-effectors-drive System for grippers-mechanical grippers magnetic grippers-vacuum grippers-gripper force analysis and gripper design.

Module 4

Sensors and intelligent robots: need for sensing systems- sensing devices-piezoelectric sensors-linear position and displacement sensing absolute optical encoding-incremental optical encoder-position and direction measurement-velocity measurement—force and torque sensors-proximity sensors-range sensors-robot vision systems

Module 5

Trajectory planning for Robots: Joint space schemes-cubic polynomials with via points-Blending schemes - interfacing to microprocessors and computers.

References

1. Robotics and Image Processing - PA Janakiraman
2. Robotic Technology and flexible Automation - S R Deb
3. Robotics for engineers - Yoram Koren
4. Introduction to Robotics- Analysis, Systems and Applications: Saeed B. Nikku, Pearson Education Asia, LPE

ADVANCED POWER SYSTEMS

E 805-4

Module 1

Automatic generation and voltage control - load frequency Control (single area case) -turbine speed governing system - model of Speed system - Turbine model- generator load model - steady state analysis- dynamic response - control area concept.

Module 2

Unit commitment - constraints in unit commitment-spinning spinning reserve - thermal unit constraints - other constraints - unit commitment solution methods - priority - list methods - dynamic programming solution.

Module 3

Hydrothermal co-ordination - long range and short range hydro scheduling- hydro electric plant models - scheduling problems - the short term hydrothermal scheduling problem - short - term hydro— scheduling: a gradient approach - hydro units in series-dynamic programming solution to the hydrothermal scheduling problem.

Module 4

Interchange evaluation and power pools - economy interchange economy interchange evaluation - interchange evaluation with unit commitment multiple interchange controls -after - the fact production costing - other types of interchange - power pools - the energy broker system - centralized economic despatch of a power pool - allocating pool savings.

Module 5

Power system security - factors affecting power system security-contingency analysis: Detection network problem - network sensitivity methods - calculation of network sensitivity factors - correcting the generation despatch - sensitivity methods - linear programming.

References

1. Power System Engineering - I.J.Nagrath, D.P.Kothari
2. Power generation, operation and control - Allen J.Wood, Bruce Wollenberg, John Wiley & Sons

ADVANCED MICROPROCESSORS

E 805-5

Module 1

Intel 8086 - Pin out signals and functions - Internal architecture - Registers and flags - bus buffering and latching bus timing – Pipelining

Operating modes - minimum mode and maximum mode.

Module 2

Introduction to 8086 assembly language programming - addressing modes – instruction set classification - Writing simple programs eg. Arithmetic operations, reading data from input port etc.

8086 memory interface – memory bank – separate bank decoders and signals

Module 3

8087 internal block diagram and interfacing (Programming not required).

Intel 80186 Architecture - block diagrams - different integrated peripherals

Intel 286 - Block diagram - Hardware features - Additional instructions (Programming not required)

Module 4

Intel 8038 - memory system - I/O system - Protected mode – mmu - Descriptors and selectors - TSS, Memory paging mechanism.

Intel 80486 - Internal Architecture - memory management and cache memory.

Module 5

Introduction to Pentium - processors – memory system – I/O system - special Pentium registers - Pentium memory management.

Pentium II - Introduction - software changes Pentium III - Introduction - chip set, Bus

Pentium *IV* - Memory interface, Hyper pipelined technology (elementary treatment only).

Concept of RISC – comparison of CISC and RISC

References

1. The 80x86 Family - John Uffenbeck - Pearson
2. Microprocessor and Interfacing - Douglas V. Hall - McGraw Hill
3. The Intel Microprocessors - Barry B. Brey (6^{th} edition) – Pearson LPE
4. Advanced Microprocessors and Peripherals – A.K Ray and M. Bruchandy – TMH
5. An Introduction to the Intel family of Microprocessors – James L. Antonokos, Pearson LPE

SYSTEM SOFTWARE

E 805-6

Module 1

Introduction: Concept of system software - Classification of system software- Relationship of system software with the machine and the user. Assemblers: overview of the assembly process- single pass and two pass assemblers. Elementary ideas of macros -Macro definition- macro call macro expansion - macro processors.

Module 2

Linkers and Loaders: translated, linked and load time addresses- relocation and linking concepts- object module- loader- absolute loader, relocating loader- linking loaders -(elementary ideas only).

Compilers: Overview of compilation process - phases of a compiler - analysis phase -synthesis phase - lexical analysis - parsing - static and dynamic storage allocation-intermediate code generation - code generation (basic ideas only).

Module 3

Operating systems: Definition of operating system -functions of operating system - types of services-Types of operating systems- batch processing multiprogramming, multitasking - timesharing, real-time, distributed systems (brief descriptions only).

Process management- process concept- process states- scheduling - FCFS, Shortest Job first, round robin scheduling policies.

Module 4

Memory management- contiguous memory allocation - static and dynamic partitioning -swapping - non-contiguous allocation- fragmentation- concept of virtual memory- paging-page tables - page replacement- FIFO and LRU page replacement policies - segmentation -caching of secondary storage information.

File system - directory structures - file system implementation - sharing and security. Device management - basic principles of I/O device controllers - I/O scheduling policies.

Module 5

Introduction to distributed operating system: characteristics of distributed systems -advantages -client server model - remote procedure call.

Real time operating systems - Basic requirements - hard and soft real time systems - issues in real time systems- basic ideas of real time scheduling - reentrancy- real time embedded systems (basic ideas only).

References

1. Introduction to System Software - Dhamdhere D.M., Tata McGraw Hill
2. Systems Programming - Donovan J.I, McGraw Hill
3. Systems Programming - Dhamdhere D.M., Tata McGraw Hill & Operating Systems
4. Principles of compiler design - Aho & Ullman, Narosa Publishing
5. Operating System- Milenkovic, McGraw Hill
6. Operating System concepts - Peterson & Silberschatz, Addison Wesley
7. Real time systems & programming languages- Burns, Wellings, Addison Wesley
8. Introduction to RTS - Martin
9. Real time embedded Systems - Mathai Joseph, CERN

ADVANCED POWER ELECTRONIC SYSTEMS

E 805-7

Module 1

DC-DC converter topologies: Buck and boost converters - continuous and discontinuous current modes - buck-boost, C'uk converter - operation – control of dc-dc converters –PWM method - Full-bridge with bipolar and unipolar switching – output voltage equations.

Module 2

SMPS topologies: Basic block schematic of SMPS – isolated dc-dc topologies – forward and flyback – principles – (circuit and operation only). Push-pull topology – half bridge

Basics of SMPS control methods – voltage-mode and current-mode control (block diagrams and description only).

Module 3

Resonant Converters: Advantages of resonant converters over PWM converters – Classification - series and parallel resonant converters – half-bridge operation – discontinuous and continuous current modes (basic modes only, no analysis required) Principles of Zero voltage and Zero current switching (ZVS and ZCS switches only – no analysis required)

Module 4

PWM Inverters: Need for PWM techniques – various PWM techniques – principle of sinusoidal PWM – bipolar and unipolar PWM - modulation index – application to single phase bridges - disadvantages of SPWM – brief introduction to other PWM methods – current-mode control schemes (tolerance band control and fixed frequency control – description with block diagram only)

Module 5

Applications: Power factor correction – Actual power factor – Displacement factor and distortion factor – principles of input line current shaping using boost rectifiers. UPS – Different topologies – block schematics.

Electronic ballast – block schematics.

References

1. Power Electronics: Converters, Applications and Design – Mohan, Undeland and Robbins, John Wiley and Sons, 2nd ed.
2. Power Electronic Systems: Theory and Design – Jai P. Agrawal , Pearson Education Asia, LPE
3. Modern Power Electronics – P.C Sen, Wheeler Publ.

ELECTIVE - III

E 806 **2+1+0**

List of Electives:

E 806.01 Digital Protection of Power Systems
E 806.02 Insulation Technology
E 806.03 Computer Networks
E 806.04 Artificial Intelligence and Expert Systems
E 806.05 Opto-Electronics and Communication
E 806.06 VLSI Technology

Note

New Electives may be added according to the needs of emerging fields of technology. The name of the elective and its syllabus should be submitted to the University before the course is offered.

DIGITAL PROTECTION OF POWER SYSTEMS

E 806-1

Module 1

Need for protection-nature and causes of fault -zones of protection-classification of protective relays based on technology and function-instrument transformers used in protection circuit.
A/D converters- analog multiplexers-sample and hold circuits.

Module 2

Computer applications to protective relaying - simulation of power system disturbances-simulation of current and voltage transformers-simulation of distance relays during transient conditions.

Module 3

Offline application of computers-on line application of computers –Relay co-ordination programmes.

Module 4

Microprocessor based protective relays - multistage frequency relay - measurement of power system signals through phase locked loop interface - protection of alternators against loss of excitation.

Module 5

Microprocessor based over current relays-impedance relays- directional relay-reactance relay - distance relay - measurement of R and X - mho relay - quadrilateral relay - generalized interface for distance relays.

References

1. Madhava Rao T.S, "Power System Protection-Static relays"
2. Bddri Ram, "Power System Protection and Switchgear"
3. Singh L.P, "Digital Protection-Protective Relaying from electromechanical to microprocessors"
4. Arun G. Phadke, James S. Thorp, "Computer Relaying for Power systems"

INSULATION TECHNOLOGY

E 806-2

Module 1

Insulating materials - classification, brief study of preparation and properties of ceramics, mica, paper, PVC, PE Epoxy resin, teflon, SF6 transformer oil, polychlorobiphenyls (PCB) vacuum purification of transformer oil- drying and degassing. Impregnation of paper and cotton insulation.

Module 2

Dielectric properties - permittivity, complex permittivity, dielectric loss factors influencing permittivity, permittivity of mixtures, factors influencing tan delta, Measurement of resistivities, dielectric loss and constant, testing for tracking partial discharge measurements.

Module 3

Polarisation - internal fields, Clausins - Mossotd relation limitations, different types of polarisaiton. Electric fields in homogeneous dielectrics, mechanical force under electric fields, absorption currents.

Insulation problems in high voltage transformers, surge phenomena, insulation design to withstand surges in transformers, Elementary de-sign of insulating system of capacitors.

Module 4

Breakdown phenomena in gases - ionization processes, de-ionization processes, breakdown mechanisms, T ownrend's theory. Steramer theory, Paschen's law, breakdown in electronegative gases, uniform fields, non-uniform fields penning effect.

Module 5

Breakdown mechanisms in vacuum-breakdown in liquid dielectrics pure liquids and commercial liquids, breakdown in solid dielectrics - different types - intrinsic, electronic, thermal, electromechanical, tracing and tracking, partial discharges, partial discharges.

References

1. High Voltage Engineering: Naidu and Kamaraju
2. Ionisation, Conductivity and Breakdown in Liquids: Adam Czawski
3. High Voltage Engineering: Kuffel and Zeamgl
4. SF6 and Vacuum Insulation for High Voltage Applications: Naidu and Maller

COMPUTER NETWORKS

E 806-3

Module 1

Introduction: Goals and applications of networks - Network Topologies - Broadcast - Point to point - bus, star, ring, tree - Types of networks - LAN, MAN, WAN OSI reference model - TCP/IP reference model - Client server computing Physical layer - Packet switching -Transmission media - Fibre optic networks – ISDN

Module 2

Data link layer: Services - Data framing - Error handling - Data link protocols – Elementary protocols - Sliding window protocol(basic concepts only) - data link layer in the Internet- SL1P/PPP.

Module 3

Medium access sub layer: Channel allocation - static vs dynamic channel allocation - CSMA protocol - collision detection - wireless LANs - IEEE 802 standards - Ethernet - Token bus -Token ring - Bridges – FDDI

Module 4

Network layer: services - Routing - congestion control - internetworking - Principles - Gateways - Host - backbone network - Network layer in the Internet - IP protocol - IP address - Internet control protocols. Transport layer: Services - Internet Transport protocols - TCP and UDP.

Module 5

Application layer: services - Network security - Cryptography - DNS - DNS Namespace -Name servers - Network Management concepts. Internet services: E-mail - USENET - FTP -TELNET - gopher - WWW - WAIS – Archie

References

1. Computer Networks (3r edition) - Tanenbaum, Pearson Education Asia
2. Data and computer communications - William Stalling, Pearson Education Asia
3. Data Communication, Computer networks - F. Halsall, Addison Wesley and open systems
4. Computer Networks, A system approach - Peterson & Davie, Harcourt Asia
5. The Internet Book- Douglas E. Comer, Pearson Education Asia
6. Internet Complete Reference - Harley Harn Osborne

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

E 806-4

Module 1

Introduction to AI and problem solving concepts: Definition- pattern recognition-production systems - problem and production system characteristics - two-pail problem-analysis of AI techniques - criteria for success

Module 2

Knowledge representation - formal and non-formal logic: Representation evaluation criteria -level of representation -formal logic schemes -resolutions - predicate and prepositional logic -conversion to clause form -semantic networks-frames-scripts-production system

Module 3

Problem solving strategies dealing with uncertainty: Defining the problem - control strategies - exhaustive search - generate and test-space transformation models- forward versus backward reasoning -matching - weak methods - hill climbing -breadth and depth first searches - search algorithms.

Module 4

Expert system development process and knowledge acquisition: Definition - analysis of expert system problem solving - role and analysis of knowledge - architecture of the expert system - problem selection - formalization - implementation –evaluation.

Module 5

Knowledge acquisition techniques- cognitive behavior - knowledge representation development.

Expert system tools: Expert system shells -narrow tools -large hybrid expert system tools -PC based expert system tools knowledge acquisition tools.

References

1. Introduction to AI & Expert System - D. W. Patterson, Prentice hall of India
2. Principles of Artificial Intelligence& Expert Systems Development - David W.Rolston, Tata McGraw Hill
3. Artificial Intelligence - Elaine Rich, McGraw Hill
4. Principles of Artificial Intelligence - Nils J. Nilsson, Springer Verlag
5. Introduction to Artificial Intelligence - Charnaik & McDermott, Addison Wesley

OPTOELECTRONICS AND COMMUNICATION

E 806-5

Module 1

Review of P-N jn-characteristics - semiconductor-hetero junction-LEDs (-spontaneous emission-LED structure-surface emitting-Edge emitting-Injection efficiency-recombination efficiency-LED characteristics-spectral response-modulation-Band width.

Module 2

Laser diodes-Basic principle-condition for gain-Laser action-population inversion-stimulated emission-Injection faster diode-structure-temperature effects-modulation-comparison between LED and ILDs.

Module 3

Optical detectors-optical detector principle-absorption coefficient-detector characteristics-Quantum efficiency-responsivity- response time-bias voltage-Noise in detectors P-N junction-photo diode-(characteristics-P-I-N-photo diode-response-Avalanche photo diode (APD) multiplication process-B. W-Noise-photo transistor.

Module 4

Optical Fibre-structure-advantages-Types-propagation-wave equation-phase and group velocity-transmission characteristics-attenuation-absorption-scattering losses-dispersion-fibre bend losses-source coupling, splices and connectors-wave length division multiplexing.

Module 5

Optical fibre system-system design consideration-fibre -optic link-optical transmitter circuit-source limitations-LED drive circuit-Laser drive circuit-pre-amplifier-equalization-Fibre-optic link analysis-typical lira design.

References

1. Semiconductor Opto electronics Devices-Pallab Bhattacharya (Pearson Education)
2. Optical fibre Communication Systems-Principles and practice- John M Senior (PHI)
3. Optical communication Systems-John Gower (PHI)
4. Optical fibre Communication- Gerd keiser (PHI)

VLSI TECHNOLOGY

E 806-6

Module 1

Process steps in 1C fabrication: Crystal growth and wafer preparation-Czochralski process- apparatus- silicon shaping, slicing and polishing- Diffusion of impurities-physical mechanism- Pick's I and II law of diffusion- Diffusion profiles- complementary (erfc) error function- Gaussian profile- Ion implantation-Annealing process- Oxidation process- Lithography- Photolithography, Fine line lithography, electron beam and x-ray lithography- Chemical vapour deposition (CVD)- epitaxial growth- reactors-metallisation- patterning- wire bonding and packaging.

Module 2

Monolithic components: Isolation of components- junction isolation and dielectric isolation- Transistor fabrication- buried layer- impurity profile-parasitic effects-monolithic diodes- schottky diodes and transistors- FET structures- JFET- MOSFET-PMOS and NMOS, control of threshold voltage (Vth)- silicon gate technology-Monolithic resistors- sheet resistance and resistor design- resistors in diffused regions-MOS resistors- monolithic capacitors-junction and MOS structures- 1C crossovers and vias.

Module 3

CMOS technology: Metal gate and silicon gate- oxide isolation- Twin well process- Latch up- BiCMOS technology- fabrication steps- circuit design process-stick diagrams- design rules- Capacitance of layers- Delay- Driving large capacitance loads- Wiring capacitance- Basic circuit concepts- scaling of MOS structures- scaling factors- effects of miniaturization.

Module 4

Subsystem design and layout- Simple logic circuits- inverter, NAND gates, BiCMOS circuit, NOR gates, CMOS logic systems - bus lines- arrangements- power dissipation-power supply rail distribution- subsystem design process- design of a 4 bit shifter.

Module 5

Gallium Arsenide Technology: Sub-micro CMOS technology- Crystal structure- Doping process- Channeling effect- MESFET- GaAs fabrication- Device modeling.

References

1. VLSI technology. S M Sze, Me Graw Hill pub,
2. Basic VLSI design: Douglas Pucknell, PHI
3. Principles of CMOS VLSI Design: H E Weste, Pearson Edn.
4. Integrated Circuits: K R Botkar, Khanna Pub.
5. CMOS circuit design layout and simulation: Barter, IEEE press.
6. Introduction to VLSI: Conway, Addison weslay.

ELECTRICAL MACHINES LAB II

E 807 **0+0+4**

1. Alternator regulation by synchronous impedance and mmf methods
2. Alternator regulation by Potier method
3. Alternator regulation by Blondel's method and verification by direct loading
4. Alternator V – curves for constant input/output
5. Synchronous motor V – curves and compounding curves
6. Alternator regulation by feeding back power to mains – use of synchroscope
7. Study of starters and load tests on double cage and single phase induction motors
8. Characteristics of cage / slip ring motors by circle diagram
9. Characteristics of induction generator and rotor hysterisis by Link's method
10. Synchronous Induction motor – predetermination of excitation current and verification
11. Characteristics of pole changing motor
12. Characteristics of Schrage motor – torque variation with load, predetermination of speed variation with brush shift and verification
13. Characteristics of cascade induction motor set
14. Experimental determination of torque slip curve of induction motor in unstable region upto about 40% slip
15. Experimental determination of variation of starting torque with rotor resistance in slip-ring induction motor
16. Predetermination of line current. Torque, power of a 3-phase induction motor under single phasing - verification
17. No load and blocked rotor tests on single phase induction motor and determination of equivalent circuit parameters

18. Determination of
    a. Continuous rating for specified temperature rise
    b. One hour rating by heat run test of a machine

PROJECT AND SEMINAR

E 709/E808

Each student is required to present a technical paper on a subject approved by the department. The paper should be in general reflecting the state-of-the-art. He/she shall submit a report of the paper presented to the department.

In addition to the seminar he/she shall undertake a project work (as a team or individually) in the 7^{th} semester itself in consultation with the Guides. On completion of the project work, he/she shall present the work done before a panel of staff members, and submit a report of the project work, and submit a report of the project work done to the department.