SYLLABUS

FOR

INTERDISCIPLINARY SUBJECTS

(2013 SCHEME)

M.TECH / M.PLANNING/M.ARCH

University of Kerala

Thiruvananthapuram

LIST OF INTER DISCIPLINARY SUBJECTS - M.TECH/M.ARCH/M.PLANNIG

1.	**ADI 3001**	**SUSTAINABLE DEVELOPMENT AND ARCHITECTURE**
2.	**ADI3002**	**SUSTAINABLE INFRASTRUCTURE& TECHNOLOGY**
3.	**ADI3003**	**EARTHQUAKE RESISTANT DESIGN AND MANAGEMENT**
4.	**ADI3004**	**CLIMATOLOGY AND BUILT ENVIRONMENT**
5.	**ADI 3005**	**URBAN DESIGN- THEORIES AND PRINCIPLES**
6.	**BMI 3001**	**QUALITY AND SAFETY MANAGEMENT**
7.	**BMI 3002**	**ENVIRONMENTAL ENGINEERING**
8.	**BMI 3003**	**ENERGY ENGINEERING**
9.	**BMI 3004**	**OPTIMISATION TECHNIQUES FOR ENGINEERS**
10.	**BMI 3006**	**COMPUTATIONAL FLUID DYNAMICS**
11.	**BMI 3007**	**ELEMENTS OF FINANCIAL MANAGEMENT**
12.	**BMI 3008**	**ENTREPRENEURSHIP**
13.	**CSI 3001**	**FINITE ELEMENT ANALYSIS**
14.	**CSI 3002**	**MECHANICS OF COMPOSITES**
15.	**CHI 3001**	**FUZZY SETS AND SYSTEMS IN ENGINEERING**
16.	**CRI 3001**	**GEOINFORMATICS FOR INFRASTRUCTURE DEVELOPMENT**
17.	**CGI 2001**	**GEOTECHNICAL ENGINEERING FOR INFRASTRUCTURE PROJECTS**
18.	**CTI 3001**	**FUNDAMENTALS OF RELIABILITY ENGINEERING**
19.	**CEI 3001**	**PHILOSOPHY OF TECHNOLOGY**
20.	**CEI 3002**	**ENVIRONMENTAL MANAGEMENT**
21.	**CEI 3003**	**ENVIRONMENT AND POLLUTION**
22.	**EAI 3001**	**AUTONOMOUS POWER SYSTEMS**
23.	**ECI 3001**	**CONTROL SYSTEMS**
24.	**EGI3001**	**INTRODUCTION TO NAVIGATION, GUIDANCE AND CONTROL**
25.	**EMI 3001**	**BIOMEDICAL ENGINEERING**

26.	**EPI3001**	**RENEWABLE ENERGY SOURCES AND TECHNOLOGY**
27.	**EPI3002**	**ENERGY AUDITING & MANAGEMENT**
28.	**EDI3001**	**SOLAR PHOTOVOLTAIC SYSTEM DESIGN**
29.	**EII 3001**	**ARTIFICIAL NEURAL NETWORKS**
30.	**EII 3002**	**ENGINEERING OPTIMIZATION**
31.	**EII 3003**	**FUZZY SYSTEMS & APPLICATIONS**
32.	**EII 3004**	**ADVANCED NUMERICAL TECHNIQUES FOR ENGINEERING**
33.	**INI3001**	**BIOINFORMATICS**
34.	**INI3002**	**SERVICE ORIENTED ARCHITECTURE**
35.	**INI 3003**	**ADVANCED TECHNIQUES IN OPERATIONS RESEARCH**
36.	**INI 3004**	**SERVICE ORIENTED ARCHITECTURE**
37.	**INI 3005**	**ADVANCES IN E-COMMERCE**
38.	**INI 3006**	**COMPONENT BASED TECHNOLOGY**
39.	**INI 3007**	**INTELLIGENT SYSTEMS**
40.	**MCI 3001**	**ARTIFICIAL INTELLIGENCE IN CIM**
41.	**MCI 3002**	**ADVANCED NUMERICAL TECHNIQUES**
42.	**MCI 3003**	**NANOTECHNOLOGY**
43.	**MCI 3004**	**SURFACE ENGINEERING**
44.	**MI I 3001**	**HEURISTICS FOR OPTIMIZATION**
45.	**MII 3002**	**FINANCIAL MANAGEMENT**
46.	**MII 3003**	**ORGANISATIONAL BEHAVIOUR**
47.	**MII 3004**	**OPERATIONS RESEARCH**
48.	**MII 3005:**	**MANAGEMENT INFORMATION SYSTEMS**
49.	**MDI 3001**:	**APPLIED FINITE ELEMENT METHODS**
50.	**MDI 3002**	**EXPERIMENTAL STRESS ANALYSIS FOR ENGINEERS**
51.	**MPI 3001:**	**COMPUTATIONAL FLUID DYNAMICS**
52.	**MTI 2001:**	**NUMERICAL METHODS**
53.	**MRI 3001**	**ENERGY CONSERVATION IN REFRIGERATION AND AIR- CONDITIONING SYSTEMS**
54.	**MRI 3002**	**ENERGY CONSERVATION IN BUILDINGS**

55. MRI 3003	**ENERGY CONSERVATION IN INDUSTRIAL PROCESSES & EQUIPMENTS**
56. RII 2001	**.NET PROGRAMMING**
57. RII 2002	**JAVA PROGRAMMING**
58. RCI 2001	**OBJECT ORIENTED MODELING AND DESIGN**
59. RCI 2002	**SOFTWARE PROJECT MANAGEMENT**
60. RCI 2003	**BASIC DATA STRUCTURES AND ALGORITHMS**
61. TM1 2001	**FUZZY SYSTEMS AND APPLICATIONS**
62. TAI 2001	**MECHATRONICS**
63. TSI 1001	**ARTIFICIAL NEURAL NETWORKS**
64. TEI 3001	**EMBEDDED SYSTEMS**
65. TEI 3002	**REAL TIME OPEARATING SYSTEM**
66. TEI 3003	**SOFTWARE ENGINEERING**
67. TCI3001	**MULTIMEDIA COMMUNICATION**
68. TCI3002	**FUZZY SYSTEM**
69. TCI3003	**MICROCONTROLLER BASED SYTEM DESIGN**
70. TNI 3001	**NANO ELECTRONICS**

ADI 3001 SUSTAINABLE DEVELOPMENT AND ARCHITECTURE

Structure of the course:

Credits: 3
Lecture: 3 Hours/ week
Internal Continuous Assessment: 40 marks
End Semester Examination: 60 marks

Course Objectives: - Understand the role of Architect/ professionals in construction industry towards deteriorating environmental quality through building design, construction and rapid urbanization. Examine the critical issues underlying the current and future environmental issues.

Learning Outcomes: The student will provide environmentally responsible solutions to problems encountered in construction industry. The course enables student to develop a critical awareness of the existing environmental rating systems and methods.

Module 1

Sustainable Development – Major Environmental problems like Global warming, etc. and its relation to building industry – Space – ship- Earth concept – Green Buildings – sustainability and green Architecture- Relation between Energy Efficiency and Sustainable development- Different Green rating systems – LEED India rating – TERI GRIHA rating- other similar rating systems – Examples of Green buildings – positive and negative aspects of today's green building concept- Critical evaluation of sustainable building needs.

Module 2

Components of Sustainability in buildings – Natural resource conservation; Water Conservation, need, methods, recycling, etc.- Solid waste management- sewage management – Methods and techniques for designing, constructing and maintaining Green buildings – Sustainable building materials – Green roofing – Xeriscape

Module 3

Relation between Climatically responsive buildings and sustainability – Factors influencing human comfort – Energy Efficiency – Energy and Buildings – Concept of embodied energy – Transportation energy concepts – Life cycle energy – Zero energy buildings – Total Energy assessment in buildings – Energy Audit.

References

1. Baker Nick and SteemersKoen, “Energy and Environment in Architecture:, E & FN, Spon, London, 1999.
2. Goulding, John, R, Lewis, Owen J and Steemers, Theo C., “ Energy in Architecture”, Bastford Ltd., London,1986.
3. BansalNaveendra K., Hauser Gerd and MinkeGernot, “Passive Buildings Designs: Handbook of natural Climatic Control”, Elsevier Science, Amsteerdam 1997.
4. Smith R J, Philips, GM Sweeney, “ Environmental Science”, Longman Scientific & Technical, Essex, England, 1982.
5. Watson Donald,” Climatic Design: Energy Efficient Building Principles & Practices”, MC Graw Hill Book Company, New York, 1983.

Structure of the Question Paper

For the End Semester Examination the question paper will have three questions (with sub-divisions) from each module out of which two questions are to be answered.

ADI3002 SUSTAINABLE INFRASTRUCTURE& TECHNOLOGY

Structure of the course:

Credits: 3
Lecture: 3 Hours/ week
Internal Continuous Assessment: 40 marks
End Semester Examination: 60 marks

Course Objectives: - Understand the relationship between resource conservation and impact on environment. Examining the requirement to provide basic infrastructure facilities to urban/rural areas, like water supply, electricity, sewage, rain water collection, solid waste disposal, etc. Understand the critical sustainability issues underlying each of the basic amenities and their impact on the environment.

Learning Outcomes: The student understands the importance of providing sustainable infrastructure facilities while conceiving development projects. Practical application possibilities in providing sustainable infrastructure practices in regional context.

Module I

Water: Global needs, Regional needs, rational for shortage- methods of conservation-water recycling-water cycle-rain water-regional rain data-rain water harvesting, collection- rain water scenario in Kerala-sand mining- Xeriscape-concept of zero discharge building- Waste water; blue, grey and black water-purification techniques- water efficient toilets- recharge of ground water.

Module II

Electricity: Global, national and regional energy scenario- regional electricity needs, production and distribution- different sources of electricity production and its impact; Hydro, thermal, nuclear-possibilities using solar energy- building envelop, design techniques and electricity consumption pattern-technological inputs; LED, energy efficient appliances, energy rating, etc.- energy auditing- ECBC rules-Kyoto protocol- peak oil scenario.

Module III

Solid waste management: Quantity and quality- urbanization and solid waste relation- management techniques and policies- Vilappilshala and similar plants, related issues- NIMBY movement- landfill and related issues- types of solid waste- biodegradable and non- biodegradable- construction waste- concept of zero waste buildings – plastic – recycling of plastic – great pacific garbage patch- use of recycled and recyclable materials.

Sewage management: present methods and techniques globally and in regional context- sewage plants-natural (bio) sewage management techniques.

References

1. Baker Nick and Steemers Koen, “Energy and Environment in Architecture: E & FN, Spon, London, 1999.
2. Goulding, John, R, Lewis, Owen J and Steemers, Theo C., “Energy in Architecture”, Bastford Ltd., London, 1986.
3. BansalNaveendra K., Hauser Gerd and MinkeGernot, “Passive Buildings Designs: Handbook of natural Climatic Control”, Elsevier Science, Amsteerdam 1997.
4. Smith R J, Philips, GM Sweeney, “Environmental Science”, Longman Scientific & Technical, Essex, England, 1982.

Structure of the Question Paper

For the End Semester Examination the question paper will have three questions (with sub-divisions) from each module out of which two questions are to be answered.

ADI3003 EARTHQUAKE RESISTANT DESIGN AND MANAGEMENT

Structure of the course:

Credits: 3
Lecture: 3 Hours/ week
Internal Continuous Assessment: 40 marks
End Semester Examination: 60 marks

Course Objectives: - To look at Earth quake risk for India. To examine the various earthquake mitigation measures adopted and practiced. Architectural detailing of earthquake resistant structures is also looked at.

Learning Outcomes: To create awareness among the students on disaster preparedness and management. The students are equipped to manage the hazardous situations.

Module I

Earthquake risk and hazard; Earthquakes – an over view; the Indian Perspective; Causes of earthquake; Strength of earthquakes-magnitude and intensity; Past experiences on the effect of earthquakes on building and soil; Seismic zonation maps; Earthquake philosophy

Module II

Management, Preparedness and mitigation - Predictability/ forecasting &warning, Community preparedness, retrofitting of existing structures, Population reduction in vulnerable areas, Awareness, Capacity building. Techno legal regime.

Module III

Earthquake resistant provisions at planning stage of buildings; Architectural detailing; Earthquake safe construction of timber structures, masonry structures, framed structures, steel structures; Codal provisions; Reduction of earthquake effects on buildings with case studies. Vernacular housing in seismic zones of India

References

1. Government of India, (2004),Disaster Management in India – A Status Report, Ministry of Home Affairs (Disaster Management Division), New Delhi.
2. Zebrowski, Ernest Jr, (1997), Perils of a Results Planet: Scientific Perspectives on Natural Disasters, CambridgeUniversity Press, Cambridge.
3. Guha-Sapir D., Hargitt, D and Hoyois P. (2004), Thirty Years of Natural Disasters: 1974-2003, The Numbers, UCL Presses, De Lou vai

4. Bhatia, Harshad (2003), “Mumbai in the Wake or Make of a Disaster”, Architecture: Time Space and People, Vol.3, Issue 4, April, Council of Architecture, New Delhi, pp. 26-31.
5. Ministry of Home Affairs (MHA), (2004), National Programme for Capacity Building of Architects in Earthquake Risk Management (NPCBAERM), National Disaster Management Division (Government of India), New Delhi.
6. Hewitt, K (1983), Interpretation of a Calamity, Allen &Unwin Inc., London.
7. Heide, Auf der E (1989), Disaster Response: Principles of Preparation and Coordination,C.V.Mosby, Baltimore.
8. S.K. Duggal, Earthquake Resistant Design of Structures, Oxford Higher Education,

   3rd edition, 2009
9. A K Lal, Handbook of low cost housing.

Structure of the Question Paper

For the End Semester Examination the question paper will have three questions (with sub-divisions) from each module out of which two questions are to be answered.

ADI3004 CLIMATOLOGY AND BUILT ENVIRONMENT

Structure of the course:

Credits: 3
Lecture: 3 Hours/ week
Internal Continuous Assessment: 40 marks
End Semester Examination: 60 marks

Course Objective: - The course takes an overall view of the climate and its factors. Typologies of tropical climates and responses of traditional architecture to these climatic zones are also examined.

Learning Outcomes: The course introduces the students into various factors and parameters of climate. The student develops an understanding of climate responsive design.

Module I

Introduction to Climate : – Weather and Climate – Tilt of earth axis – Solar radiation quantities – Sun path diagram – Earth's thermal balance and atmosphere – Global windpattern – Thermal forces, trade winds, westerly and polar winds.

Elements of Climate: Temperature, humidity, Wind, Precipitation – Measurements of climatic elements – Special characteristics and vegetation of a region – Graphical representation of climatic information – Micro and macro climate – Urban and rural climate – Site climate

Module II

Tropical climate – Classification of Tropical climates and its characteristics – warm-humid, warmhumid island, hot dry desert, hot dry maritime desert, composite or monsoon and tropical upland climates – Climate of Kerala – Kerala rain data

Module III

Built environments shaped by the climate- Traditional solutions - Response by way of planning – Material selection- Techniques and Technology- Introduction to Climate Responsive Architecture.

References

1. O.H.Koenigsberger, T.G. IngerSoll, Alan Mathew, S.V. Szokolay, 'Manual of tropical Housing and Building'.
2. B. Givoni, 'Man, Climate and Architecture'
3. Maxwell Fry and Jane Drew, 'Tropical Architecture'
4. T.A. Markers & E.N. Morris, 'Building Climate and Energy
5. Ken Yeang , "Ecodesign: A Manual for Ecological Design", Wiley

Structure of the Question Paper

For the End Semester Examination the question paper will have three questions (with sub-divisions) from each module out of which two questions are to be answered.

ADI 3005 URBAN DESIGN- THEORIES AND PRINCIPLES

Structure of the course:

Credits: 3
Lecture: 3 Hours/ week
Internal Continuous Assessment: 40 marks
End Semester Examination: 60 marks

Course Objectives: - Problems encountered due to rapid urbanization after industrial revolution is examined. Various theories that sought to solve the urban problems are studied. Current principles and trends in the practice of urban Design are examined.

Learning Outcome: The student will be introduced to how a city is shaped across time and space. The course intends to enable students to appreciate the various factors involved in the shaping, designing and functioning of cities. The course gives glimpses into the world of contemporary principles of Urban Design.

Module I

Brief historical overview- ancient cities – Greece –Rome- medieval cities- Industrial revolution slums- City beautiful Movement- Garden City concept- world wars and aftermath on rise of modern cities- skyscrapers- New York city.

Indian historical developments- principles of city and town planning- Indraprastha and Nine square plan of Jaipur-colonial cities- Chennai- Mumbai-Calcutta.

Module II

Introduction to theories of urban design- Place theory, linkage theory etc,- Post-modern urbanism, Lynch's ideas of good city form, imageability and memory, - public and private domains, suburbs and periphery- Privacy, Territoriality and Proxemic theory, Defensible spaces , ideas of community through design- ideas of smart growth- New Urbanism-landscape Urbanism.

Module III

Principles of Urban Design-Scale-Massing-Context-Contrast-Movement- concepts of Public Realm. Impact of digital revolution- Place making in the digital Age- Reconfiguring Urban space- Sustainable cities program- Studies on Density – Revitalization of brown field sites- Digital media as facilitator for participatory, sustainable urban design.

References

1. Paul.D.Spierigen, 'Architecture of towns and cities'
2. Edmund Bacon," Design of Cities".
3. Spiro Kostof,"Cities shaped".
4. Thomas Telford,"By Design: Urban Design in the Planning System: Towards Better Practice".
5. William J Mitchell, City of Bits: Space, Place and the Infobahn, MIT Press, 1996.
6. Neil Leach, Designing for the digital world, John Wiley and sons, 2002.

Structure of the Question Paper

For the End Semester Examination the question paper will have three questions (with sub-divisions) from each module out of which two questions are to be answered.

BMI 3001 QUALITY AND SAFETY MANAGEMENT 3-0-0-3

MODULE 1 :Introduction to Quality concepts-Managing for quality products and services-Seven QC tools-Philosophy of TQM-Historical outline-Leadership-Customer satisfaction-Employee involvement-Continuous process improvement-Sourcing-Supplier selection and rating-Performance measures-Reliability-Failure mode and effect analysis-Product liability-Total Productive Maintenance-Management tools of analysis-Statistical Process Control-Experimental design-Reactive improvement-Proactive improvement-Quality Engineering-Continuous process improvement-Six- Sigma,Just-in-time,Taguchi,Hoshin and Kaizen concepts-Business process re-engineering-Benchmarking-Quality Management Systems-ISO 9000 series of standards-Environmental Management System-ISO 14000 series of standards-Occupational Health and Safety Management System-BS 8800,OHSAS 18001 and 18002-Good Manufacturing Practice in industry

MODULE 2: Biosafety guidelines and regulations-FAO, WDA and DBT guidelines on biosafety-Containment of equipment and apparatus in biotechnology industry and research-Good Laboratory Practices-Biosafety levels-Containment in BSL-1,BSL-2,BSL-3 and BSL-4 levels-Design requirements and standard microbiological laboratory practices in each level-Design for Good Laboratory practices-Waste disposal-Shipping/Transportation and treatment of biohazardous materials and waste products-Decontamination of industrial and laboratory wastes-agents, selection and methods

MODULE 3: Hazards of genetic engineering-Biosafety for human health and environment-Social and ethical issues related to genetic engineering-Biosafety in relation to transgenic research, r-DNA guidelines and applications-Biosafety and cartagene protocol- Environmental monitoring of GM organisms and crops released into the environment

REFERENCES:

1. Dale H Besterfield “Total Quality Management” Pearson Education
2. B. JanakiRaman& R. K. Gopal “Total QualituyMangement” Prentice Hall of India Pvt. Ltd.
3. J. M. Juran, Frank M Gyna, “ Quality Planning and Anlaysis” Tata McGraw Hill Publishing Co Ltd.
4. F. P Lease “ Loss Prevention in process plants” Butterworth London
5. G. L. Wells “Safety in Process Plants Design” IChem E/ Godwin
6. Murray MooyoungVol 4 “Comprehensive Biotechnology” Pergomon Press
7. D. A. Shapton and R. G. Board “Safety in Microbiology”, Academic Press London

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3002

ENVIRONMENTAL ENGINEERING 3-0-0-3

MODULE 1: Characterization of waste-physical, chemical and biological-wastewater composition.

Treatment of wastewater by chemical and biological methods-Activated sludge process for treatment of wastewater-design of ASP.

MODULE 2: Solid-liquid separation- primary and secondary clarifier

Anaerobic treatment of wastes - kinetics of anaerobic treatment-sludge treatment and disposal.

MODULE 3: Membrane processes for wastewater treatment-solid waste and hazardous waste management-Xenobiotics and its treatment.

REFERENCES:

1. Metcalf Eddy: Waste Water Engineering Treatment and Reuse
2. Karia Christian: Waste water Treatment
3. Foster C. F, John Ware D. A," Environmental Biotechnology", Ellis Horwood Ltd. 1987
4. Karnely D., Chakrabarthy K, Omen G S, "Biotechnology and Biodegradation", Advances in applied Biotechnology Series, Vol. 4, Gulf Publications Co., London 1989
5. Howard S, Peavy, Donald. R. Rowe, George Tchobanoglous, " Environmental Engineering", McGraw – Hill Book Company, New York

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3003

ENERGY ENGINEERING 3-0-0-3

MODULE 1: Energy-units of energy-conservation factors-general classification of energy-world energy resources and energy consumption- Indian energy resources and energy consumption-energy crisis-energy alternatives-electrical energy from conventional energy resources-internal combustion engines-steam turbines-gas turbines-hydro turbines (thermodynamic cycles not included)- nuclear reactors-thermal, hydel and nuclear power plants(process outlines only)-efficiency, merits and demerits of the above power plants-combined cycle power plants-fluidized bed combustion-small hydropower.

MODULE 2: Solar energy-solar thermal systems-flat plate collectors-focusing collectors-solar water heating-solar cooling-solar distillation-solar refrigeration-solar dryers-solar pond-solar thermal power generation-solar photovoltaic systems-solar cells-solar photovoltaic power generation-solar energy application in India-energy plantations- wind energy-types of wind mills-types of wind rotors-darrieus rotor and gravian rotor-wind electric power generation-wind power in India-economics of wind farm-ocean wave energy conversion-ocean thermal energy conversion-tidal energy conversion-geothermal energy conversion.

MODULE 3: Biomass energy resources-thermochemical and biochemical methods of biomass conversion- combustion –gasification –pyrolysis-biogas production-ethanol-fuel cell- alkaline fuel cell-phosphoric acid fuel cell-molten carbonate fuel cell-solid oxide fuel cell-solid polymer electrolyte fuel cell-magneto hydro dynamics-open cycle and closed cycle systems-magneto hydro dynamic power generation-energy storage routes like thermal energy storage,chemical,mechanical storage, electrical storage.

Energy conservation in chemical process plants-energy audit energy saving in heat exchangers, distillation columns, dryers, ovens and furnaces and boilers-steam economy in chemical plants-energy conservation in petroleum, fertilizer and steel industry-cogeneratio,pinch technology-recycling fro energy saving-electrical energy conservation in chemical process plants-environmental aspectsof energyuse.

REFERENCE

1. Goldmberg .J.,Johansson, Reddy A.K.N., and Williams R.H.,Energy for a Sustainable world, John Wiley
2. BansalN.K,Kleeman M. and MelissM.,Renewable energy sources and conversion tech.,Tata McGraw Hill
3. SukhatmeS.P.,SolarEnergy, Tata McGraw.
4. Mittal K.M., non-conventional energy systems,Wheeler pub.
5. VenkataswarluD.,Chemical technology, I,S. Chand.
6. Pandey G.N.,A Text book on energy systems and engineering, Vikas pub
7. Rao. S, &ParulekarB.B,EnergyTechnology,Khanna pub
8. RaiG.D.,Non-conventional energy sources,Khanna pub
9. Nagpal G.R., Power plant Enginerring,Khanna pub

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3004

OPTIMISATION TECHNIQUES FOR ENGINEERS 3-0-0-3

MODULE 1: Decision-making procedure under certainty and under uncertainty-Operations Research-Probability and decision-making-Queuing or Waiting line theory-Simulation and Monte-Carlo Technique-Game theory-Transportation problems-Nature and organization of optimization problems-Scope and hierarchy of optimization-Typical applications of optimization-Essential features of optimization problems-Objective function-Investment costs and operating costs in objective function-Optimizing profitably constraints-Internal and external constraints-Formulation of optimization problems-Nature of functions and their representation-

MODULE 2: Continuous functions-Discrete functions-Unimodal functions-Convex and concave functions-Necessary and sufficient conditions for optimum of unconstrained functions-Numerical methods for unconstrained functions-One-dimensional search-Gradient-free search with fixed step size-Gradient search with acceleration-Newton's method-Quasi-Newton method-Dichotomous search-Fibonacci search-Golden-section method-Quadratic interpolation-Numerical methods for unconstrained multivariable optimization-Univariate search-Simplex method-Powell's method-Method of steepest descent-Fletcher-Reeves conjugate-Gradient method- Newton's method

MODULE 3: Linear Programming-Basic concepts of linear programming-Graphical interpretation-Simplex method-Apparent difficulties in the Simplex method-Two-phase Simplex method-Non-linear programming with constraints-Equality constraints-Method of direct substitution-Lagrange multiplier method-Use of Lagrange multipliers for inequality constraints-Kuhn-Tucker conditions-Numerical methods for multi-variable constraint problems-Complex method of box-Zoutendijk's method-Rosen's gradient projection method-Optimizing of evaporator design-Optimum pipe dia for transportation of fluids- Optimizing recovery of waste heat-Optimization of liquid-liquid extraction processes-Optimum residence time for isothermal batch reactor-Linear programming to optimize reactor operations

REFERENCES**:**

1. Rao. S. S, "Optimisation Theory & Applications", Wiley Eastern
2. Beveridge G S G & Schechter R S, "Optimisation Theory & Practice", McGraw Hill
3. Edgar T F, Himmelblau D. M.," Optimisation of Chemical Processes", McGraw Hill
4. Beightler C S, Phillips D. T and Wild D. J, "Foundations of Optimnisations", Pretis Hall of India

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3006

COMPUTATIONAL FLUID DYNAMICS 3-0-0-3

MODULE 1: Introduction of the governing equations of fluid mechanics- Conservation equations for mass,momentum,energy and chemical species- derivation of the governing equations- turbulence closure and mass transfer models- dimensionless form- simplified equations- introduction to compressible flow- Euler equation- conservative/ non conservative forms- computational fluid dynamics techniques.

MODULE 2: Matrices and linear equations- Gauss elimination methods-Tri Diagonal matrix algorithm, Iterative method-Introduction of finite difference method-discretaisation- linearization of the governing equations-Linear wave equation, Burgers equation, Convection diffusion equation First and second order numerical methods such as upwind,Lax-Frederichs ,Lax- Wendroff, Mac Cormack,etc,.

MODULE 3: Examples and application of fluid flow,heat transfer, Non Newtonian flow- implicit and explicit schemes- Stability and CFL conditions- Two dimensional problem-Finite difference method for the momentum equations, Boundary conditions for the velocity-equations for the pressure,boundary conditions for pressure.Numerical procedure for solving Navier-Stokes equation-Mixed variational form-Galerkin and FE approximations- Algebraic problem- Stability, LBB condition- mass conservation.

Computer programs for solving – Navier-Stokes equations- Practical exposure to differenyt CFD packages for solving Navier- Stokes equation, Euler equation, etc.

REFERENCES:

1. D.A. Anderson, J. C. Tanneheil, R. H. Fletcher, Computational Fluid Mechanics and Heat Transfer, Hemisphere, New York
2. R.Peyret, T. D. Tayler, Computational Methods for Fluid Flows, SpringerVerlag.
3. G. D.Smith, Numerical Solutions of Practical Differential Equations: Finite Difference Methods, Clarendon Press, Oxford
4. S. V. Patankar, Numerical Heat Transfer and Fluid Flow, McGraw Hill, Washington.
5. R.B.Bird, R.C Armstrong, O. Hassagar, Dynamics of polymeric liquids, John Wiley, New York

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3007

ELEMENTS OF FINANCIAL MANAGEMENT 3-0-0-3

MOULE 1: Overview of financial management-Objective of financial management-Financial decisions-Capital Budgeting decision-Financing decision-Dividend decision-Current asset management-Time value of money-Preference rate, compound value, Present value-Basic valuation models-Concept of value-Valuation of bonds,debentures,common shares and preference shares-Yield-Required vs. expected rates of return-Techniques of capital budgeting-Project generation,evaluation,selection and execution-Measurement of cash flows-Capital budgeting appraisal methods-Ranking of mutually exclusive projects-Multiple rates of return-Capital rationing-Risk analysis in capital budgeting-Statistical techniques to handle risk-Probability assignments-Standard deviation-Coefficient of variation-Probability distribution approaches-Decision tree-Utility theory-Cost of capital-

MODULE 2: Future cost and historical cost-Specific cost and combined cost-Average cost and marginal cost-Explicit and implicit cost-Use of cost of capital in capital budgeting decisions-Financial Leverage-EBIT-EPS analysis-Graphic presentation-Degree of financial leverage-Measures of financial leverage-Capital structure theories-Traditional view-Modigliani-Miller hypothesis-Its criticism-MM hypothesis and corporate taxes-Behaviour of K_d,Koand V-Capital structure planning-Determinants of capital structure-Dividend theories-Walter's model, Gordon's model- Diversification –Uncertainty-Informational content of dividends-Dividend policy in practice-Significance and danger of stability of dividends-stock dividend-Stock splits-Working capital management-Determinants of working capital-Profit margin and profit appropriation-Dimensions of working capital management-Risk-return tangle-Financing current assets-Management of cash and marketable securities-Determining the optimum cash balance-Investment in marketable securities-

MODULE 3: Management of receivables-Optimum credit policy-Benefits and costs of credit extension-Costs-benefits trade-off-Aspects of credit policy-Credit limit-Collection procedures-Inventory management techniques-Economic order quantity-Re-order point-Selective inventory control-Computation of safety stocks-Statements of financial information-Financial statements-Balance sheet-Income statement-Standards of financial reporting-accounting principles and concepts-Statements of changes in financial position-Forms of the statement -Preparing the statement-Sources and uses of cash-Incorporating all financial resources-Financial analysis-Ratio analysis-Types of ratios-Limitations of ratio analysis-Budgeting-Purposes-Essentials of

budgeting-Adaptation of accounting system-Budget administration-Types of budgets-Operating budgets, Financial budgets, Capital budgets-Preparation of budgets-Budgetary control-Advantages of budgeting-Problems and dangers of budgeting-Cost-Volume-Profit analysis-Determination of break-even point-Assumptions underlying CVP analysis-Operating leverage-Analysis of changing factors-P/V graphs-CVP analysis and P/V graphs for multi-product firms-Uses of CVP analysis-Limitations of CVP analysis

REFERENCES:

1. I.M Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd
2. Brighman, "Fundamentals of Financing Management", 9th Edition, Thomson Learning Books
3. S. K. Banerjee, "Financial Management", S Chand & Co.

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

BMI 3008

ENTREPRENEURSHIP 3-0-0-3

MODULE 1

Entrepreneurial Competence: Entrepreneurship concept-Entrepreneurship as a career - Entrepreneur-Personality characteristics of successful entrepreneur-types of entrepreneurs-entrepreneurs Vs managers-knowledge skills required for as entrepreneur-successful entrepreneurs in India - Technocrats -women entrepreneurs.

Entrepreneurial Environment: Business environment - Role of Family & society - external and internal factors - entrepreneurship development & training-entrepreneurship training institutes and their role in entrepreneurial development - Central State govt. industrial policies and regulators.

MODULE 2

Business Plan Preparation: Sources of product for business - Feasibility study - capital budgeting - Project profile preparation - Project Feasibility Report and Project Report reparation - evaluation criteria. Launching And Development Of Small Business- Finance and Human Resource mobilization - Capital Market in India - operation planning - Market and channel selection - growth strategies - Product Launching - international marketing

MODULE 3

Value Engineering Techniques: value added products - Value adding techniques - cost reduction techniques - waste control - Alternate Product Applications, functional value of the product improvement expansion.Legal Aspects in Small Business Factories Act - Workmen Compensation Act - Company Law - Industrial Disputes Act - Sales Taxes Excise Laws.

Role of agencies in development of industries & rehabilitation of units:Role of Banks in Financing industries - SIDBI - IDBI-DIC-TIIC-SIDCO-TIDCO-SISI-NSIC- Banks, Licensing procedure-Industrial subsides-sickness-causes of sickness-prevention of sickness in small industries-Govt. role

References:

1.Hisrich, "Entrepreneurship", Tata McGraw Hill, 2002.
2.Dr.JayashreeSuresh,"Entrepreneurial Development", Margham Publications, 2003.
3.Khanka S. S., "Entrepreneurial development", 1999
4 Nelsonn R. E and Nech R.A, "The practice of Entrepreneurship" ILC Publishers, Genevel, 1982.
5 Dirk Larkin R., "Profit Improvement Technology", College Book Publishing Company, Canada, 1981
6 Sukumaar A. Bhattachary, "Indian Direct Taxes" Warcha and Company, 1983

7 Srivasthava K. D, "Commentaries of workmen compensation Act and ESI Act", 1998
8 Srivasthava K. D., "Factories Act", 1948

Question Paper

The end semester question paper totaling 60 marks shall have three questions of 10 marks each, from each of the three modules - out of which any two need to be answered. It shall have questions on problems/theory (50%) and applications (50%).

For continuous evaluation, a minimum of four assignments and two tests should be considered.

CSI 3001 **Finite Element Analysis**

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives

- To provide an understanding of fundamental knowledge and technique of FEM
- To develop tools to analyse engineering problems using FEM and typical commercial FEA package.

Learning Outcomes

- Will be able to analyse and build FEA model for various engineering problems.
- Can be extended to the dynamic analysis of structures

Module I

Basics of elasticity- Equations of equilibrium- Strain-displacement relation- stress-strain (constitutive) relation- Energy principles- Principle of virtual work- Principle of stationary potential energy- Variational formulation- Rayleigh-Ritz method- Introduction to weighted residual methods- Evolution of FEM- Review of direct stiffness method- Outline of the FE procedure.

Module II

Element properties- Displacement functions- convergence requirements- equilibrium and compatibility in the solution- Development of equilibrium equation- Types of finite elements- Development of shape functions for truss, beam and frame elements- CST, LST- Lagrange and Serendipity elements- Plane stress and plane strain problems- Gauss quadrature technique- Development of stiffness matrix for truss and beam elements.

Module III

Development of consistent nodal load vector- patch test- static condensation- Concept of isoparametric formulation- Line element- Plane bilinear element- Subparametric and superparametric elements- Assembly procedure and storage techniques of stiffness matrix, Application of boundary conditions- Solution techniques of equilibrium equation- Introduction to plate and shell elements- Types of 3D elements- Discussion of finite element packages.

References

1. Cook R D et al., Concepts and Applications of Finite Element Analysis, John Wiley & Sons, Singapore.
2. Krishnamoorthy C S, Finite Element Analysis- Theory and Programming, Tata McGraw Hill, New Delhi.
3. Bathe K J, Finite Element Procedures in Engineering Analysis, Prentice Hall, New Delhi.
4. Zienkiewicz O C and Taylor R W., Finite Element Method, Elsevier Butterworth-Heinemann, UK.
5. Rajasekharan S, Finite Element Analysis in Engineering Design, Wheeler, New Delhi.
6. Chandrupatla T R and Belegundu A D, Introduction to Finite Elements in Engineering, Pearson Education, New Delhi.
7. Hutton D V, Fundamentals of Finite Element Analysis, Tata McGraw Hill Education Private Ltd. New Delhi.
8. Mukhopadhyay M and Abdul Hamid Sheikh, Matrix and Finite Element Analyses of Structures, Ane Books Pvt. Ltd., New Delhi.

Structure of the question paper

For the end semester examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students.

CSI 3002 **Mechanics of Composites**

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives:

Composite materials are finding immense application in the field of aerospace, automobile and Civil engineering presently due to its outstanding material capability. It is required for the present structural engineers to know the fundamentals of composite material for designing composite structures in various fields.

Learning Outcomes:

- An ability to identify the properties of fiber and matrix materials used in commercial composites, as well as some common manufacturing techniques.
- A basic understanding of linear elasticity with emphasis on the difference between isotropic and anisotropic material behavior.
- An ability to predict the failure strength of a laminated composite plate.
- An ability to use the ideas developed in the analysis of composites towards using composites in aerospace design.

Module I

Introduction. Composite Fundamentals: Definition of composites, Objectives, constituents and Classification of composites based on size (macro, micro, nano);structure (multilayered and multiphase); fibre architecture- linear, 2D, 3D, nd , matrix material (PMC,MMC,CMC, CC). General Characteristics of reinforcement- classification, terminology used in fibre science, General fibres- Glass, carbon, aramid, polyethylene, boron. Polymer matrix composites- Thermoplastics and thermosetting resins; mechanical properties, glass transition. Carbon fibre/epoxy, carbon fibre/PEEK, glass fibre/polyester, phenolic, epoxy, polyimide,

cyanate ester composites. Concept of A stage, B stage and C stage. Structural applications of Composite Materials, Manufacturing Processes.

Module II

Macro mechanical behaviour of composite lamina - Review of Basic Equations of Mechanics and Materials and Linear Elasticity in 3D and 2-D plane stress and plane strain - Number of elastic constants and reduction from 81 to 2 for different materials. Stress-Strain Relations for a unidirectional and orthotropic lamina. Effective Moduli of a continuous fibre-reinforced lamina - Models based on mechanics of materials, theory of elasticity. Failure of Continuous Fibre-reinforced orthotropic Lamina. Maximum stress/strain criteria, Tsai-Hill and Tsai-Wu criterion. Hygrothermal effects on material properties on response of composites. Micro Mechanical Behaviour of a Composite Lamina - Introduction, Mechanics of Materials approach to Stiffness, Comparison of approaches to stiffness

Module III

Macro mechanical behaviour of a laminate- Classical Lamination Theory, stress-strain variation, In-plane forces, bending and twisting moments, special cases of laminate stiffness. Laminate strength analysis procedure, Failure envelopes, Progressive failure Analysis. Free-Edge Interlaminar Effects , Analysis of free edge interlaminar stresses, Effects of stacking sequence, Design guidelines.

References

1. Jones M. Roberts, Mechanics of Composite Materials, Taylor and Francis,1998
2. Reddy, J.N , Mechanics of Laminated Composite Plates: Theory and Analysis,CRC Press, 2006
3. Calcote, L. R., Analysis of Laminated Composite structures, Van Nostrand, 1969
4. Vinson, J. R. and Chou P, C., Composite materials and their use in Structures, Applied Science Publishers, Ltd. London, 1975
5. Agarwal, B.D. and Broutman, L. J., Analysis and performance of Fibre composites. 3rd Edn., Wiley, 1990

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students.

CHI 3001 Fuzzy Sets And Systems In Engineering

Structure of the Course

Lecture : 3hrs/week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives

- To make the students familiar with the concepts of fuzzy sets.
- To familiarize the students with fuzzy relations and membership functions.
- To study the applications of fuzzy sets in the field of water resources engineering.

Learning Outcomes

- The students will be able to understand the principals of fuzzy systems.
- They will be able to design fuzzy systems using various approaches.
- Students will learn the applications of fuzzy systems in water resources

Module I

Fuzzy systems- concept of fuzzy set- fuzziness and randomness, types of uncertainty linguistic variables and Inference rules – Definition of fuzzy set, membership functions, basic concepts, extension principle - Operation on fuzzy sets, complement, union, intersection, combinations, Aggregation – Fuzzy numbers

Module II

Fuzzy relations – max min and max product composition-binary relations on a single set, transitive closure – Fuzzy relation equations, solution- fuzzy relation in n dimensions, projections, cylindric extension -Construction of membership functions, Direct and Indirect methods- single and multiple experts

Module III

Fuzzy logic control systems – structure and operation, fuzzification and defuzzification methods – applications. Fuzzy decision making – fuzzy linear and dynamic programming – applications. Fuzzy measures- Belief and Possibility measures, probability measures, possibility and necessity measures.

References

1. George J Klir, Tina A Folger, Fuzzy Sets, Uncertainity and Information, Prentice Hall Publishers, New Jersey, 1988.
2. George J Klir, B Yuan, Fuzzy sets and Fuzzy Logic, Prentice Hall Publishers, New Jersey, 1995
3. Timothy J Ross, Fuzzy Logic with Engineering Applications, McGraw Hill, New York, 1995

Structure of the Question Paper

For the End Semester Exam, there will be three questions from each module out of which two questions are to be answered by the students.

CRI 3001 Geoinformatics for Infrastructure Development

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3

Internal Continuous Assessment: 40 Marks

End Semester Examination : 60 Marks

Course Objective

- Expose the students with concept of GIS and remote sensing
- To provide exposure to the applications of GIS and Remote sensing for infrastructure development

Learning outcome

- The ability to understand various satellite images and GIS Techniques and its application in infrastructure development

Module I

Remote Sensing: Energy sources and radiation principles-Interaction of EM energy with atmosphere and surface features, spectral reflectance patterns, Classification of Remote sensing systems. Data acquisition and interpretation – Multistage remote sensing concept-multispectral, thermal and microwave remote sensing. Image Interpretation : Elements of visual image interpretation – Image interpretation keys – Image interpretation equipment - Introduction to Digital Image processing.

Module II

Introduction to GIS: Geographical concepts and terminology, Components of GIS, Various GIS packages and their salient features, Applications of GIS.Spatial and non-spatial data, Vector and raster data, Coordinate Systems: Geographic coordinate systems-approximations of earth, ellipsoid and geoid models, Datum-geodetic and vertical, coordinate transformation, Map projections-concepts and properties, Data input and editing: Methods of data input, Spatial data editing. Vector data analysis-buffering, overlay, slivers, Raster data analysis- categories, Data visualization: cartographic symbolization, types of maps, map design, map production

Module III

Applications: Land use/ Land cover mapping, Network Analysis-Pipeline, sewer line, power line, road network, telecommunication DEM/DTM, water conveyance system, Suitable site for-land filling, water treatment plant, power grid, recreations, public buildings such as scools, colleges, hospitals, post offices etc, residential area.

References:

1. Lillesand T.M. and Kiefer R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, 1979
2. Sabins F.F (Jr.), Remote Sensing : Principals and Interpretation, Freeman & Co., San Francisco, 1978
3. Colwel R.N. (Ed.), Manual of Remote Sensing, Vol. I & II, American Society of Photogrammetry and Remote Sensing, Falls Church, Va. (1983)
4. Moffit, Francis, Photogrammetry, 2nd Edn, International Textbook Co. Scranton, 1967
5. Paul, R.Wolf, Elements of Photogrammetry, McGraw-Hill Book Co., New York 1974
6. Keith P.B., Thompson et. Al. (Ed.), Remote Sensing and Water Resources Management, American Water Resources Association, Urbana Illinois, 1973.
7. Schowengerdt, R. A.,Remote sensing, Models and Methods for image processing, Academic Press (2009)
8. Joseph, G., Fundamentals of Remote Sensing, Universities Press (2003)
9. Kennie, T.J.M. and Matthews, M.C., Remote Sensing in Civil Engineering, Surrey University Press (1985)
10. Burrough P.P. & McDonnel, R.A. (1998) Principles of GIS, Oxford University Press
11. Chang, K (2008), Introduction to Geographic Information Systems, Tata McGraw-Hill
12. Panigrahi,N (2008), Geographical Information Science, University Press
13. Davis, B. E. (2001), GIS: A visual approach, Onword Press
14. Lo, C.P. and Albert Yeung , Concepts and Techniques of GIS , Prentice Hall, 2nd Ed. 2006
15. M Anji Reddy(2001), Remote Sensing and Geographic Information Systems, B S Publications, Hyderabad

Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.

CGI 2001 Geotechnical Engineering for Infrastructure Projects

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives

• General awareness of the versatile foundation requirements of infrastructure projects.
• Detailed knowledge of the requisite data for arriving at foundation choices
• Selection of right foundation for the structure.

Learning Outcomes

• Ability to choose the right foundation.
• Ability to design foundations for few typical situations.
• Understand the foundation demands (forces) of various structures.

Module I

Foundations for infrastructure facilities – requirements, types, suitability, selection. Investigation for infrastructure projects: methods, data required, investigation planning, selection of investigation types, obtaining and analysis of field data with special reference to IS code provisions. Foundations for building infrastructure: Choice between shallow and deep foundations (Piles, wells, large diameter drilled shafts), Types of shallow and deep foundations, selection.

Module II

Design of deep and shallow foundations for typical cases. Foundations on rocks. Shallow foundations on rock, rock socketed piles, IS code provisions. Equipment for deep foundation construction. Foundations for power infrastructure: Dams, penstock supports, transmission line towers. Foundations for transport infrastructure: embankments supporting transport structures, application of soil reinforcement in embankments and retaining walls.

Module III

Applications of sheet piles, excavation. Foundations for marine structures: Forces acting on piles supporting berthing structures and jetties, pile installation for marine structures. Field tests on foundations: Vertical, lateral, cyclic, CRP, and pullout test for piles, plate load test, and analysis of field test data. Pile integrity testing. Investigating geotechnical failures, concepts of forensic geotechnical engineering.

References

1. Tomlinson, M. and Wodward, J. (2008). "Pile Design and Construction Practice", Taylor and Francis, NY.
2. Swamy Saran. (2006). "Analysis and Design of Substructures". Oxford and IBH, New Delhi.
3. Das, B.M. (2010). "Principles of Foundation Engineering". Cengage Learning, Stanford, USA.

Structure of the Question paper

For the End Semester Examination there will be three questions from each module out of which two questions from each module are to be answered by the students.

CTI 3001 Fundamentals of Reliability Engineering

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Understanding the concept of reliability in engineering
- Understanding the principles of engineering design
- Understanding reliable designs

Learning Outcomes

- Awareness of underlying principles of reliability
- Applying reliability principles to engineering design
- Conducting case studies on reliable design

Module I

Reliability Engineering: basic principles, elements of probability theory, elements of statistical theory, general stochastic processes, statistical failure models, system reliability, reliability improvement, maintainability and availability, fault tree analysis, failure mode effect analysis, reliability physics models.

Module II

Engineering Design: Introduction to engineering design, design morphology, production process & material selection ; Concept of load, strength optimisation and safety ; Product life cycle, design and development, risk reliability, product liability; Failure analysis techniques, Case histories of failures; Quality Control.

Module III

Reliable design: Design for maintenance; Ergonomics in design, probabilistic concept in design. Cost evaluation and economic decision making; Case studies: reliability design process in civil engineering systems.

Reference

1. Kapur & Lamberson: Reliability in Engineering Design, Wiley
2. Lewis, E., Introduction to Reliability Engineering, Wiley
3. Shooman, Probabilistic Reliability: An Engineering Approach, McGraw-Hill

Structure of the Question paper

For the end Semester Examination there will be three questions from each module out of which two questions are to be answered by the students.

CEI 3001 Philosophy of Technology

Structure of the Course

Lecture : 3hrs/week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course objectives

- To give a broader perspective about the evolution of technology and role of technology in human life.

Learning outcomes

- Students are able to perform the duties of teacher with broader perspective of ecological and cultural background.

Module I

Scope of Technology- Scope and subdivisions of philosophy- scope and historical development of philosophy of science and technology- Ethics and interpersonal relationship in engineering – IQ- Vs EQ – Ergonomics. Thoughts on technology: Martin Heidegger, Karl Marx and Mahatma Gandhi.

Module II

Brief study of the evolving world views based on Issac Newton, Albert Einstein, Werner Heisenberg and Stephen W Hawking – Cybernetics and systems science- Analytic Vs Systemic approach- Theory of chaos and complexity.Philosophy of Quantum mechanics.

Module III

Philosophy of Architecture, Information Technology and Biotechnology – Gaia hypothesis – Philosophy of Ecology and Environment – Concept of Sustainable development – Cost benefit analysis Vs Environmental Impact Assessment. Technology revolutions and social changes. Social impact of Nano Technology.

References

1. Friedrich Paulson , Introduction to Philosophy , Anmol Publications, 1999.
2. Ilya Prigogire and Isabella Tengers, Order out of chaos, Bantom books, 1984.
3. John G MoGuine and Howard Barlow, An Introduction to Engineering Profession , Addition Wesley, 1951.
4. John Morgan, The end of science, Helix Books, 1996.
5. Jonathen Powers, Philosophy and New Physics, Methuen, 1982.
6. Green,L, Tecnoculture, Atten & Unwin, 2007.
7. Nataraja , G, Science and Human Values- in Wisdom, D K Print world, 1995.
8. Oroon K, Science , Society and Philosophy, Ajantha Publishers, 1985.
9. Philip L Alger et .al, Ehical Problems in Engineering, John Wiley and Sons, 1965.
10. Pradeep T , Nano:, The Essentials, Tata Mc Graw Hill
11. Stephen W Hawking, A brief history of Time, Bantam Books, 1998.
12. Heisenberg,W, Physics and philosophy, 1957.

Structure of the Question paper

For the End Semester Exam, there will be three questions from each module out of which two questions are to be answered by the students.

CEI 3002 Environmental Management

Structure of the course

Lecture: 3 hrs/week Credits: 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objective

- To create an attitude towards conserving our environment irrespective of the student's field of study or work
- To induce sense of responsibility towards good environmental management and practice good environmental ethics
- To identify the impact on environment as a whole due to a product manufacture or a major policy decision

Learning outcomes

- Understand various environmental issues and its causes
- Identify different environmental management tools and apply depending on the need of the hour
- Familiarising with ISO14001

Module I

Importance of environmental management , Impact of Man on environment ,Interdisciplinary nature of environmental education, Role of media in environmental education, Major environmental issues - Acid rain ,Global warming, Greenhouse effects, Ozone layer depletion, Environmental Ethics, Policy and legal aspects –Environmental laws and legislation in India.

Module II

Natural resources of environment – Renewable resources, Non renewable resources, Environment and Biotechnology, Ecomapping, Industrial Symbiosis Sustainable development – definition, Economic dimensions – Environmental dimension – Framework for achieving sustainability, assessment of sustainable performance.

Module III

Tools of environmental management – EIA - Purpose of EIA, Steps in EIA , Different methods of conducting EIA (brief introduction only) Life cycle assessment-Steps in LCA, Scope of LCA,

Code of good conduct of LCA Environmental auditing,-Objectives and scope, Types of environmental audit, Basic Structure of EA, EA steps ,Elements of EA Environmental Management system specification standard ISO 14001, Steps in establishing an EMS.

References

1.Vijay Kulkarni ,T V Ramachandra ,Environmental Management, Commonwealth of Learning , Canada, Capitol Publishing Company, New Delhi, Edition 2008.

2. Edward S Rubin, Engineering and Environment, MC Graw Hill International Edition 2001.

3. Canter, L.W., "Environmental Impact Assessment, McGraw Hill, New York, Edition 2002.

4. Suresh K Dhameja, Environmental Engineering and management, S. K. Kataria & Sons, 2009.

Structure of the Question paper

For the end Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

CEI 3003 Environment and Pollution

Structure of the Course

Lecture : 3hrs/week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives

- To impart knowledge why environmental problems arise and why they should be tackled
- To make the students aware about the importance of protection of environment
- Generates curiosity, creativity, competence and compassion in students

Learning Outcomes

- To develop a deeper concern for the environment and a sense of commitment and responsibility to take proactive actions
- To develop necessary skills and attitudes and motivate them to work together and individually for a better man-nature relationship
- To create a society of motivated citizens to strive towards a life in perfect harmony with nature

Module I

Environment-Scope and Definition-Interdisciplinary Nature of environment-Man and Environment-Components of Envionment- Ecology-Ecosystem-Types- Food chain- Food web-Energy flow-Ecological pyramids-Material Cycling- Hydrologic cycle, Carbon cycle, Nitrogen cycle, Introduction to environmental laws and Policies (in India)

Module II

Natural resources of environment- Water, land and energy- Environmental Ethics- Social, economical and environmental dimensions of sustainable development. Water pollution-Characteristics- Sources- Effects- Air pollution- Sources- Types- Effects- Solid waste Management-Landfill-Incineration-Composting

Module III

Population explosion- Effects- Global and Indian scenario- Key features of National population policy. Global environmental issues- Green House Effect, Global warming, Ozone layer depletion, Acid rain, Deforestation. Introduction to the applications of Remote sensing and GIS in environmental engineering

References

1. Kurian Joseph & R.Nagendran, Essentials of Environmental Studies, Pearson Education (Singapore) pte.Ltd, New Delhi, 2004.
2. B.C.Bhartia, Environmental Pollution and Control in Chemical Process Industries, Khanna Publishers, Delhi, 2001.
3. P.Aarne Vesiland, Introduction to Environmental Engineering, PWS publishing company Boston, 1997.
4. Suresh K Dhameja, Environmental Engineering and Management, S.K.Kataria & Sons, Delhi, 2010.
5. M.Anji Reddy, Remote Sensing and Geographical Information System, B.S.Publications, Hyderabad, 2008.
6. S.T Misra & S.N Pandey, Essential environmental studies, ANNE Books INDIA Publications New Delhi, 2008.
7. Paul L Bishop, Pollution Prevention: Fundamentals and Practice, McGraw – Hill International, Boston,2000.

Structure of the Question paper

For the End Semester Exam, there will be three questions from each module out of which two questions are to be answered by the students.

EAI3001 AUTONOMOUS POWER SYSTEMS 3-0-0-3

Structure of the course

Lecture : 3Hrs /Week Credits: 3
Internal Assessment : 40 Marks.
End semester Examination : 60 Marks.

Course Objective: *Objectives of the course is to introduce autonomous power systems to students*

Module -1

Classification of EES systems -Roles of electrical energy storage (EES) system – Emerging needs for EES - Types and features of energy storage systems Mechanical storage systems - Pumped hydro storage (PHS) - Compressed air energy storage (CAES) - Flywheel energy storage (FES) - Electrochemical storage systems: Secondary batteries - Flow batteries - Chemical energy storage: Hydrogen (H2) - Synthetic natural gas (SNG) - Electrical storage systems: Double-layer capacitors (DLC) -Superconducting magnetic energy storage (SMES)- Thermal storage systems - Standards for EES - Technical comparison of EES technologies

Module -2

Captive Power Plants: Selection Considerations - Diesel Generator Captive Power Plants – Comparison of different types of captive power plants - Selection and Installation Factors - Sizing of a Genset: High Speed Engine or Slow/Medium Speed Engine, Capacity Combinations, Air Cooling Vs. Water Cooling, get over-heated during summer months - Safety Features - Parallel Operation with Grid- Maximum Single Load on DG Set - Unbalanced Load Effects - Neutral Earthing - Site Condition Effects on Performance Derating - Operational Factors - Load Pattern & DG Set Capacity - Sequencing of Loads - Load Pattern - Load Characteristics - Power Factor - Unbalanced Load Transient Loading

Module -3

SMPS- Characteristics – Steady state Analysis - Control methods:-Design of feedback compression

UPS: Necessity - types - typical layouts of UPS. Stand alone high quality Electronics Power Supplies

Combined Cycle Power Plant: Introduction - Typical cycles - Gas Turbine - G as Turbine
HRSG Systems - Steam Turbine -Combined Cycle Plants -Availability and reliability

References:

1. Bueuru of Energy Efficiency, Study material for Energy manager programme, 2012
2. Irving M.Gottilieb “Power supplies, Switching Regulators, Inverters and Converters” BPB Publications – 1985
3. RK Chetty “Switched Power Supply Design” BPB Publication- 1987
4. Current Literature

Structure of the question paper

The question paper contains three questions from each module out of which two questions are to be

ECI3001

CONTROL SYSTEMS **3-0-0-3**

Structure of the course

Lecture : 3 hrs/week Credits: 3

Internal Assessment : 40 Marks

End semester Examination : 60 Marks

Course objectives

1. To provide a strong foundation on classical and modern control theory.
2. To provide an insight into the role of controllers in a system.
3. To design controllers in the state space domain.
4. To study the essentials of Non-linear control.
5. To extend the analysis techniques for classical control theory to nonlinear system.
6. To analyse the physical system with inherent non-linearity for stability and performance.

Learning Outcomes

Upon successful completion of this course, students will be able to:-

1. Analyse a given system and assess its performance.
2. Realise a linear system in state space domain and evaluate controllability and observability.
3. Use tools including graphical and analytical for analysis of nonlinear control systems.
4. Use a complete treatment of design concepts for linearization via feedback.

Module I

Open loop-and closed loop control systems:-Introduction to state space -TF and state space model of simple - Mechanical and Electromechanical systems – Force voltage and force current analogy - block diagram representation – block diagram reduction - signal flow graph - Mason's gain formula - characteristics equation. State equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonical forms of state representation-solution of time invariant autonomous systems- state transition matrix- relationship between state

equations and transfer function. Properties of state transition matrix- controllability & observability. State feedback design via pole placement technique.

Module II

Time domain analysis of control systems: Transient and steady state responses - test signals - time domain specifications - first and second order systems - impulse and step responses - steady state error analysis – static error coefficient of type 0,1,2 systems - Concept of stability: stability of feedback system - Routh's stability criterion - Root locus-General rules for constructing Root loci - effect of addition of poles and zeros. Frequency domain analysis: Introduction - Bode plot-Polar plot-Log magnitude vs. phase plot, Nichols chart. Frequency domain specifications: - Nyquist stability criterion- gain margin - phase margin - stability analysis using Bode plot.

Module III

Nonlinear systems: Introduction- characteristics of nonlinear systems. Types of non-linearities. Describing function analysis - Determination of describing function of static nonlinearities (saturation and ideal relay only)- application of describing function for stability analysis of autonomous system with single nonlinearity. Phase Plane Analysis: Concepts-Singular points-focus-centre node and saddle points-Limit cycle. Lyapunov Stability- definition of stability-asymptotic stability and instability - Liapunov methods to linear and nonlinear systems.

References

1. Katsuhiko Ogata, '*Modern Control Engineering*', fourth edition, Pearson Education, NewDelhi, 2002.
2. Nagarath I. J., Gopal M., '*Control System Engineering*', Wiley Eastern, New Delhi.
3. Gopal M, '*Modern Control System Theory*', Wiley Eastern Ltd., New Delhi.
4. Kuo B. C., '*Analysis and Synthesis of Sampled Data Systems*', Prentice Hall Publications.
5. Richard C. Dorf, Robert. H. Bishop, '*Modern Control Systems*', Pearson Education, New Delhi 11th Edition, 2007.
6. Norman S. Nise, *Control Systems Engineering*, 5th Edition, Wiley Eastern, 2007.
7. Hassan K. Khalil, '*Non linear systems*', McMillan Publishing Company, NJ, 2004.
8. Jean-Jacques E. Slotine and Weiping Li, '*Applied Nonlinear Control*', Prentice-Hall, NJ, 1991.

9. M. Vidyasagar, '*Nonlinear Systems Analysis*', Prentice-Hall, India, 1991.
10. Gene K. Franklin & J David Powell, '*Feedback Control of Dynamic Systems*', Addison-Wesley, 3rd Edition
11. Friedland B., '*Control System Design: An Introduction to State Space Methods*', McGraw Hill, NY 1986.

Structure of the question paper

For the end semester examination, the question paper consists of at least 60% problems and derivations. The question paper contains three questions from each module (excluding the review part) out of which two questions are to be answered by the student.

EGI3001 INTRODUCTION TO NAVIGATION, GUIDANCE AND CONTROL

3-0-0-3

Structure of the Course

Lecture : 3 hrs/week Credits : 3

Internal Continuous Assessment : 40 marks

End Semester Examination : 60 marks

Course Objective

To impart basic ideas of navigation, guidance and control of aerospace vehicles.

Learning Outcomes

Upon successful completion of this course, students will have fundamental understanding of the processes of navigation, guidance and control of aerospace vehicles

.

Module I

Introduction to the concepts of navigation guidance and control. General principles of early conventional navigation systems. Geometric concepts of navigation. Reference frames. Direction cosine matrix, Euler angles, Quaternion representation in co-ordinate transformation. Comparison of transformation methods, GPS and GNSS.

Module II

Inertial navigation- block diagram- inertial sensors-Gyros - Principle of operation-Accelerometer- principle of operation-Inertial platforms-stabilised platforms-gimballed and strap down INS.

Module III

Stabilization and Control of space crafts, Missile control systems and Autopilots, Launch vehicle flight control systems. Longitudinal and lateral autopilots for aircraft. Radar systems-Command and Homing guidance systems

References

1. Anthony Lawrence, '*Modern Inertial Technology second Edition',* Springer-Verlag, New York, Inc., 1998.
2. George M. Siouris, *'Aerospace Avionics Systems - A Modern Synthesis'*, Academic Press, Inc.
3. Ching-Fang-Lin, *'Modern Navigation, Guidance, and Control Processing'*, Prentice-Hall Inc., Engle Wood Cliffs, New Jersey, 1991
4. Manuel Fernadez and George R. Macomber, Engle Wood Cliffs *'Inertial Guidance Engineering'*, Prentice-Hall, Inc., , New Jersey, 1962
5. Blakelock, '*Automatic Control of Aircraft and Missiles',* J. H. Wiley, 1990.

Structure of the Question paper

For the end semester examination, the question paper contains three questions from each module out of which two questions are to be answered by the student.

EMI 3001 BIOMEDICAL ENGINEERING 3-0-0-3

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal continuous assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objectives

1. To give an introduction to Biomedical Engineering.
2. To introduce the students with modern instruments used for various diagnostic and therapeutic applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to provide sufficient theoretical back ground for operation and maintenance of modern biomedical equipments used in clinical practice.

Module I

Introduction to biomedical engineering, Various branches of biomedical engineering , transducers and electrodes used in biomedical engineering, Biomechanics and Biomaterials- Mechanical properties of bone and soft tissues, Visco-elasticity analysis of forces in skeletal joints, Biocompatibility, Characteristics of an ideal biomaterial, Metals , Polymers and Ceramics.

Module II

Measurement of electrical activities, ECG, EEG, EMG etc. and their interpretation, Measurement of Blood Pressure, Direct and indirect methods, Measurement of blood flow. Electromagnetic and Laser Doppler blood flow meters

Module III

Therapeutic Equipments, Cardiac pacemakers, Defibrillators, haemodialysis machines and diathermy machines. Instrumentation for clinical laboratory, Measurement of PH value of blood.

ESR measurements. Oxygen and carbon dioxide concentration in blood. GSR measurements, X-ray and radio isotopic instrumentation, diagnostic X-ray, CAT, Medical uses of isotopes, Ultra sonography and MRI, Development of artificial internal organs:- Artificial kidney machines- artificial pancreas- Liver assisted devices, heart- lung machines.

References

1. R. S. Khandpur, '*Handbook of Biomedical Instrumentation'*, TMH publishing company Ltd., New Delhi.
2. Leslie Cromwell, '*Biomedical Instrumentation and measurements'*, PHI Pvt., Ltd., New Delhi.
3. Joseph J. Carr, *'Introduction to Biomedical Equipment Technology'*- Pearson Education Pvt. Ltd.

Prerequisite: Basic knowledge in electronic instrumentation.

Structure of the question paper

For the end semester examination, the question paper contains three questions from each module out of which two questions are to be answered by the student.

EPI3001 RENEWABLE ENERGY SOURCES AND TECHNOLOGY 3-0-0-3

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal Assessment	: 40 Marks	
End semester Examination	: 60 Marks	

Course Objective

This subject provides sufficient knowledge about the promising new and renewable sources of energy so as to equip students capable of working with projects related to it and to take up research work in connected areas.

Learning Outcomes

Upon successful completion of this course, students will be able to compare different renewable energy techniques and choose the most appropriate based on local conditions.

Module I

Solar Thermal Systems: Solar radiation spectrum, radiation measurement, technologies. Applications: Heating, Cooling, Drying, Distillation, Power generation. Design consideration of solar water heater.

Solar Photovoltaic Systems : Operating principles, photovoltaic cell concepts, Cell, module, array, series and parallel connections, maximum power point tracking. Applications, Battery charging. Design of standalone PV system.

Fuel Cell: Principle of working, construction and applications.

Module II

Wind Energy: Wind patterns and wind data, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, applications, site selection. Types of windmills. Design of wind turbines. Characteristics of wind generators. Load matching

Microhydel :Operating principles, components of a microhydel power plant. types and characteristicsof turbines, selection and modification, load balancing.

Module III

Biomass: Operating principles, combustion and fermentation, types of biogas plants, applications, bio diesel

Ocean Energy: Ocean energy resources, principles of ocean thermal energy conversion systems, ocean thermal power plants- wave energy, characteristics, energy and power from the waves, wave energy conversion devices. Tidal power, energy estimation, site selection, types, tidal power plants.

Geothermal energy: Types of geothermal energy sites, site selection, geothermal power plants.

References

1. John W. Twidell, Anthony D. Weir, '*Renewable energy sources'*, English Language, Book society (ELBS), 1996
2. Godfrey Boyle, '*Renewable Energy'*, Oxford
3. D. P. Kothari, K.C.Singal, Rakesh Ranjan, '*Renewable Energy Sources and Emerging Technologies'*, Prentice Hall of India, New Delhi, 2009
4. B.H. Khan, '*Non-Conventional Energy Resources', 2nd* ,Tata McGraw Hill, New Delhi, 2010
5. Chetan Singh Solanki, *'Renewable Energy Technologies',* Prentice Hall of India, New Delhi, 2009
6. Tasneem Abbasi, S. A. Abbasi, '*Renewable Energy Sources'*, Prentice Hall of India, New Delhi, 2010
7. Siraj Ahmed, '*Wind Energy- Theory and Practice'*, Prentice Hall of India, New Delhi, 2010

Structure of the question paper

For the end semester examination, the question paper contains three questions from each module out of which two questions are to be answered by the student.

EPI3002 ENERGY AUDITING & MANAGEMENT 3-0-0-3

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal Assessment	: 40 Marks	
End semester Examination	: 60 Marks	

Course Objective

Understanding, analysis and application of electrical energy management-measurement and accounting techniques-consumption patterns- conservation methods-application in industrial cases.

Learning Outcomes

Upon successful completion of this course, students will be able to manage energy consumption efficiently and to apply energy conservation method in industries.

Module I

System approach and End use approach to efficient use of Electricity; Electricity tariff types; Energy auditing: Types and objectives-audit instruments.

Electric motors-Energy efficient controls and starting efficiency-Motor Efficiency and Load Analysis- Energy efficient /high efficient Motors-Case study; Load Matching and selection of motors.

Variable speed drives; Pumps and Fans-Efficient Control strategies- Optimal selection and sizing -Optimal operation and Storage; Case study

Module II

Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation, case study.

Reactive Power management-Capacitor Sizing-Degree of Compensation-Capacitor losses-Location-Placement-Maintenance, case study.

Peak Demand controls- Methodologies-Types of Industrial loads-Optimal Load scheduling-case study.

Lighting- Energy efficient light sources-Energy conservation in Lighting Schemes- Electronic ballast-Power quality issues-Luminaries, case study.

Module III

Cogeneration-Types and Schemes-Optimal operation of cogeneration plants-case study; Electric loads of Air conditioning & Refrigeration-Energy conservation measures- Cool storage. Types-Optimal operation-case study; Electric water heating-Gysers-Solar Water Heaters- Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls- software-EMS

References

1. Y P Abbi and Shashank Jain, '*Handbook on Energy Audit and Environment Management'* , TERI, 2006
2. Albert Thumann, William J. Younger, Terry Niehus, '*Handbook of Energy Audits',* 2009
3. Giovanni Petrecca, '*Industrial Energy Management: Principles and Applications'*, The Kluwer International Series, 1999
4. Anthony J. Pansini, Kenneth D. Smalling, '*Guide to Electric Load Management'*, Pennwell Pub; (1998)
5. Howard E. Jordan, *Energy-Efficient Electric Motors and Their Applications*, Plenum Pub Corp; 2nd edition, 1994
6. Turner, Wayne C., '*Energy Management Handbook'*, Lilburn, The Fairmont Press, 2001
7. Albert Thumann, '*Handbook of Energy Audits'*, Fairmont Pr; 5th edition (1998)
8. IEEE Bronze Book '*Recommended Practice for Energy Conservation and Cost Effective Planning in Industrial facilities'*, IEEE Inc, USA. 2008
9. Albert Thumann, P.W., '*Plant Engineers and Managers Guide to Energy Conservation*', Seventh Edition, TWI Press Inc., Terre Haute, 2007
10. Donald R. W. '*Energy Efficiency Manual'*, Energy Institute Press, 1986

Structure of the question paper

For the end semester examination, the question paper contains three questions from each module out of which two questions are to be answered by the student.

EDI3001 SOLAR PHOTOVOLTAIC SYSTEM DESIGN 3-0-0-3

Structure of the Course

Lecture	: 3 hrs/week	Credits : 3
Internal Continuous Assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objective

Fundamentals, design and application of solar photovoltaic systems for power generation on small and large scale electrification.

Learning Outcomes

Upon successful completion of the course the students will be able to understand and apply

1. The principle of solar energy conversion to electric power using PV technology.
2. The structure, materials and operation of solar cells, PV modules, and arrays.
3. The socio-economic and environmental merits of photovoltaic systems for a variety of applications.
4. The prospects of photovoltaic technology for sustainable power generation.
5. The concept of achieving high penetration of photovoltaic systems into the utility grid while maintaining or improving the power quality and the reliability of the grid.

Module I

Introduction to Solar energy: solar insolation vs. world energy demand, current energy consumption from different sources, environmental and health effects; Sustainable Energy: production and storage, resources and utilization.

Solar energy conversion: Photovoltaic and Thermoelectric systems. Introduction to photovoltaic (PV) systems. Historical development of PV systems. Overview of PV usage in the world. Limitations & future of PV systems. Solar energy potential for PV, irradiance, solar radiation and spectrum of sun, geometric and atmospheric effects on sunlight.

Module II

Solar PV Systems- Components: PV array, inverter, energy storage, system charge control, load, balance of systems (BOS) components. Photovoltaic modules – solar PV modules from solar cells- series and parallel connection of cells, mismatch in series connection- hot spots in module, bypass diode, mismatching in parallel connection. Design of PV Modules , PV module power output and performance. Balance of Solar PV systems (BOS) - Batteries: Lead-acid, Ni-Cd batteries, Battery charge controllers. DC-DC converters, DC-AC converters (inverters), maximum power point tracker (MPPT). PV array installation, operation, costs, reliability

Principles of designing high-quality PV systems: load, suitability, site adequacy, weather, system balance, additional considerations. Classification of PV system - Classification - Stand-alone PV system, Grid-Interactive PV System, Small system for consumer applications, Hybrid solar PV system.

Module III

System pre-sizing: load profile, solar radiation analysis, photovoltaic energy calculation, sizing of PV, battery bank, inverter, wires, cables and fuses.

Power considerations and system design – Array integration: mechanical integration, electrical integration, utility integration. Permits and Inspection . Commissioning, maintenance and troubleshooting. Economic analysis , environmental aspects of PV power systems.

Solar Energy Grid Integration Systems (SEGIS)- High PV Penetration and the Utility Distribution System – Approaches to enable high penetration of PV-Value analysis of SEGIS.

References

1. John Balfour, Michael Shaw, Nicole Bremer Nash. "*Introduction to Photovoltaic Design*", Jones & Bartlett Learning, Burlington, USA 15th ed., 2013.
2. John Balfour, Michael Shaw, "*Introduction to Photovoltaic Installations*", Jones & Bartlett Learning, Burlington, USA 15th ed., 2013
3. John Balfour, Michael Shaw, Nicole Bremer Nash. "*Advanced Photovoltaic System Design*", Jones & Bartlett Learning, Burlington, USA 15th ed., 2013
4. James P Dunlop, NJATC, "*Photovoltaic Systems*", National Joint Apprenticeship and Training Committee (NJATC), 2012

5. Gopal Nath Tiwari, Swapnil Dubey, "Fundamentals *of Photovoltaic Modules & Their Applications*", Royal Society of Chemistry (RSC) Publishing , RSC Energy series No.2, 2010.
6. Paul A Lynn, "*Electricity from Sunlight- An Introduction to Photovoltaics*", 2nd ed. John Wiley & Sons, 2011
7. Chetan Singh Solanski, "*Solar Photovoltaics: Fundamentals Technologies And Applications*", PHI Learning Pvt. Ltd., New Delhi, 2009
8. A. K. Mukerjee, Nivedita Thakur, "*Photovoltaic Systems : Analysis and Design"*, PHI Learning Pvt. Ltd., 2011
9. Djamila Rekioua, Ernest Matagne, "*Optimization of Photovoltaic Power Systems: Modelization, Simulation and Control*, *Green Energy and Technology",* Springer, 2012
10. Michael Boxwell, "Solar Electricity Handbook - 2013 Edition", 7th ed., Greenstream Publishing, 2012
11. Ryan Mayfield, "Photovoltaic Design and Installation For Dummies", 10th ed., Wiley Publishing Inc., 2010
12. Solar Energy Grid Integration Systems (SEGIS), Program Concept Paper, May 2008, http://www1.eere.energy.gov/solar/pdfs/segis-es_concept_paper.pdf

Structure of the Question paper

For the end semester examination, the question paper will consist of three questions from each module out of which two questions are to be answered by the students.

EII 3001 ARTIFICIAL NEURAL NETWORKS

Structure of the course

Lecture	: 3hrs/week	Credits: 3
Internal Continuous Assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objective

To provide an idea about artificial neural networks

Learning Outcomes

Upon successful completion of this course, students will be acquainted with Neural Networks, various Learning Algorithms, and applications.

Module I

Introduction to Neural Networks, Biological Neurons and Neural Networks, Networks of Artificial Neurons. Single Layer Perceptron, Learning and Generalization in Single Layer Perceptron, Hebbian Learning, Gradient Descent Learning, learning rates, Widrow-Hoff Learning , The Generalized Delta Rule, Practical Considerations Basic neural network models ADALINE networks, LMS algorithm, Learning in Multi- Layer Perceptrons.

Module II

Back-Propagation algorithms, Radial Basis Function Networks: Fundamentals, Algorithms and Applications, Learning with Momentum, Conjugate Gradient Learning, Bias and Variance. Under-Fitting and Over-Fitting. Applications of Multi-layer Perceptrons. Basic learning models Associative Learning, Competitive Networks, Winner-take-all networks, Adaptive Resonance Theory (ART).

Module III

Neural networks as associative memories, Hopfield network, BAM, Self Organizing Maps: Fundamentals, Algorithms and Applications. Learning Vector Quantization, Optimization problems solving using neural networks, Stochastic neural networks, Boltzmann machine

Applications of Artificial Neural Networks: Application areas like system identification and control, decision making, pattern recognition, and sequence recognition.

References

1. Simon Haykin, '*Neural Networks'*, 2nd Edition, Prentice Hall, 1999
2. Christopher M. Bishop, Neural *Networks for Pattern Recognition*, Oxford University Press, 1995
3. Martin T. Hagan, Howard B. Demuth, Mark Beale, *Neural Network Design*, Vikas Thomson Learning, 2003

For the end semester exam (50 marks), the question paper shall have six questions of 10 marks each covering entire syllabus out of which any five shall be answered. It shall have 75% problems & 25% Theory. For the Internal marks of 50, two tests of 20 marks each and 10 marks for assignments (Minimum two) /Term Project.

Structure of the Question paper

For the end semester examination, the question paper will consist of three questions from each module out of which two questions are to be answered by the students

EII3002 ENGINEERING OPTIMIZATION

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal Continuous Assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objective

Familiarising different optimization procedures to solve a wide variety of problems which can be applied to different fields

Learning Outcomes

Upon successful completion of this course, students will be able to apply optimisation techniques for various applications in engineering

Module I

Concepts of optimization: Statement of optimization problem - Classification – Engineering applications. Linear Programming- Graphical method- Simplex method – Duality- Sensitivity analysis -Transportation and assignment problems.

Module II

Nonlinear programming- Unconstrained optimization techniques-Direct search methods-Descent methods -Constrained optimization - Direct and Indirect methods - Kuhn tucker conditions.

Module III

Dynamic programming- Multistage decision process -Concept of sub optimization and Principle of optimality -Computational procedure Advanced optimization techniques- Genetic Algorithm - Simulated annealing methods- Optimization programming.

References

1. G. V. Reklaitis, A. Ravindran & K. M. Rajsdell, '*Engineering Optimization - Methods and Applications'*, John Wiley & Sons, 2007
2. Singiresu S. Rao, '*Engineering Optimization Theory and Practices'*, John Wiley and Sons, 3rd Edition, 2009
3. A. Ravindran, Don T. Philips and Jamer J. Solberg, '*Operations Research - Principles and Practice*', John Wiley & Sons, 2007
4. P. G. Gill, W. Murray and M. H. Wright, '*Practical Optimization'*, Academic Press, 1981
5. Fredrick S. Hiller and G. J. Liberman, '*Introduction to Operations Research*', McGraw-Hill Inc 1995
6. Ashok D. Belegundu, Tirupathi R. Chandrapatla, '*Optimization Concepts and Applications in Engineering*', Pearson Education, Delhi, 2002

Structure of the Question paper

For the end semester examination, the question paper will consist of three questions from each module out of which two questions are to be answered by the students

EII3003 FUZZY SYSTEMS & APPLICATIONS

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal Continuous Assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objective

Knowledge about fuzzy systems.

Learning Outcomes

Upon successful completion of this course, students will be able to apply fuzzy systems for different applications.

Module I

Introduction to Fuzzy sets and systems. Basics of fuzzy sets, membership function, support of a fuzzy set, height - Normalised fuzzy set, alpha- cuts (decomposition of a fuzzy set), set theoretic definitions on fuzzy sets, complement, intersection and union equality, subsethood - basic definition based on membership functions. The law of the excluded middle and law of contradiction on fuzzy sets. Properties of fuzzy sets operations (logical proof only). Extension of fuzzy sets concepts - Type-2 and Level-2 Fuzzy sets - examples.

Module II

Operations on fuzzy sets - intersection, algebraic sum - product, bounded sum - product, drastic sum product, t-norms and t-co-norms(s - norms) on fuzzy sets, typical parameterised t - norms and s-norms(with simplified proof). Extension principle and its applications. Fuzzy relation. Resolution form of a binary fuzzy relation. Operations on fuzzy relations - projection, max.-min. and min and max, compositions cylindric extension. Similarity relations - Reflexivity, symmetry, transitivity. Further operations on fuzzy sets, concentration, dilation, contrast intensification, linguistic hedges. Logical operations on fuzzy sets – Negation – Conjunction, disjunction, implication, fuzzy inference. Block diagram of a fuzzy logic system.

Module III

Fuzzy rule base – simplification of compound rule base – fuzzy inference – max. – min, man product, man drastic product, man bounded product. Defuzzification – Centre of gravity, center of sums, weighted average etc. Fuzzy pattern recognition-Feature analysis, Partitions, Identification, Multifeature recognition. Fuzzy control systems- Review of control theory for fuzzy controls, Simple controllers, General controllers, Stability, Models, Inverted pendulum, Aircraft landing control, Aircondioner control.

References

1. C.T. Lin & C. S. George Lee, '*Neural Fuzzy Systems*, Prentice Hall, 1996
2. Ahamad M. Ibrahim, '*Introduction to Applied Fuzzy Electronics'*, PHI, 1997
3. S. Rajasekharan, G A Vijayalakshmi Pai, '*Neural Networks, Fuzzy Logic and Genetic Algorithms*', PHI, 2003
4. Timothy J. Ross, '*Fuzzy Logic with Engineering Applications'*, 2/e, McGraw-Hill, 2009

Structure of the Question paper

For the end semester examination, the question paper will consist of three questions from each module out of which two questions are to be answered by the students

EII3004 ADVANCED NUMERICAL TECHNIQUES FOR ENGINEERING

Structure of the course

Lecture	: 3 hrs/week	Credits: 3
Internal Continuous Assessment	: 40 Marks	
End Semester Examination	: 60 Marks	

Course Objective

Overview of different numerical techniques.

Learning Outcomes

Upon successful completion of this course, students will be able to apply advanced numerical techniques for engineering problems.

Module I

Solution of Simultaneous Linear Equations- Guassian elimination and Guass-JordanMethods, Matrix inversion, Interactive Method and Relaxation Method. Solution of nonlinear equation-Linear interpolation Methods, Newton's Method, Muller's Method.

Module II

Numerical Differentiation and Integration-derivatives from Differences Table, Higher- Order Derivatives, Newton-Cotes Integration Formula, Trapezoidal Rule and Simpson's Rule. Solution of Ordinary differential Equation. Taylor- series, Modified Euler Method, Renge-Kutta Method. Boundary- value Problem.

Module III

Finite Element Method (FEM)- Rayleigh- Ritz Method, Galerke Method, Finite element for Ordinary Differential equation. Optimization techniques-Conventional and Non Conventional. Introduction to MATLAB.

References

1. Gerald Wheatly, '*Applied Numerical Analysis'*, Pearson Education, 2007
2. John H. Mathews, '*Numerical Methods using MATLAB'*, Third Edition, Pearson Education, 2004s
3. M. K. Jain, S.R. K. Iyengar, R. K. Jain, '*Numerical Methods Scientific and Engineering Computation*', New Age International Publishers Ltd., 2003

Structure of the Question paper

For the end semester examination, the question paper will consist of three questions from each module out of which two questions are to be answered by the students

EPI 3001 RENEWABLE ENERGY SOURCES AND TECHNOLOGY 3-0-0-3

Structure of the course

Lecture : 3Hrs /Week Credits: 3
Internal Assessment : 40 Marks.
End semester Examination : 60 Marks.

Course Objective: This subject provides sufficient knowledge about the promising new and renewable sources of energy so as to equip students capable of working with projects related to it and to take up research work in connected areas.

Module 1

Solar Thermal Systems : Solar radiation spectrum, radiation measurement, technologies. Applications: Heating, Cooling, Drying, Distillation, Power generation. Design consideration of solar water heater.

Solar Photovoltaic Systems : Operating principles, photovoltaic cell concepts, Cell, module, array, series and parallel connections, maximum power point tracking. Applications, Battery charging. Design of standalone PV system.

Fuel Cell: Principle of working, construction and applications.

Module 2

Wind Energy: Wind patterns and wind data, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, applications, site selection. Types of windmills. Design of wind turbines. Characteristics of wind generators. Load matching

Microhydel :Operating principles, components of a microhydel power plant. types and characteristics of turbines, selection and modification, load balancing.

Module 3

Biomass: Operating principles, combustion and fermentation, types of biogas plants, applications, bio diesel

Ocean Energy: Ocean energy resources, principles of ocean thermal energy conversion systems, ocean thermal power plants- wave energy, characteristics, energy and power from the waves, wave energy conversion devices. Tidal power, energy estimation, site selection, types, tidal power plants.

Geothermal energy: Types of geothermal energy sites, site selection, geothermal power plants.

Reference

1. John W Twidell and Anthony D Weir, *Renewable energy sources*, English Language, Book society (ELBS), 1996
2. Godfrey Boyle, *Renewable Energy*, Oxford
3. D.P.Kothari, K.C.Singal, Rakesh Ranjan, *Renewable Energy Sources and Emerging Technologies*, Prentice Hall of India, New Delhi, 2009

4. B.H. Khan, *Non-Conventional Energy Resources, 2nd* ,Tata McGraw Hill, New Delhi, 2010
5. Chetan Singh Solanki, *Renewable Energy Technologies,* Prentice Hall of India, New Delhi, 2009
6. Tasneem Abbasi, S.A.Abbasi, *Renewable Energy Sources*, Prentice Hall of India, New Delhi, 2010
7. Siraj Ahmed, *Wind Energy- Theory and Practice*, Prentice Hall of India, New Delhi, 2010

Structure of the question paper

The question paper contains three questions from each module out of which two questions are to be answered by the student.

EPI 3002 ENERGY AUDITING & MANAGEMENT 3-0-0-3

Structure of the course

Lecture /Week	:	3Hrs	Credits: 3
Internal Assessment	: 40 Marks.		
End semester Examination	: 60 Marks.		

Course Objective: Understanding, analysis and application of electrical energy management-measurement and accounting techniques-consumption patterns- conservation methods-application in industrial cases.

Module 1

System approach and End use approach to efficient use of Electricity; Electricity tariff types; Energy auditing: Types and objectives-audit instruments.
Electric motors-Energy efficient controls and starting efficiency-Motor Efficiency and Load Analysis- Energy efficient /high efficient Motors-Case study; Load Matching and selection of motors.
Variable speed drives; Pumps and Fans-Efficient Control strategies- Optimal selection and sizing -Optimal operation and Storage; Case study

Module 2

Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation, case study.
Reactive Power management-Capacitor Sizing-Degree of Compensation-Capacitor losses-Location-Placement-Maintenance, case study.
Peak Demand controls- Methodologies-Types of Industrial loads-Optimal Load scheduling-case study.
Lighting- Energy efficient light sources-Energy conservation in Lighting Schemes- Electronic ballast-Power quality issues-Luminaries, case study.

Module 3:

Cogeneration-Types and Schemes-Optimal operation of cogeneration plants-case study; Electric loads of Air conditioning & Refrigeration-Energy conservation measures- Cool storage. Types-Optimal operation-case study; Electric water heating-Gysers-Solar Water Heaters- Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls- software-EMS

References

1. Handbook on *Energy Audit and Environment Management* , Y P Abbi and Shashank Jain, TERI, 2006
2. Handbook of *Energy Audits,* Albert Thumann, William J. Younger, Terry Niehus, 2009
3. Giovanni Petrecca, *Industrial Energy Management: Principles and Applications.*, The Kluwer international series -207,1999

4. Anthony J. Pansini, Kenneth D. Smalling, *Guide to Electric Load Management.*, Pennwell Pub; (1998)
5. Howard E. Jordan, *Energy-Efficient Electric Motors and Their Applications*, Plenum Pub Corp; 2nd edition (1994)
6. Turner, Wayne C., *Energy Management Handbook*, Lilburn, The Fairmont Press, 2001
7. Albert Thumann , *Handbook of Energy Audits*, Fairmont Pr; 5th edition (1998)
8. IEEE Bronze Book- *Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities*, IEEE Inc, USA. 2008
9. Albert Thumann, P.W, *Plant Engineers and Managers Guide to Energy Conservation*-Seventh Edition-TWI Press Inc, Terre Haute, 2007
10. Donald R. W.,*Energy Efficiency Manual*, Energy Institute Press, 1986

Structure of the question paper

The question paper contains three questions from each module out of which two questions are to be answered by the student.

EAI3001 AUTONOMOUS POWER SYSTEMS 3-0-0-3

Structure of the course

lecture : 3Hrs /Week Credits: 3
Internal Assessment : 40 Marks.
End semester Examination : 60 Marks.

Course Objective: *Objectives of the course is to introduce autonomous power systems to students*

Module -1

Classification of EES systems -Roles of electrical energy storage (EES) system – Emerging needs for EES - Types and features of energy storage systems Mechanical storage systems - Pumped hydro storage (PHS) - Compressed air energy storage (CAES) - Flywheel energy storage (FES) - Electrochemical storage systems: Secondary batteries - Flow batteries - Chemical energy storage: Hydrogen (H2) - Synthetic natural gas (SNG) - Electrical storage systems: Double-layer capacitors (DLC) -Superconducting magnetic energy storage (SMES)- Thermal storage systems - Standards for EES - Technical comparison of EES technologies

Module -2

Captive Power Plants: Selection Considerations - Diesel Generator Captive Power Plants – Comparison of different types of captive power plants - Selection and Installation Factors - Sizing of a Genset: High Speed Engine or Slow/Medium Speed Engine, Capacity Combinations, Air Cooling Vs. Water Cooling, get over-heated during summer months - Safety Features - Parallel Operation with Grid- Maximum Single Load on DG Set - Unbalanced Load Effects - Neutral Earthing - Site Condition Effects on Performance Derating - Operational Factors - Load Pattern & DG Set Capacity - Sequencing of Loads - Load Pattern - Load Characteristics - Power Factor - Unbalanced Load Transient Loading

Module -3

SMPS- Characteristics – Steady state Analysis - Control methods:-Design of feedback compression

UPS: Necessity - types - typical layouts of UPS. Stand alone high quality Electronics Power Supplies

Combined Cycle Power Plant: Introduction - Typical cycles - Gas Turbine - G as Turbine
HRSG Systems - Steam Turbine -Combined Cycle Plants -Availability and reliability

References:

5. Bueuru of Energy Efficiency, Study material for Energy manager programme, 2012
6. Irving M.Gottilieb “Power supplies, Switching Regulators, Inverters and Converters” BPB Publications – 1985
7. RK Chetty “Switched Power Supply Design” BPB Publication- 1987
8. Current Literature

Structure of the question paper The question paper contains three questions from each module out of which two questions are to be answered by the students .

INI 3002

BIOINFORMATICS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To impart knowledge on various techniques of Bioinformatics.
- Learn the key tools used in bioinformatics

Learning Outcomes

- Understand the basics and special topics of bioinformatics
- Understand sequence analysis and secondary structure predictions t
- Understand mapping and sequence

Module I

Introduction to Genomic data and Data Organization: Sequence Data Banks - Introduction to sequence data banks - protein sequence data bank. NBFR-PIR, SWISSPROT, Signal peptide data bank, Nucleic acid sequence data bank - GenBank, EMBL nucleotide sequence data bank, AIDS virus sequence data bank. RRNA data bank, structural data banks - Protein Data Bank (PDB), The Cambridge Structural Database (CSD) : Genome data bank - Metabolic pathway data : Microbial and Cellular Data Banks.

Module II

Introduction to MSDN (Microbial Strain Data Network): Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; other important Data banks in the area of Biotechnology/life sciences/biodiversity.
Sequence analysis: Analysis Tools for Sequence Data Banks; Pair wise alignment - NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to analyze sequence data: Sequence patterns motifs and profiles.

Module III

Secondary Structure predictions : Prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Network model. Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Network model.

Special Topics in Bioinformatics: DNA Mapping and sequencing − Map alignment − Large scale sequencing and alignment − Shotgun − DNA sequencing − Sequence assembly − Gene predictions − Molecular predictions with DNA strings.

Reference

1. “Introduction to Bioinformatics”, Atwood, Pearson Education
2. Lesk, Introduction to Bio Informatics, Lesk, OUP

3. Bioinformatics Computing, Bergeron, Pearson Ed
4. Developing Bioinformatics Computer Skills, Cynthia Gibas and Per Jambeck, 2001 SPD
5. Biocomputing: Informatics and Genome Project, Smith, D.W., 1994, Academic Press, NY
6. Bioinformatics: A practical Guide to the Analysis of Genes and Proteins, Baxevanis, A.D., Quellette, B.F.F., John Wiely & Sons
7. Murty CSV, Bioinformatics, Himalaya

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3003 ADVANCED TECHNIQUES IN OPERATIONS RESEARCH

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Improve the ability to rigorously prove mathematical statements.
- Cultivate an ability to analyze the structure of and mathematically model various complex systems occurring in industrial applications.
- Develop knowledge of the mathematical structure of the most commonly used deterministic linear optimization models.
- Develop an understanding of the techniques used to solve linear optimization models using their mathematical structure.
- Develop an understanding of the use of modeling languages for expressing and solving optimization models.
- Develop knowledge of existing commercial solvers for linear optimization.

Module I

Mathematical Preliminaries – Maxima and Minima –Quadratic forms – Gradient and Hessian – Unimodal functions – Convex sets – Concave and Convex functions – Mathematical Programing problems – Varieties
and characteristics – Difficulties caused by nonlinearity – Role of convexity in N. L. P. Unconstrained Optimization – Search methods – Fibonacci Search – Golden sections search.

Module II

Hooke and Jeeve's method – Optimal Gradient method – Newton's method – Constrained nonlinear optimization constrained optimization with equality constraints. Lagrangian method – Sufficiency conditions – Optimization with inequality constraints – Kuhn – Tucker conditions – Sufficiency conditions.

Module III

Quadratic Programming – Separable convex programming – Frank & Wolfe's method – Kelley's cutting plane method – Rosen's gradient projection method – Fletcher – Reeve's method – Penalty and Barrier methods. Integer linear programming – Gomory's cutting plane method – Branch and Bound Algorithm – Travelling Salesman problem – Knapsack problem. Introduction to Optimization tools and software – MATLAB, LINDO, LINGO.

REFERENCES:

1. Taha. H. A., Operations Research, An Introduction , PHI, VI edition.

2. Simmons D. M, Nonlinear Programming for Operations Research, PHI.

Structure of the Question paper

For the End Semester Examination the question paper will consist of 70% Design problems and 30 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3004
SERVICE ORIENTED ARCHITECTURE

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Introduce the strategic and technological aspects of service oriented architecture for enterprise applications.
- Enable the students to participate in the development and implementation of Enterprise Architecture.

Learning Outcomes

- Understand benefits and limitations of service-oriented architecture
- Model and design services from a business perspective of an enterprise.
- Participate in designing an architectural framework for an organisation.
- Evaluate and choose methods, models and tools

Module I

SOFTWARE ENGINEERING PRINCIPLES -SOFTWARE ARCHITECTURE − Types of IT Architecture − SOA − Evolution − Key components − perspective of SOA − Enterprise-wide SOA − Architecture − Enterprise Applications − Solution Architecture for enterprise application −Software platforms for enterprise Applications − Patterns for SOA − SOA programming models.

Module II

SERVICE-ORIENTED ANALYSIS AND DESIGN − Design of Activity, Data, Client and business process services − Technologies of SOA − SOAP − WSDL − JAX − WS − XML WS for .NET − Service integration with ESB − Scenario − Business case for SOA − stakeholder objectives − benefits of SPA − Cost Savings - SOA implementation and Governance − strategy − SOA development − SOA governance − trends in SOA − event-driven architecture − software s a service − SOA technologies − proof-of-concept − process orchestration − SOA best practices .

Module III

Meta data management − XML security − XML signature − XML Encryption − SAML − XACML − XKMS − WS-Security − Security in web service framework - advanced messaging . TRANSACTION PROCESSING − paradigm − protocols and coordination − transaction specifications − SOA in mobile −Cloud Computing Concepts - Cloud Computing Platforms - SOA with Cloud Services

Research Topics in SOA

Reference

1. Shankar Kambhampaly, "Service −Oriented Architecture for Enterprise and Cloud Applications",2/e, Wiley India Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education.
3. Judith Hurwitz, Robin Bloor, Carol Baroudi, and Marcia Kaufman, "Service Oriented Architecture for Dummies", Wiley Publishing Inc, 2007.
4. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, and Rawn Shah, "Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap", IBM Press, 2005.
5. Mark O' Neill, et al. , "Web Services Security", Tata McGraw-Hill Edition, 2003.

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3005

ADVANCES IN E-COMMERCE

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To introduce various advances taking place in the field of E-commerce.
- To introduce various business opportunities available in the field of E-commerce

Learning Outcomes

- Understand major electronic commerce activities.
- Ability to implement E-commerce hardware/software infrastructure

Module I

The scope of E-Commerce - Definition – Internet commerce - Electronic Markets - Electronic Data Exchange. Business Strategy in an Electronic Age: The value chain - supply chains - Porter's value chain Model – Inter organisational value chains - Competitive Advantage using e-commerce.
Strategic implications of IT - Business capability - Strategy formulation and Implementation Planning - e-commerce implementation - e-commerce evaluation. Case Studies : Airline Booking Systems - Web Booking Systems - Online Retailing and Services - Online Content and Media - Social Networks, Auctions, and Portals.

Module II

Business to Business Electronic Commerce: Inter-organisational Transactions - Electronic Markets - Advantages and Disadvantages of Electronic Markets and its future.
Electronic Data Interchange (EDI): Definitions, Examples - EDI Technology – EDI Communications - Implementation - EDI Agreements.

Module III

Business to Consumer Electronic Commerce: The e-shop - e-commerce technologies - consumer e-commerce advantages and disadvantages.
Internet e-commerce security - A Web Site Evaluation Model - Internet Bookshops - Internet Banking - online share dealing - e-diversity - Technology Adoption.
Latest Developments in E-Commerce.

Reference

1. Laudon, K.C. and Traver C.G., E-Commerce: business, technology, society (International Edition). 7th edition. Pearson, 2011.
2. David Whiteley, E-Commerce : Strategy, Technologies and Applications Tata McGraw Hill Publishing Company, 2000.

3. Deborah L.Bayles, E-Commerce Logistics and Fulfillment, Pearson Education.
4. Brenda Kienan, Managing your e-commerce business, 2nd edition, Prentice Hall of India, New Delhi, 2001.
5. Latest international journals on E-commerce

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3006

COMPONENT BASED TECHNOLOGY

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Introduces in depth JAVA, Corba and .Net Components
- Deals with Fundamental properties of components, technology and architecture and middleware.
- Component Frameworks and Development are covered indepth.

Learning Outcomes

- To be familiar with the latest advances in the field of Component-Based Computing.
- To know the different considerations of using the component software applications and their standards.
- To understand the technological issues related to Component-Based Computing.
- To be familiar with the tools, platforms used with the Component-Based Computing such as DCOM, COBRA *and .NET).*

Module I

INTRODUCTION - Software Components – objects – fundamental properties of Component technology – modules – interfaces – callbacks – directory services – component architecture – components and middleware. JAVA COMPONENT TECHNOLOGIES - Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI and RMI-IIOP.

Module II

CORBA TECHNOLOGIES - Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture.COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls

Module III .NET TECHNOLOGIES .NET components - assemblies – app domains – contexts – reflection – remoting. COMPONENT FRAMEWORKS AND DEVELOPMENT - Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools - assembly tools.

References:

1. "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003.
2. Ed Roman, "Enterprise Java Beans", Third Edition , Wiley , 2004.

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3007

INTELLIGENT SYSTEMS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Introduce principles of intelligent systems and teach basic approaches used in this field.
- To introduce applications of intelligent systems in different research areas in Computer Science / Information Technology.

Learning Outcomes

- Understand advantages and disadvantages of intelligent systems.
- Students will be able to apply intelligent systems to research problems

Module I

Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts models of neuron - types of activation function - network architectures – learning process - perceptron convergence theorem – multilayer perceptrons - backpropagation algorithm. Radial basis and recurrent neural networks - Comparison of RBF and MLP networks - recurrent networks – Hopfield networks – Support Vector Machines - Applications

Module II

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures – membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - Fuzzy Associative Memories. Neuro-Fuzzy Modelling -Applications

Module III

Genetic Algorithm – Basics of Genetic Algorithms, Design issues in Genetic Algorithm, Genetic Modelling, Hybrid Approach: GA based Fuzzy Model Identification. Fuzzy Logic controlled Genetic Algorithm, Neuro- Genetic Hybrids & Fuzzy – Genetic Hybrids..

Reference

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.
2. Martin T. Hagan, Howard B. Demuth, and Mark Beale, "Neural Network Design",Thomson Learning, New Delhi, 2003.
3. S. Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.
4. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications",Prentice Hall, 1995.

5. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine
6. Learning”, Addison Wesley, 1997.
7. Neurofuzzy and Soft Computing, J S R Jang, C T Sun, E Mizutani, PHI.
8. Latest International Journals

Structure of the Question paper

For the End Semester Examination the question paper will consist of 60% Design problems and 40 % Theory. There will be three questions from each module out of which two questions are to be answered by the students.

INI 3001

NEURAL NETWORK AND APPLICATIONS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Should understand the motivation behind artificial neural network (ANN), its potential and limitations
- Should familiarize various architecture of ANN and its applications
- Ability to apply ANN for solving classification task

Learning Outcomes

- Understand various architectures of ANN
- Understand various tasks that can be handled using ANN
- Understand the use of ANN for various applications

Module I

Biological Neuron, Artificial Neural Model, Types of activation functions, architecture:Feedforward and Feedback, Learning Process: Error Correction Learning, Memory Based Learning, Hebbian learning, Competitive Learning, Boltzman Learning, Supervised and Unsupervised Learning, Learning Tasks: Pattern Space, Weight Space, Pattern Association, Pattern Recognition, Function Approximation, Control, Filtering, Beamforming, Memory, Adaptation, Statistical Learning Theory

Module II

Single Layer Perceptron – Perceptron Learning Algorithm, Perceptron Convergence Theorem, Least Mean Square Learning Algorithm.

Multilayer Perceptron – Back Propagation Algorithm, XOR problem, Limitations of Back Propagation Algorithm.

Radial Basis Function Networks - Exact Interpolator, Regularization Theory, Generalized Radial Basis Function Networks, Learning in Radial Basis Function Networks, Applications: XOR Problem, Image Classification.

.

Module III

Support Vector Machines - Optimal Hyperplane for Linearly Separable Patterns and Nonseparable Patterns, Support Vector Machine for Pattern Recognition, XOR Problem, Support Vector Machines for Nonlinear Regression.

Neural Network Associative Memory – Linear Associative Memory, Hopfield Network, Content Addressable Memory, Error Performance of Hopfield Networks, Applications of Hopfield Networks

Self-organizing Map – Maximal Eigenvector Filtering, Sanger's Rule, Generalized Learning Law, Competitive Learning, Vector Quantization, Mexican Hat Networks, Self organizing Feature Maps, Applications

Reference

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.
2. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.
3. B. Yegnanarayana, "Artificial Neural Networks", Prentice Hall of India, 2001

Structure of the Question paper

There will be three questions from each module out of which two questions are to be answered by the students.

MCI 3001 ARTIFICIAL INTELLIGENCE IN CIM

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

To provide an introduction to the basic principles and applications of Artificial Intelligence in CIM environment.

To provide hands-on experience in the design and implementation of intelligent agent systems, employing a variety of AI techniques.

Learning Outcomes

Students will have an understanding of the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action, and learning and their applications.

Module 1

Artificial Intelligence (A.I.), Learning and Problem Solving, Knowledge Acquisition and Representation, Learning Systems, Expert systems, Expert system applications for CIM,

Module 2

Knowledge based systems (KBS), Applications of KBS for Assembly, Process Planning and Scheduling.

Module 3

Artificial Neural Networks, Fuzzy Logic And Fuzzy Sets, Multi layered networks, Applications of Fuzzy systems and ANNS for selection of Robots, Fault Diagnostics

References :

1. Andrew Kusiak, Intelligent Manufacturing Systems, Prentice Hall Publications.2005
2. Simons, G. L., Introducing Artificial Intelligence, NCC Pub., 1990.
3. Andrew Kusiak, Computational Intelligence in Design and Manufacturing, John Wiley and Sons, 2000

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MCI 3002 ADVANCED NUMERICAL TECHNIQUES

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

To computationally solve scietific problems that arise in science and engineering. They will learn how to design and implement efficient sequential and parallel algorithms for solving important problems in their field of study

Learning Outcomes

On completion of the course students will have a solid grounding in the theory and practice of numerical methods for solving linear and nonlinear equations and in the numerical approximation of standard mathematical functions

Module 1

Solution of Algebraic and Transcendental Equation: Newton-Raphson method including method of complex roots,Graeffe's root square method (Computer based algorithm and programme for these methods)

Interpolation and Approximation: Lagrange's and Newton-divided difference formula, Newton interpolation formula forfinite differences, Gauss's forward and backward interpolation formulae, Bessel's and Laplace-Everett's formulae.

Module 2

Solution of Linear Simultaneous Equations: Cholesky's (Crout's) method, Gauss-Seidel iteration and relaxationmethods, Solution of Eigenvalue problems; Smallest, largest and intermediate Eigen values (Computer based algorithm for these methods)

Numerical Differentiation and Integration: Numerical differentiation using difference operators, Simpson's 1/3 and 3/8rules, Boole's rule, Weddle's rule.

Module 3

Solution of Differential Equations: Modified Euler's method, Runge-Kutta method of 2nd, 3rd and 4th orders, Predictor-Corrector method, Stability of Ordinary differential equation, Solution of Laplace's and Poisson's equations byLiebmann's method, Relaxation method.

References

1.Jain, M,K., Iyenger, S,R,K., Jain, R,K., Numerical Method for Scientific and Engineering Computation, Wiley Eastern Ltd.
2. Gupta, S.K., Numerical Methods for Engineers, Wiley Eastern Ltd.
3. Grewal, B,S.,Numerical Methods, Khanna Publications
4. Booth, A,D., Numerical Methods,Academic Press, NY
5. Atkinson, K,E., An Introduction to Numerical Analysis, John Wiley & Sons, NY
6. Sastry,S,S., Introduction Methods of Numerical Analysis, Prentice Hall of India
7. Conte, S,D., Elementary Numerical Analysis, McGraw Hill

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MCI 3003 NANOTECHNOLOGY

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objective:

To understand the general issues relating to nanotechnology and nanofabrication,: Methods for production of Nanoparticles, Characteristic techniques of nanomaterials

Learning outcome :

To appreciate the students with the background, applications and current status of nanotechnology and nanomaterials, and to make them understand the relevant basic scientific principles underpinning nanotechnology.

Module 1

Introduction To Nanomaterials: Amorphous, crystalline, microcrystalline, quasi-crystalline and nano-crystalline materials. Historical development of nanomaterials – Issues in fabrication and characterization of nanomaterials

Synthesis Of Nanomaterials: Methods of production of Nanoparticles, Sol-gel synthesis, Inert gas condensation, High energy Ball milling, Plasma synthesis, Electro deposition and other techniques. Synthesis of Carbon Nanotubes – Solid carbon source based production techniques, Gaseous carbon source based production techniques - Growth mechanisms Nano wires.

Module 2

Characterisation Of Nanomaterials: Scanning Probe Microscopy (SPM) – Scanning tunneling microscope, Transmission electron microscope, Scanning transmission electron microscope, Atomic force microscope, Scanning force microscopy, Electrostatic force microscopy , Dynamic force microscopy, Magnetic force microscopy, Scanning thermal microscopy, Peizo force microscopy, scanning capacitance microscopy, Nano indentation.

Module 3

Applications Of Nanomaterials: Applications in Mechanical, Electronics engineering industries – Use of nanomaterials in automobiles, aerospace, defense and medical applications – Metallic, polymeric, organic and ceramic nanomaterials.

Nano Fabrication And Machining: LIGA, Ion beam etching, Molecular manufacturing techniques – Nano machining techniques –, Top/Bottom up Nano fabrication techniques - Sub micron lithographic technique, conventional film growth technique, Chemical etching, Quantum materials.

References:

1. A.K. Bandyopadhyay, " Nano Materials", New Age International Publishers, New Delhi, 2007
2. Bharat Bhushan, "Handbook of Nanotechnology", Springer, Germany, 2004.

3. Mark Ratner and Daniel Ratner, “Nano Technology”, Pearson Education, New Delhi, 2003.
4. Gregory Timp, “Nanotechnology”, Springer, India, 2005
5. Ahmed Busnaina, “Nanomanufacturing Handbook”, CRC Press, London, 2006

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MCI 3004 SURFACE ENGINEERING

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

To develop expertise in advanced coating technologies with an emphasis on thermal spray, weld overlay and physical vapour deposition

Learning Outcomes

Students will

Be able to gain in depth knowledge of various surface coating technologies and their application in industry

Be able to be familiar with standard methods of testing of modified surfaces

Module 1

Importance of surfaces in engineering applications. Surface quality and integrity concepts. Often and damage during sliding and rolling contact. Factors influencing crack propagations process. Surface modification – coating process – Types and classifications.

Mechanical Treatments: Shot peening – process variables, almen test, shot peening equipments – process control applications.

Thermal and thermo chemical treatments: - Introduction hardening, Tuff riding treatment, surface treatment equipment and process, surface structure and chemistry, properties of treated surfaces and applications. Electro deposition – fundamentals of electro-deposition for the pipe ting – recent developments.

Module 2

Thermal spraying process and applications – Wire flame spraying, powder flame spraying, Electric arc spraying, plasma spraying, characteristics of sprayed coatings – process control – other methods of spraying like Hypersonic flame spraying, vacuum plasma spraying etc. Vapour Deposition – process and applications, CVD process, PVD process – Properties of coatings – Advantages and Disadvantages – Comparison and applications.

Module 3

Ion treatments: -Basic mechanism, Ion/plasma nitriding of stainless steel.

Ion Implantation: - Concepts, process, characteristics of ion implanted surfaces – Effect of implantation on tool wear. Laser surface treatment – transformation hardening – laser grazing, laser cladding.

Reference: -

1. Griffiths B.J., Manufacturing surface design and monitoring for performance, Elsevier
2. Ollard,E,A., Smith, E,B., Hand Book of Industrial Electroplating - Metals hand Book (9th Ed), American Society of Metals

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MII 2001 HEURISTICS FOR OPTIMIZATION 3-0-0-3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

The main objectives of this course are:-

- To introduce the students to heuristic solution techniques.
- To enhance problem solving skills to more advanced levels.
- To experiment with real life problems and promote decision making skills.
- To demonstrate various meta-heuristic solution techniques which provide faster heuristic solutions as against time consuming exact algorithms.

Learning Outcomes

- The students will have knowledge of various heuristic solution techniques and applications of the same.
- The students will have the skill to model and solve real life problems.

Module I

Introduction to evolutionary computation: Biological and artificial evolution, Evolutionary computation and AI-different historical branches of EC.
Genetic Algorithm - Genetic Algorithms: Basic concepts, Encoding, Selection, Crossover, Mutation-Binary GA, Continuous GA, Hybrid GA, Parallel GA-Application of GA in solving Constrained and Combinatorial Optimization problems, Reliability problem, Sequencing problem, Scheduling problem, Transportation problem etc. Scatter Search-Components, Algorithm, Applications.

Module II

Greedy Randomized Adaptive Search Procedure ,Ant Colony Algorithms: Overview, Basic algorithm, Variants, Formalization and properties of ant colony optimization, Applications. Lagrangean Relaxation: Basic methodology,Lagrangean heuristic and problem reduction, Lagrangean multipliers, Dual Ascent algorithm, Tree search. Applications of Lagrangean Relaxation in solving facility location problems, Logistics etc.

Module III

Local Search Algorithms, Tabu Search -Neighborhood, Candidate list-Short term and Long term memory, Threshold Accepting,Application of TS in solving facility location problem, Quadratic Assignment problem etc. Simulated Annealing -Main Components of Simulated Annealing,Homogenous vs. Inhomogenous Simulated Annealing , Annealing Schedules Applications in sequencing and scheduling, Travelling salesman problem etc.
Multi objective evolutionary optimization: Pareto optimality, Multiobjective evolutionary algorithms.

References:

1) Baeck T, Fogel D B &Michalewicz Z , Handbook on Evolutionary Computation, IOP Press
2) Michalewicz Z , Genetic Algorithms + Data Structures = Evolution Programms, Springer-Verlag,Berlin
3) Goldberg D E , Genetic Algorithms in Search, Optimization & Machine Learning, Addisson Wesley
4) BanzhafW,NordinP,Keller et al., Genetic Programming :An Introduction, Morgan Kaufmann
5) Yao X , Evolutionary Computation: Theory and Applications, World Scientific Publ.Co,Singapore
6) J.Dreo,A.Petrowski,EricTaillard , Metaheuristics for Hard Optimization:Methods and case studies, Springer.
7) Fred Glover ,Tabu Search.
8) ZbigniewMichalewicz,David B. Fogel , How to Solve It:Modern Heuristics, ACM Press
9) Marco Dorigo Thomas Stützle , AntColonyOptimization, MIT Press
10) GüntherZäpfel • Roland Braune, Michael Bögl, Metaheuristic Search Concepts-A Tutorial with Applications to Production and Logistics, Springer

Structure of the Question paper

For the End semester Examination There will be three questions from each module out of which two questions are to be answered by the students.

MII 3002: FINANCIAL MANAGEMENT 3-0-0-3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives
At the end of the course students should be able to:

- Understand the use of basic financial management concepts.
- Understand and use the tools of analysis such as valuation, risk-return relationships, financial statement analysis, capital budgeting, cost of capital, capital structure and working capital management.

Become familiar with the various types of financing available to a firm

Learning Outcomes
After successful completion of the course, the students are able to:

- Obtain an overview of Indian financial system.
- Analyze financial statements using standard financial ratios.
- Apply techniques to project financial statements for forecasting long-term financial needs.
- Explain the role of short-term financial needs.
- Apply time value, risk, and return concepts.
- Obtain an overview of international financial management.

Module I

Introduction to Financial management: Evolution, Scope, Objectives, Functions, and Environment of corporate finance. Indian financial system: financial markets, capital market, all India financial institutions-IFCI, IDBI, ICICI, investment institutions-LIC, UTI-commercial banks.
International financial management: World monetary system, foreign exchange markets and rates, financing foreign operations.

Module II

Working capital management: importance, objectives, inventory management, receivables management, credit policy, cash management.

Capital budgeting: Purpose, principles in estimating costs and benefits of investments, Appraisal criteria-payback period, ARR, NPV, Benefit –Cost ratio, IRR. Risk analysis in capital budgeting. Cost of capital.

Module III

Sources of finance: Long term-equity capital-debenture capital-term loans, deferred credit-government subsidies -leasing and hire purchase, Short term financing-accruals-trade credit-short term bank finance public deposit-commercial paper.

Capital structure and dividend policies. Financial analysis: ratio analysis- types of ratios-time series analysis-common size analysis-DuPont analysis-funds flow analysis. Break even analysis and leverages.

References:

1. Corporate Finance – Berely&Mayers
2. Financial Management Theory and Practice – Prasannachandra – TMH
3. Financial Management – Van Horne – Pearson Education
4. Financial Management – Khan & Jain – TMH
5. Financial Management – S. N. Maheswary – Himalaya
6. Investment Analysis – Preethi Singh – Himalaya

Structure of the Question paper

For the End Semester Examination there will be three questions from each module out of which two questions are to be answered by the students

MII 3003: ORGANISATIONAL BEHAVIOUR 3 – 0 – 0 - 3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

The main objective of the course is to:

- Understand the conceptual framework for the study of organizational behavior.
- Study various dimensions of perception, personality and motivation.
- Learn theories of leadership including the trait, group and exchange, contingency and path goal approaches.
- Learn about formal and informal groups
- Learn the phases and models of decision making
- Learn about organizational culture and its change

Learning Outcomes

The student is expected to

- Have a clear understanding of job attitudes, satisfaction and commitment
- Explore the dynamics of organizational behavior in achieving the goals of the organization

Module I

Dimensions of human behaviour: self development, perception, motivation, personality and leadership- concepts, theories and applications. Modes of values, beliefs, attitudes and intelligents in determining human behaviour.

Module II

Group dynamics: nature of groups and group decision making. Conflict management , Transactional Analysis . Organizational development: Concepts of QWL, Organizational change, Goals of organizational change.

Module III

Concept of organizational climate, health and effectiveness. Organizational culture: nature and characteristics, Motivation of person across cultures, Managerial leadership across cultures. Case studies.

References:

1. Jerry l. Gray, Frederick A. Stark,OrganisationalBehaviour concepts and applications
2. Fred Luthans ,Organizational Behaviour ,McGraw Hill
3. Stephen P.Robbins ,OrganizationalBehaviour ,Pearson Education.
4. Uma Sekharan ,Organizational Behaviour-Text and Cases ,TMH

Structure of the Question paper

For the End Semester Examination there will be three questions from each module out of which two questions are to be answered by the students.

MII3004 OPERATIONS RESEARCH 3 – 0 – 0 - 3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

The main objective of the course is to:

- Introduce important ideas in Operations Research (OR),
- Prepare and motivate future specialists to continue in their study by having an insightful overview of OR,
- To develop student's skill in formulating and building models,
- To translate a verbal description of a decision problem into an equivalent mathematical model,
- To demonstrate the cohesiveness of OR methodology.

Learning Outcomes

After successful completion of the course:

- The students increase their skills in formulating and building formal models of complex decision environments and in perceiving the critical issues to be resolved.
- The students learn how to achieve sound and incisive evaluations of the important alternatives.
- The students learn how to attain crucial insights to actual managerial problems.
- Students appreciate and understand the pivotal concepts in operations research.

MODULE I

Overview of OR modeling approach;
Linear programming - formulation, simplex method, revised simplex method, duality theory and sensitivity analysis. Dual Simplex method, Parametric linear programming;
The Transportation and Assignment problems.

MODULE II

Dynamic Programming – Deterministic DP, Probabilistic DP; Integer Programming – Binary IP, B&B technique, Branch & Cut approach;
Game Theory – Two person zero sum game, Games with mixed strategies, Graphical solution;
Replacement Problems – Individual replacement policy, Group replacement policy;
Introduction to Nonlinear programming (Overview only)

MODULE III

Network Optimization models – The Shortest path problem, The Minimum spanning tree problem, The Maximum flow problem, The Minimum cost flow problem, PERT/CPM.
Sequencing – n jobs on 1 machine, Hodgson's algorithm, n jobs on m machines, Johnson's procedure.
Queuing Theory; Introduction to softwares for OR.

References

1. H.A. Taha, Operations Research: An Introduction, Pearson Education
2. S.S. Rao, Engineering Optimization: Theory and Practice, New Age International Publishers.
3. H. M. Wagner, Principles of Operations Research, Prentice- Hall of India Pvt. Ltd.
4. Gross and Harris, Fundamentals of Queuing Theory, John Wiley & Sons
5. Frederick S Hiller and Gerald J Lieberman, Introduction to Operations Research, Tata McGraw-Hill Publishing Co., New Delhi
6. A P Verma, Operations Research, S K Kataria& Sons.

Structure of the Question paper

For the End Semester Examination there will be three questions from each module out of which two questions are to be answered by the students.

MII 3005: MANAGEMENT INFORMATION SYSTEMS 3 – 0 – 0 - 3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

The main objective of the course is to:

- To learn about different information systems.
- To effectively use and manage information technology in today's network enterprises.
- To study inter connected networks of information systems for end user collaboration.
- To learn systems for making timely decisions based on organized informations.

Learning Outcomes

After the completion of the course the student is expected to

- Widen his knowledge about information technology that will enable him to solve management problems.
- Explore full potential of computer as a problem solving tool.

MODULE I

Introduction to Information Systems, Establishing the framework, Business models, Information System Architecture, Evolution of Information Systems. Information Systems: Functional Areas such as Finance, Marketing, Production, Personnel Levels. Types: DSS, EIS, ES, OAS, TPS – Comparison, Concepts and knowledge representation, Managing International Information System.

MODULE II

Information technology infrastructure: hardware, software, managing data resources, telecommunications and networks. System Development: System development Life Cycle, Structured Methodologies- prototyping, case methodology, Designing Computer based methods, procedures, control.

MODULE III

Implementation and Control: Control, Testing Security, Coding Techniques, Detection of error, Validating, Cost Benefit Analysis, Assessing the value and risk of information systems. System Audit: Software engineering qualities – design, production, service, software Specification, software metrics, software quality assurance. Systems methodology: objectives, Time and Logic, Knowledge and Human Dimension, software life cycle models – Verification and Validation.

References:

1) Kenneth C. Laudon and Jane P Laudon -Management Information Systems –Managing the Digital firm, ,Pearson Education, Asia, 2002.
2) Gordon B.Davis - Management Information System: Conceptual Foundations, Structure and Development, , McGraw Hill
3) Joyce J Elam ,Simon and Schuster-Case series for Management Information Systems'- Custom Publishing, 1996.
4) Steven Alter - Information Systems – A Management Perspective - Addison Wesley, 1999.
5) James A O'Brein - Management Information Systems, Tata McGrawHill, New Delhi,1999.
6) Turban, Mc Lean and Wetherbe - Information Technology for Management-Making connections for strategic advantage, John Wiley, 1999.
7) Ralph M. Stair and George W. Reynolds- Principles of Information Systems -A Managerial Approach, Thomson Learning, 2001.

Structure of the Question paper

For the End Semester Examination there will be three questions from each module out of which two questions are to be answered by the students.

MDI3001: **APPLIED FINITE ELEMENT METHODS** **3-0-0-3**

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives:

The objective in this course is to summarize modern and effective finite element procedures for the non linear analysis of static and dynamic problems. The modeling of geometric and material nonlinear problems is discussed. The basic finite element formulations employed are presented, efficient numerical procedures are discussed, and recommendations on the actual use of the methods in engineering practice are given.

Learning Outcomes:

The student may be able to model nonlinear problems

- Geometric nonlinear problems
- Material nonlinear problems
- Large deformation problems
- Dynamic problems of above types

Module I

Introduction to Nonlinear Analysis, Basic Considerations in Nonlinear Analysis Lagrangian Continuum Mechanics Variables for General Nonlinear Analysis, Total Lagrangian and updated Lagrangian formulation for Incremental General Nonlinear Analysis from the principles of continuum mechanics

Module II

Formulation of Finite Element Matrices from the principles of continuum mechanics: Two and Three-Dimensional Solid Elements; Plane Stress, Plane Strain, and Axisymmetric Conditions, Two-Noded Truss Element using Updated and Total Lagrangian Formulation.

Module III

Solution of the Nonlinear Finite Element Equations in Static Analysis, Solution of Nonlinear Dynamic Response, Use of Elastic Constitutive Relations in Total Lagrangian Formulation, Formulation of Finite Element Matrices for Beam, Plate and shell Elements.

Extra reading -
(Assignments to write programs in Matlab/Fortran and to practice in FEM packages)

Modeling of Elasto-Plastic and Creep Response

Reference:

1. Finite element procedures K. J. Bathe, PHI.
2. An Introduction to Nonlinear Finite Element Analysis, J.N Reddy, Oxford University Press, 2005.
3. Nonlinear Finite elements for continua and structures, Ted Belytschko, Wiley 2001.
4. Continuum Mechanics and plasticity, Han Chin Wu, CRC,2001.
5. An introduction to continuum mechanics with applications, J.N Reddy, Cambridge university Press, 2008.
6. Nonlinear Finite Element Analysis of Solids and Structures VOLUME 1 ESSENTIALS - M.A. Crisfield, Wiley.
7. Nonlinear Finite Element Analysis of Solids and Structures Volume 2 Advanced Topics - M.A. Crisfield, Wiley.

Structure of the Question paper

For the End Semester Examination There will be three questions from each module out of which two questions are to be answered by the students.

MDI 3002 Experimental Stress Analysis For Engineers 3-0-0-3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To familiarize the basics of commonly used experimental stress analysis techniques.
- To familiarize different strain gages.
- To establish the fundamental concepts and new experimental techniques.
- To be able to use the experimental techniques on the practical problems.
- To equip the students with basic theory of elasticity and stress-strain relationships.
- To familiarize various strain measurement techniques.
- To familiarize various instrumentation for strain measurements.
- To introduce the concept of photo elastic stress analysis methods.
- To familiarize various nondestructive test methods.

Learning Outcomes:

- Apply the principles and techniques of photo elastic measurement.
- Apply the principles and techniques of strain gage measurement.
- Apply the principles and techniques of moiré analysis.
- Apply the principles and techniques of brittle coating analysis.

Module I

Stress analysis by strain measurement: Principal stresses and strains. Mohr's circle-measurement of strains and stresses.Strain gauges and Stress gauges. Mechanical, Optical and Electrical gauges- construction and applications. Variable resistance strain gauges, Gauge characteristics, Gauge sensitivity, circulatory for resistance strain gauges, Recording equipments static and dynamic strains- reduction of strain gauge data-compensation-strain measurement over long period at high and low temperature.

Module II

Photo elasticity: The Polariscope, stress optic law, Photo elastic model materials, Polariscope arrangements – Dark Field and Light field, Partial fringe value and compensation techniques, Use of photo elastic coatings. Movie fringe, Brittle coating Techniques.

Module III

Strain rosettes- Rectangular rosette, Delta rosette. Residual stresses: Beneficial and harmful effects – Principle of residual stress measurement:-methods only.

Non-destructive testing – Types –dye penetrate methods radiography-X-ray and Gamma ray-X-ray fluoroscopy-Penetrameter-Magnetic particle method.
Introduction to lasers in NDT – Ultrasonic flow detection

References:

1. Daily and Litty-Experimental stress Analysis-McGraw Hill
2. Dove and Adams-Experimental stress Analysis and Motion measurement-Prentice hall
3. Hetenyi-Handbook and Experimental stress Analysis-John wiley
4. Perry and Lissener-Strain gauge Primer-McGraw Hill
5. W.J. McGonnagle-Non-destructive Testing-McGraw Hill
6. American Society for Metals-Metals Hand Book – Vol.7.

Structure of the Question paper

For the End Semester Examination There will be three questions from each module out of which two questions are to be answered by the students.

MPI 3001: COMPUTATIONAL FLUID DYNAMICS 3 – 0 – 0 - 3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- A number of physical problems related to Propulsion Engineering and Thermal Engineering can be modeled as partial differential equation and often non-linear. These equations can not be solved by analytical methods and suitable numerical techniques are to be applied. The objective this stream elective is to give the students the necessary fundamentals ideas and their applications for real problems. An exposure to open source computational tools is also aimed. Reading and understanding at least two Journal Publications dealing with later developments in solution algorithms for flow and heat transfer.

Learning Outcomes

- Mathematical formulation of physical problems and their solution.
- Capability to write computer programs based on the techniques learned.
- Development of a directory containing the basic and applied computer programs, tutorials and their document.

Module I

System and control volume approaches – velocity, acceleration, Reynold's transport theorem – conservation of mass, momentum and energy equations – Gradient of velocity – deformation and rotation tensors – stress strain relations – Navier – Stoke's equations – Cartesian and polar coordinates(derivation) – Energy equation – Boundary layer equation. Stream function – potential flow – vorticity stream function formulation – potential flow – Turbulence and turbulence modeling.

Module II

Finite difference schemes – backward - central and forward schemes – stability analysis – Finite volume method for incompressible flows – Vertex centered and cell centered FVM – Treatment of convection term – Upwind, hybrid, upwind least square reconstruction and QUICK schemes – staggered and collocated grids – solution algorithms for both types – Evaluation of velocity field – SIMPLE, SIMPLER, and projection methods – Time dependent problems – Implicit, Crank-Nicolson and Explicit schemes – Finite volume method for compressible flows-Treatment of convection terms – Flux vector splitting method – Artificial diffusion – Structured and unstructured grids – Solution of system of equations – Tridiagonal matrix algorithm – Line by line solver.

Module III

Development of a computer program for the analysis of incompressible flows in two dimensions – solution of few typical problems using the computer program. Study of any two latest papers describing development in CFD.

References:

1. J D Anderson : Computational Fluid Dynamics – McGraw Hill International, 1995
2. C A J Fletcher : Computational Techniques for Fluid Dynamics – Vol 1 & 2, Springer Verlag, 1988
3. S V Patankar : Numerical Heat Transfer – Hemisphere, 1980
4. K Muralidhar and T Sundrarajan : Computational Fluid Flow and Heat Transfer, Narosa Publishers, 1996.
5. K.Muralidhar and G.Biswas: Advanced Engineering Fluid Mechanics, Narosa Publishers, 1996.
6. Joel H Ferziger, MilovanPeric : Computational Methods for Fluid Dynamics.

Structure of the Question paper

For the End semester Examination There will be three questions from each module out of which two questions are to be answered by the students.

MTI 3001: NUMERICAL METHODS 3 – 0 – 0 – 3

Structure of the Course

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To prepare and motivate students to pursue research programmes or to serve in industry or technical profession through rigourous education.
- To provide students with a solid foundation of the theory of Numerical Techniques thus equipping them to solve mathematical models of engineering systems.
- To equip students with good scientific and mathematical principles to model and solve engineering problems met with in engineering design so as to innovate or improve existing designs in view of the purpose of improvement of standard of life.
- To inculcate in student's professional and ethical attitude, effective communication skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
- To provide students with an academic environment that encourages them towards excellence, gain leadership qualities, to learn and live by ethical codes and guidelines and life0long learning needed for a successful professional career.
- With all of the above it is desired, as the objectives, that they become useful contributors to society and thus return to it what they received in their making of a successful individual.

Learning Outcomes

- Graduates will have received training in solving real-life engineering problems from the study of theory and problem-solving skills practiced in the class-room.
- Graduates will have their minds developed to equip them in their career to recognize problems faced by industry and society, and forge out viable solutions there to.
- Graduates will demonstrate knowledge of professional and ethical responsibilities.
- Graduate will be able to communicate effectively in both verbal and writtern form.
- Graduates will show understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.
- Graduates will develop confidence for self education and ability for life-long learning.
- Graduate be able to participate and succeed in competitive examinations

Module I

Solution of algebraic and transcendental equations- Review and comparison of various iterative methods, convergence – Generalised Newton-Raphson method for multiple roots – Higher order methods – Newton's method for non-linear systems.Solution of simultaneous equatiuons-Direct &indirectmethods-Gauss elimination and Gauss Jordan methods – ill conditioning – pivoting – Jacobi, Gauss-Seidel and Relaxation methods-convergence-Eigen value problems-Vector iteration method.

Module II

Interpolation-Newton's Divided difference, Lagrange, Aitken, Hermite and Spline techniques – Inverse interpolation-Error estimates-Double interpolation-Trigonometric interpolation.
Numerical differential- Numerical integration-Newton-Cote's Integration formula-Gauss quadrature-Error estimates-Double integration.
Curve fitting – method of least squares – nn-linear relationships – Correlation and Regression – Linear Correlation – Measures of correlation – Standard error of estimate – Coefficient of correlation – Multiple linear regression.

Module III

Solution of ordinary differential equations-Single step & multi step methods-stability of solution – simultaneous first order differential equations- higher order different equations. Numerical solution of integral equations. Partial differential equations – classification – Laplace equation, ID wave equation, ID heat equation – Finite differencemethods – Relaxation methods. Stability and convergence of solution.
Note- Computer program assignments are essential as part of sessional requirements.

References:

1) Numerical methods for Scientific and Engineering Computation – Jain M.K.,
2) Elementary Numerical Analysis – Conte and Carl DeBoor
3) Introduction to Numerical Analysis – Gupta A and Bose S C
4) Introduction to Numerical Analysis – Hilderbrand FB
5) Introduction toNumerical Analysis – Fjorberg C E
6) An Introduction toNumerical Analysis – Kendall E Atkinson
7) Statistics – Murrey R Spiegel
8) Numerical Mathematical Analysis – James B. Scarborough
9) Applied Numerical Analysis – C F Gerald & P O Wheatley
10) Numerical algorithms – E V Krishnamurthy & S K Sen

Structure of the Question paper

For the End semester Examination There will be three questions from each module out of which two questions are to be answered by the students.

MRI 3001 ENERGY CONSERVATION IN REFRIGERATION AND AIR-CONDITIONING SYSTEMS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To provide the students with a foundation in the subject.
- To recognize the aspect of engineering problems solvable by applying the subject.
- To make the students aware of the capabilities and limitations of the subject for engineers.
- Understand the various processes related to the subject.
- To study advanced features of the subject.
- To understand the associativity between the subject and Mechanical Engineering.

Learning Outcomes

- To synthesize and apply the concepts learnt.
- Describe various operations in Mechanical Engineering using the subject.
- Undertake, under supervision, laboratory experiments incorporating the subject.

Module 1

REFRIGERATION CYCLES: Refrigerators and heat pumps, reversed Carnot cycle, ideal and actual vapour compression refrigeration cycles, selection of refrigerants, heat pump systems, gas refrigeration cycles, absorption refrigeration systems, thermo-electric refrigeration systems. compressors, evaporators, condensers, throttle valves, properties of refrigerants, refrigerants and the ozone layer.

Module II

AIR-CONDITIONING: Introduction p-h, T-S, p-v and psychometric charts: comfort air-conditioning and industrial air- conditioning, factors affecting human comfort, air quality and standards, air conditioning for tropical climates, load types, determination of cooling load, air-conditioning systems and equipment selection, design of ducting and piping systems installation, commissioning and maintenance of refrigeration equipments, thermal storage systems.

Module III

ENERGY CONSERVATION IN REFRIGERATION ANDAIR-CONDITIONING SYSTEMS: Factors affecting refrigeration and air-conditioning system performance and savings opportunities, flow control, strategies and energy conservation opportunities in fans, blowers, compressors and pumps, exhaust air heat recovery, refrigeration cycle heat recovery, evaporative cooling, solar cooling and heating and ice storage, hybrid types and applications, IAQ requirement.

SYSTEM DESIGN USING TOOLS: Use of softwares for energy efficient design of refrigeration and air-conditioning systems.

References :

1. ASHRAE Handbook Fundamentals 2008, American Society of Heating, Refrigerating and Air-ConditioningEngineers, ASHRAE, 2008.
2. Edward G Pita, "Air-conditioning Principles and Systems: An Energy Approach", Pearson Education, 2003.
3. Jones W P, "Air Conditioning Engineering", 5th ed., Butterworth-Heinemann, Oxford and Boston, 2001.
4. Wang S K, "Handbook of Air Conditioning and Refrigeration", 2nd ed., McGraw-Hill, New York, 2001.

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MRI 3002 ENERGY CONSERVATION IN BUILDINGS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To provide the students with a foundation in the subject.
- To recognize the aspect of engineering problems solvable by applying the subject.
- To make the students aware of the capabilities and limitations of the subject for engineers.
- Understand the various processes related to the subject.
- To study advanced features of the subject.
- To understand the associativity between the subject and Mechanical Engineering.

Learning Outcomes

- To synthesize and apply the concepts learnt.
- Describe various operations in Mechanical Engineering using the subject.
- Undertake, under supervision, laboratory experiments incorporating the subject.

Module 1

INTRODUCTION: The sun-earth relationship and the energy balance on the earth's surface, climate, wind, solar radiation, and solar temperature, sun shading and solar radiation on surfaces, energy impact on the shape and orientation of buildings, thermal properties of building materials.

ESTIMATION OF BUILDING LOADS: Steady state method, network method, numerical method, correlations, computer packages for carrying out thermal design of buildings and predicting performance.

Module II

ENERGY EFFICIENT TECHNOLOGIES FOR BUILDINGS: Passive cooling and day lighting, active solar and photovoltaic, building energy analysis methods, building energy simulation, building energy efficiency standards, lighting system design, lighting economics and aesthetics, impacts of lighting efficiency

INDOOR ENVIRONMENTAL QUALITY REQUIREMENT AND MANAGEMENT: Psychrometry, comfort conditions, thermal comfort, ventilation and air quality, air conditioning requirement, visual perception, illumination requirement, auditory requirement, energy management options, energy audit and energy targeting, technological options for energy management.

Module III

ENERGY CONSERVATION IN AIR CONDITIONING SYSTEMS: Cycles, air conditioning systems, energy conservation in pumps, fans and blowers, refrigerating machines, heat rejection equipment, energy efficient motors, insulation.

GREEN BUILDINGS: Ecological sustainable design, life cycle analysis, barriers to green buildings, green building rating tools, material selection, embodied energy, operating energy, façade systems, ventilation systems, transportation, water treatment systems, water efficiency, building economics, leed and IGBC codes.

REFERENCES:

1. Edward G Pita, "An Energy Approach- Air-conditioning Principles and Systems", Pearson Education, 2003.
2. Colin Porteous, "The New Eco-Architecture", Spon Press, 2002.
3. Lever More G J, "Building Energy Management Systems", E and FNSpon, London, 2000.
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, "Design with Energy: The Conservation and Use of Energy in Buildings", Cambridge University Press, 1984.
6. Energy Conservation Building Codes: www.bee-india.nic.in

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

MRI 3003 ENERGY CONSERVATION IN INDUSTRIAL PROCESSES & EQUIPMENTS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To provide the students with a foundation in the subject.
- To recognize the aspect of engineering problems solvable by applying the subject.
- To make the students aware of the capabilities and limitations of the subject for engineers.
- Understand the various processes related to the subject.
- To study advanced features of the subject.
- To understand the associativity between the subject and Mechanical Engineering.

Learning Outcomes

- To synthesize and apply the concepts learnt.
- Describe various operations in Mechanical Engineering using the subject.
- Undertake, under supervision, laboratory experiments incorporating the subject.

Module 1

INTRODUCTION: Material and energy balances of different manufacturing industries, major process equipments and their characteristics,, performance evaluation, specific energy consumption analysis.

HEAT TRANSFER SYSTEMS AND EQUIPMENTS: Heat transfer principles and coefficient evaluation, evaluation of jacketed pan, heating coils immersed in liquids, refrigeration cycles and refrigerant, mechanical equipments, freezing and cold storage systems.

Module II

ABSORPTION: Theory of absorption, extraction and washing equipments, performance evaluation.

ADSORPTION: Desiccant and adsorption systems in vehicles, energy recovery systems, chemical dehumidification, cold storage.

CRYSTALLIZATION: Theory and types of crystallization, membrane separation, chiller equipments, performance evaluation.

Module III

MECHANICAL SEPARATION: Cyclones, centrifuges, filters, size reduction equipments, mixers, chemical reactors and bio-reactors, performance evaluation.

COOLING TOWERS: Cooling tower system, types, performance parameters – range,

approach, cycles of concentration, effectiveness, cooling tower losses, factors affecting performance, flow control strategies, energy saving opportunities, performance improvement.

REFERENCES:

1. Royce N Brown, "Compressors: Selection and Sizing" Third Edition", Gulf ` Professional Publishing, 2005.
2. James R Couper, W Roy Penney and James R Fair, "Chemical Process Equipment: Selection and Design", Stan Walas Gulf Professional Publishing, 2004.
3. Ernest E Ludwig, "Applied Process Design for Chemical and Petrochemical Plants", Vol. 3, Gulf Professional Publishing, 2001.
4. Ernest E Ludwig, "Applied Process Design for Chemical and Petrochemical Plants", Vol. 1, Gulf ProfessionalPublishing, 1995.

Structure of the Question paper

For the End Semester Examination the question paper will consist of three questions from each module out of which two questions are to be answered by the students

RII 2001 **.NET PROGRAMMING** **3-0-0-0**

Lecture	: 3 hrs/ Week	Credits	:	3
Internal Continuous Assessment			:	40 Marks
End Semester Examination			:	60 Marks

Course Objectives

- To impart conceptual, programming and application level aspects of .NET platforms

Learning Outcomes

- The student gets a thorough understanding of the fundamental principles of .NET frame work and acquires ability to do programming in .NET platforms for real-life applications

MODULE 1

.Net architecture, Name-spheres, Assemblies, object oriented features, memory management, interoperation with IOM, transaction in .NET, Structured exception handling, code access security.

MODULE 2

VB.NET: Similarities & differences with Visual Basic, windows focus, ADO.NET, working with databases, object oriented features.cASP.NET: Similarities & difference with ASP, Architecture, web form development, XML, databases interface.

MODULE 3

C++ .NET: Similarities & differences with C/C++, Creating components, window four, menus, validation, database interface. .NET: Security framework, .NET performance counters, Managed / Unmanaged code, .NET configuration files.

References

1. A. Chakraborti et. al., "Microsoft .NET framework", PHI, 2002.
2. M. Reynolds et. al., ".NET Enterprise", Wrox/SPD, 2002
3. J. P. Hamilton, "Object Oriented Programming with VB .NET", O'reilly, 2002.

Structure of the Question paper

For the End Semester Examination the question paper will consist of at least 50% analytical problems. There will be three questions from each module (with sub-divisions) out of which two questions are to be answered by the students.

RII 2002

JAVA PROGRAMMING

Lecture	: 3 hrs/ Week	Credits	:	3
Internal Continuous Assessment			:	40 Marks
End Semester Examination			:	60 Marks

Course Objectives

- To impart conceptual, programming and application level aspects of Java

Learning Outcomes

- The student gets a thorough understanding of the fundamental principles of Java coding and interface design and acquires ability to do programming in Java platform for real-life applications.

MODULE 1

Java Fundamentals : Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures, Classes and objects, inheritance, polymorphism, parameter passing. Java Classes : Abstract classes, Static classes, Inner classes. Packages, Wrapper classes, Interfaces, *final, this, super*, Access control. Exception handling : Exception as objects, Exception hierarchy, *try, catch, finally, throw, throws*.

MODULE 2

IO package: Byte streams - Input streams , Output streams, Character streams – Reader, Writer. Files, Object serialization, De-serialization. String handling: String and StringBuffer classes. Multi threading: Thread life cycle, use of Thread class and Runnable interface, thread creation, priority, Synchronization. Networking – classes and interfaces, communication using stream and datagram sockets, URL class. Applet class, Applet life cycle, Passing parameters embedding in HTML.

MODULE 3

Event handling- delegation event model, event classes, event listener interfaces. Introduction to AWT programming: window fundamentals, working with Frames, Graphics, Color, Font, AWT controls and event handling, Layout managers, Swings – features, components, sample programs. Database connectivity: JDBC architecture, Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Dynamic queries, Working with *ResultSet.* Basics of Beans, EJB.

References:

1. Herbert Schildt , "Java: The Complete Reference", 8/e, Oracle Press, 2011.
2. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I - Fundamentals", 8/e, Sun Micro Systems Press, 2008.
3. Cay S. Horstmann, Gary Cornell, "Core Java, Volume II - Advanced Features", 8/e, Sun Micro Systems Press, 2008.
4. E.Balaguruswamy, "Programming with Java A Primer", Tata McGraw Hill.

Structure of the Question paper

For the End Semester Examination the question paper will consist of at least 60% programming/analytical problems. There will be three questions from each module (with sub-divisions) out of which two questions are to be answered by the students.

RCI 2001

OBJECT ORIENTED MODELING AND DESIGN

Lecture	:	3 hrs/ Week	Credits	: 3
Internal Continuous Assessment			:	40 Marks
End Semester Examination			:	60 Marks

Course Objectives

- To impart conceptual and application level aspects of object oriented modelling and design

Learning Outcomes

- The student gets a thorough understanding of the fundamental principles of object-oriented modelling and design and is able to apply the principles in practical scenarios.

MODULE 1

Structural Modeling: Object Oriented Fundamentals, Basic structural Modeling, UML Model, Class Diagrams, Object Diagrams, Packages and Interfaces, Case Studies. Behavioral and architectural Modeling: Use Case Diagrams, Interaction Diagrams, State Chart Diagrams, Collaborations, Design Patterns, Component Diagrams, Deployment Diagrams, Case Studies.

MODULE 2

Object oriented Testing Methodologies: Implications of Inheritance on Testing, State Based Testing, Adequacy and Coverage, Scenario Based Testing, Testing Workflow, Case Studies, Object Oriented Metrics.

MODULE 3

Components: Abuses of inheritance, danger of polymorphism, mixin classes, rings of operations, class cohesion and support of states and behavior, components and objects, design of a component, lightweight and heavy weight components, advantages and disadvantages of using components.

References:

1. Page Jones M., "Fundamentals of Object Oriented Design in UML", Pearson Education
2. Booch G., Rumbaugh J. & Jacobsons I., "The Unified Modeling Language User Guide", Addison Wesley

3. Bahrami A., "Object Oriented System Development", McGraw Hill
4. References
5. Baugh J., Jacobson I. & Booch G., "The unified Modeling Language Reference Manual", Addison Wesley
6. Man C., "Applying UML & Patterns: An Introduction to Object – Oriented Analysis & Design", Addison Wesley
7. Ooley R. & Stevens P., "Using UML: Software Engineering with Objects & Components", Addison Wesley

Structure of the Question paper

For the End Semester Examination the question paper will consist of at least 40% analytical problems. There will be three questions from each module (with sub-divisions) out of which two questions are to be answered by the students.

RCI 2002

SOFTWARE PROJECT MANAGEMENT

Lecture	:	3 hrs/ Week	Credits	: 3
Internal Continuous Assessment			:	40 Marks
End Semester Examination			:	60 Marks

Course Objectives

- To impart conceptual and application level aspects of software project management

Learning Outcomes

- The student gets a thorough understanding of the fundamental principles of software project management and is able to apply the principles in practical scenarios.

MODULE 1

Introduction to Software Project Management: Software development as a project; Stakeholders in software project; Software product, process, resources, quality, and cost; Objectives, issues, and problems relating to software projects. Overview of Project Planning: Steps in project planning; Defining scope and objectives; work breakdown structure; Time, cost, and resource estimation; Alternatives in planning Project Evaluation: Strategic assessment; Technical assessment; Cost benefit analysis; Cash flow forecasting; Cost benefit evaluation techniques; Break even analysis; Risk evaluation Selection of Appropriate Project Approach: Choosing development technology and methodology; choice of process model; Rapid application development; Waterfall model; V-process model; Spiral model; Prototyping; Incremental delivery.

MODULE 2

Software Effort Estimation Problem in software estimation; Effort estimation techniques; Expert judgment; Estimation by analogy; Delphi technique; Algorithmic methods; Top-down and bottom-up estimation; Function point analysis; Object points; COCOMO model. Activity Planning Network planning model; activity-on-arrow network; Precedence network; Forward pass; Backward pass; Critical path; Slack and float. Risk Analysis and Management Nature and categories of risk in software development; risk Identification; Risk assessment; Risk mitigation, monitoring, and management; Evaluating schedule risk using PERT. Recourse Allocation Nature of project resources; Identifying resource requirement of activities; Allocating and scheduling resources; cost of resources; Standard, planned, and actual cost; Cost variance; time-cost tradeoff.

MODULE 3

Project Tracking and Control Measurement of physical and financial progress; Earned value analysis; Status reports; Milestone reports; Change control. Contract Management Outsourcing of products and services; Types of contracts; Stages in contract placement; Terms of contract; Contract monitoring; Acceptance testing Managing People and Organizing Teams Organizational behaviour; Recruitment and placement; Motivation; Group behaviour; Individual and group decision making; Leadership and leadership styles; forms of organizational structures. Software Quality Assurance Planning for quality; Product versus process quality management; Procedural and quantitative approaches; Defect analysis and prevention; Statistical process control; Pareto analysis; Causal analysis; Quality standards; ISO 9000; Capability Maturity Model; Quality audit. Configuration Management Configuration management process; Software configuration items; Version control; change control; Configuration audit; Status reporting.

References:

1. Bob Hughes and Mike Cotterell, "Software Project Management", 3/e, 2002, McGrawHill
2. Pankaj Jalote, "Software Project Management in Practice", 2002, Pearson Education Asia.
3. Roger S. Pressman, "Software Engineering: A practitioner's Approach", 5/e, 2001 McGrawHill
4. Robert T. Futrell, Donald F. Shafer, and Linda I. Shafer, "Quality Software Project Management" 2002, Pearson Education Asia.
5. Ramesh Gopalaswamy, "Managing Global Software Projects", 2003, Tata McGrawHill

Structure of the Question paper

For the End Semester Examination the question paper will consist of at least 40% analytical problems. There will be three questions from each module (with sub-divisions) out of which two questions are to be answered by the students.

RCI 2003

BASIC DATA STRUCTURES AND ALGORITHMS

Lecture	:	3 hrs/ Week	Credits	: 3
Internal Continuous Assessment			:	40 Marks
End Semester Examination			:	60 Marks

Course Objectives

- To gain basic concepts about
  - Algorithms and complexity analysis
  - Data structures and their use in different algorithms
  - Sorting and searching techniques

Learning Outcomes

- Basic understanding of the various data structures and their applications, and analysis of algorithms.

MODULE 1

Introduction to data structures and algorithms, Analysis of algorithms- frequency count, order notations. Linear and non-linear data structures, Arrays – 1D arrays-memory allocation- operations-applications, Multidimensional arrays-sparse matrices, Linked lists – Single linked lists-Circular lists-Double linked lists-operations-Applications-Polynomial arithmetic. Stacks- operations-Applications –Evaluation of arithmetic expressions- Recursion, Queues- Circular Queue-Deque-Priority Queue – Applications-CPU Scheduling, Tables – hash tables –hashing techniques

MODULE 2

Trees – Binary trees- properties-operations-types of binary trees – expression trees-binary search trees- heap trees –heightbalanced trees- AVL trees-rotation-BTrees(fundamental concepts only)- applications. Graphs – terminologies-representation- traversals-applications-shortest path- Dijkstra's algortithm, Topological sorting-minimum spanning trees – Kruskal's algorithm, Hamiltonian circuits, BDD and its applications.

MODULE 3

Sorting – Bubble sort, Insertion sort, Selection sort, Radix Sort , Merge sort, Quick sort, Heap Sort, Searching – Linear and Binary Search -Preliminary time and space complexity analysis of sorting and searching algorithms.

References

1. Samanta, "Classic Data Structures", 2/e, Prentice-Hall India Private Limited, 2012.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2/e, Pearson Education, 2007.
3. Robert Kruse, C.L. Tondo,Bruce Laung, Shashi Mogalla, "Data Structures and Program Design in C", 2/e, Pearson Education, 2007.
4. Alfred V Aho, John E Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", 2/e, Pearson Education, 2007.

Structure of the Question paper

For the End Semester Examination the question paper will consist of at least 60% analytical/design problems. There will be three questions (with sub-divisions) from each module out of which two questions are to be answered.

TM1 2001 FUZZY SYSTEMS AND APPLICATIONS

Structure of the Course

Lecture: 3 hrs/ Week		Credits: 3
Internal Continuous Assessment	:	40 Marks
End Semester Examination	:	60 Marks

Course Objectives

- To comprehend what is meant by fuzziness.
- To develop an understanding of fuzzy theory and learn how to use the fuzzy systems approach to solving engineering problems

Learning Outcomes

- Aware of the concept of fuzziness involved in various systems.
- Adequate knowledge about fuzzy set theory.

Module I.

Introduction to fuzzy sets and sytems.Crisp set and Fuzzy set,Basic concepts of fuzzy sets,membership functions,support of a fuzzy set,height-Normalized fuzzy set,alpha cuts,Resolution Principle,Theoretic definitions on fuzzy sets,complement,intersection and union equality,subsethood-basic definition based on membership functions.Law of Excluded middle and law of contradiction on fuzzy sets.Properties of fuzzy set operations,Extensions of fuzzy set concepts-type2 and level 2 fuzzy sets-examples

Module II.

Operations on fuzzy sets-intersection, algebraic sum, product, bounded sum, bounded product, drastic sum, product ,t norms, s norms on fuzzy sets, typical parametrised t norms and s norms(simplified proof),Extension principle and its applications, Fuzzy relation, Resolution form of fuzzy relation. Operations on fuzzy relations-projection, min max, max min composition, cylindric extension. Similarity, Reflexivity, Symmetry, transitivity. Operations-Concentration, dilation, contrast intensification. Logical operations on fuzzy sets-Negation,conjunction,disjunction,implication.

Module III.

Fuzzy logic sytem,Fuzzification,Fuzzy rule base-simplification of compound rule base-fuzzy inference-max min,bounded product.Defuzzificztion-Center of gravity,center of sums,weighted average. Fuzzy pattern recognition-Feature analysis, partitions, identification ,multifeature recognition .Fuzzy control system-Simple controllers, general controllers,stability models,inverted pendulum,Airconditioner control,Aircraft landing control.

Reference

1. C.T.Lin and C S George Lee: *Neural Fuzzy sytems*,Prentice hall.
2. Timothy J Ross,*Fuzzy logic with Engineering applications*,2/e,McGraw Hill.
3. Yen,Fuzzy logic: Intelligence,Control and Instrumentation,Pearson education.

There will be three questions from each module out of which two questions are to be answered by the students.

TAI 2001 MECHATRONICS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- To explore the concepts of Mechatronics design and its applications.
- To Study about Mechanical , electrical Systems, Sensors & Transducers.
- To Study about CNC machines, DNC and PLC.

Learning Outcomes

- Understand the concepts of mechatronics design its applications.
- Understand Mechanical , electrical Systems, Sensors & Transducers.
- Understand and write part programming, APT programming & PLC Programming.

Module I

Introduction to Mechatronics - Mechatronics System Design - Integrated Design Issues in Mechatronics, Mechatronics Key Elements, The Mechatronics Design Process, Advanced Approaches in Mechatronics- Measurement systems, control systems. Modelling and Simulation of Physical Systems - Simulation and Block Diagrams, Analogies and Impedance Diagrams. Electrical Systems, Mechanical Translational Systems. Sensors & Transducers - Sensors for Condition Monitoring.

Module II

Mechatronic Control in Automated Manufacturing, Artificial Intelligence in Mechatronics, Fuzzy Logic Applications in Mechatronics, Microsensors in Mechatronics. Introduction to Modern CNC Machines - Advantages of CNC Machines. CNC Machining Centre Developments, Turning Centre Developments, Tool Monitoring on CNC Machines, Other CNC Developments. Manual part programming examples - point to point programming and simple contour programming, canned cycles, selection of tools.

Module III

Computer aided programming - concepts - APT programming – part programming examples- Geometric definitions- cutter motion definitions- postprocessor statements-generation and execution of APT programs. Configuration of the CNC System, Interfacing, Monitoring, Diagnostics, Machine Data, Compensations for Machine Accuracies, PLC Programming, Direct Numerical Control (DNC), Distributive Numerical control, DNC software.

References

1. Devdas Shetty & Richard A Kolk - *Mechatronics System Design* – PWS Publishing Company
2. *Mechatronics* – HMT Ltd., TMH
3. *Bolton-Mechatronics*- Pearson-Fourth edn.

There will be three questions from each module out of which two questions are to be answered by the students.

TSI 1001 ARTIFICIAL NEURAL NETWORKS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Introduce students to a range of topics in the field of artificial neural networks
- To provide knowledge on different architectures of neural networks
- To get an idea of different training algorithms like Hebbian learning, Perceptron learning, Winner Take all learning, Gradient Descent Learning, Widrow Hoff Learning upon which the different neural network structures are developed
- To equip the students with the architecture and algorithm of different neural network structures as Hebb net, ADALNE net, Associative networks, Hopfield net, Kohonen net, SOM net, ART network, Back Propagation net, RBF network, Boltzmann machine etc
- To introduce the students to the variety of applications of neural network algorithms like pattern association, classification problems, optimization problems etc so that they can develop network structures by their own.

Learning Outcomes

- Understand different aspects of neural networks research.
- Have an understanding of a variety of neural networks techniques as error back propagation learning, self-organising maps, Hopfield networks, counter propagation networks, adaptive resonant networks etc
- Analyse a problem for Neural Network solution in terms of these methods
- Have an awareness of the computational theory and algorithms underlying NNs
- Have motivation to try programming NN for different applications with available tools like Matlab

Module I

Introduction to Neural Networks - Applications - Biological Neurons and Neural Networks – Typical architecture of Artificial Neural Networks - Common activation functions - Mc. Culloh Pitts Neuron - Single Layer Perceptrons − linear Separability - Learning Algorithms - Hebbian Learning, Gradient Descent Learning, Widrow Hoff Learning , The Generalized Delta Rule, learning rates, Practical Considerations. ANN models for Pattern Classification − Hebb Net,Perceptrons, ADALINE networks , LMS algorithm

Module II

Pattern Association :- training algorithm for pattern association - Hetro Associative Network, Auto Associative Network, Hopfield Network, BAM Network - Architecture, Algorithm and simple Applications. Multilayer Perceptrons- Back Propagation algorithm − Applications. Radial Basis Function Networks- Network based on competition:- Self Organizing Maps - Kohonen Network- Learning Vector Quantization, Counter Propagation Network (Architecture, Algorithm and simple Applications).

Module III

Probabilistic Neural Networks-Bolzmann machine-Adaptive Resonance Theory:- ART 1 and ART 2 −-(Architecture, Algorithms and Applications) -Applications of neural networks-Optimization problems solving , System identification and control, decision making, pattern recognition,sequence recognition

References

1. Laurene Fausett, *Fundamentals of Neural Networks*, Pearson Education 2004.
2. Simon Haykin*, Neural Networks*, 2/e, Prentice Hall.
3. Christopher M. Bishop, *Neural Networks for Pattern Recognition* by Oxford University Press, 1995.
4. James A Freeman, David M. Skapura, *Neural Networks- Algorithms, Applications and Programming Techniques* , Pearson Education.
5. Bose & Liang, *Neural Network Fundamentals*, Mc Graw Hill.
6. Martin T. Hagan, Howard B. Demuth, Mark Beale*, Neural Network Design*, Vikas Thomson
7. S N Sivanandham, S Sumathi, S N Deepa*, Introduction to Neural Networks using Matlab 6.0,* Tata Mc.Graw Hill 2005

There will be three questions from each module out of which two questions are to be answered by the students.

TEI 3001 EMBEDDED SYSTEMS

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Objectives

- Introduce the student to the basic concepts of embedded systems
- Familiarize with the basic components of embedded system

Learning Outcomes

- Ability use embedded processors for product design
- Ability upgrade and trouble shoot products with embedded system components

Module I: AN INTRODUCTION TO EMBEDDED SYSTEMS

Concepts of RISC & CISC-An Embedded System- Processor in The System- Other Hardware Units- Software Embedded into a System- Exemplary Embedded Systems- Embedded Processor and Memory Organization: Structural Units In a Processor, Processor Selection for an Embedded System, Memory Devices, Memory Selection for an Embedded Systems, Allocation of Memory to Program Cache and Memory Management Links, Segments and Blocks and Memory Map of a System, DMA

Module II: 8051 MICROCONTROLLER

Architecture of 8051 - Signals - Operational features - Memory and I/O addressing - Interrupts - Instruction set – Applications - The software model – functional description – central processing unit, pin descriptions, operation of timers/counters, serial communication, exception and interrupts, input/output ports.

Module III: PIC MICROCONTROLLER

PIC microcontrollers: History and features Comparison of PIC with other CISC & RISC based systems and Microprocessors, 16f877 architecture and pin details, RAM, FLASH, UART. Interrupts and timers. ARM controller: Architecture – Memory Organization – Pipeline and cache concepts – ARM (32 bit) Architecture - Switching between ARM and THUMB instructions. Study of ARM CPU Cores-ARM710T, ARM 720T, ARM 740T

References

1. Rajkamal, “Embedded systems: Architecture, Programming and Design”, TMH
2. David Simon, “An embedded software primer”, Pearson Education 2004.
3. Arnold S Burger, “Embedded system design”, CMP
4. Steve Heath; Butterworth Heinenann,“Embedded systems design: Real world design”, Newton mass USA 2002.

There will be three questions carrying 10 marks each from each module out of which two questions are to be answered by the students. The question paper will consist of 60% problems and 40 % Theory.

TEI 3002: REAL TIME OPEARATING SYSTEM

Structure of the Course

Lecture	: 3 hrs/ Week	Credits	: 3
Internal Continuous Assessment	: 40 Marks		
End Semester Examination	: 60 Marks		

Course Objectives

- Ability to apply RTOS concepts for solving multi task applications

Learning Outcomes

- Understand, Analyze RTOS features and apply them for real time applications

MODULE I

Basics of operating systems– system calls – files – process –design and implementation of processes – Communication between processes message queues pipes, semaphores and monitors-readers writer's problem- operating system structures. Distributed systems: Characterization of distributed system- Design goals- Networking and internetworking – inter-processes communication-remote procedure call.

MODULE II

Distributed Operating System-Real Time operating system architecture –tasks and Tasks states – Semaphores and shared data-Message queues-Mail boxes-Timer functions-Events-Memory management –Interrupt routines in an RTOS environment – RTOS tasks – RTOS task scheduling models–Performance metric in scheduling models for periodic, sporadic and aperiodic tasks.

MODULE III

Interrupt priorities-Writing short ISRS. Saving memory space and saving power. Real time Kernels –design issues- polled loop systems – RTX 51: Overview-Task management – Interrupt management –Task communication –Mailboxes –Semaphore –Dynamic Memory management – Time management –Function calls. Case Studies: Embedded RTOS for voice over IP, RTOS for control systems.

References

1. Hermann Kopetz, "*Real-Time Systems – Design Principles for Distributed Embedded Applications*", Kluwer Academic, 1997.
2. Rajib Mall, "*Real-Time Systems: Theory and Practice*", Pearson education, 2007
3. Charles Crowley, "*Operating System – A design oriented approach*", McGraw Hill, 1997.
4. Labrosse, Jean J., "*MicroC/OS-II-The Real Time Kernel, 2nd Edition*", CMP Books, 2002
5. David E. Simon, "*An Embedded Software Primer*", Pearson Education, 2002
6. Jane W. S. Liu, "*Real-Time Systems*", Pearson Education,2006
7. www.keil.com/rtx51/

There will be three questions carrying 10 marks each from each module out of which two questions are to be answered by the students. The question paper will consist of 60% problems and 40 % Theory.

TEI 3003 SOFTWARE ENGINEERING

Structure of the Course

Lecture	: 3 hrs/ Week	Credits	: 3
Internal Continuous Assessment	: 40 Marks		
End Semester Examination	: 60 Marks		

Course Objectives

- Familiarize with the principles of software engineering

Learning Outcomes

- Ability to use the principles of software engineering in embedded system design

MODULE I

Introduction to software engineering, Process models- Waterfall model, Incremental process models, Evolutionary Process, An Agile view of process- Agility, Agile process, Agile process models, Managing Software Project- Management spectrum- People, Product, Process, Project.

MODULE II

Matrices for process and projects-Matrices in the Process and Project Domain, Software Measurement- File Oriented Matrices, Function oriented Matrices, Object Oriented Matrices, Software Configuration Management- Overview, Software Configuration, Management Activity.

MODULE III

ISO 9000- Origin of ISO 9000, ISO Standards- Development Process, Software CMM and other Process Improvement Models, P-CMM, Six Sigma, Product Quality and Process Quality. Software Testing- Purpose of Testing, Inspection and Testing, Testing of Life Cycle.

References

1. Roger *S*. Pressman, Software Engineering, "*A Practitioner's Approach, Sixth Edition",* McGraw Hill, 2004.
2. Sommervalle, "*Software Engineering, Seventh Edition*", Addison Wesley,2000
3. Nina S Godbole, "*Software Quality Assurance: Principles and Practical Practice*", Alpha Science International, 2004
4. Ilene Burnstein, "*Practical Software Testing"*, Springer Publications.
5. Swapna Kishore, "*ISO 9001:2000 Implementation in Software Organizations"*, TMH, 2005
6. Rajib Mall, "*Software Engineering*", PHI.

There will be three questions carrying 10 marks each from each module out of which two questions are to be answered by the students. The question paper will consist of 60% problems and 40 % Theory.

TCI3001 MULTIMEDIA COMMUNICATION

Structure of the course:

Lecture: 3 hrs/ Week Credits: 3
Internal Continuous Assessment: 40 Marks
End Semester Examination : 60 Marks

Course Learning Objectives:

- To introduce the concept of multimedia communication systems
- To have an idea on various Computer and Multimedia Networks
- To study various Compression techniques & Standards

Course Outcomes:

- Understand the issues related to various Computer and Multimedia Networks
- Understand various Compression techniques & Standards

Module I

Introduction to multimedia systems, Definition of terms and concepts related to multimedia. Trends in the development and the use of multimedia, Tools, techniques, and guidelines facilitating the planning, design, production, and implementation of multimedia products.

Module II

Introduction to Compression techniques - Lossless Compression, Lossy Compression. Entropy coding, SourceEncoding. Text Compression – Static Huffman coding, Arithmetic Coding, LZ Coding, LZW Coding. ImageCompression- JPEG. Audio Compression- Differential Pulse code modulation (DPCM), Adaptive DPCM,MPEG audio coders, Dolby audio coders Video Compression- Video Compression Principle, frame types, Motion estimation and compensation,MPEG-1, MPEG-2, MPEG-4,MPEG-7

Module III

Computer and Multimedia Networks: Basics of Computer and Multimedia NetworksMultiplexing Technologies, LAN and WAN, Access Networks, Common Peripheral Interfaces. . Multimedia networking: ATM, RTP, RSVP, RTSP, multicasting: storage and server issues, Multimedia processors, mobile multimedia, watermarking, Multimedia systems: Video on Demand (VoD), Video conferencing, HDTV Multimedia Systems

References

1. Raghavan S.V and Tripathi S.K: Networked Multimedia systems: Concept, Architecture and Design, Prentice Hall, 1998.
2. Ze-Nian Li and M. S. Drew, “Fundamental of Multimedia”, Pearson Education,2004.
3. R. Parekh. Principles of Multimedia, TMH,2006
4. Khalid Sayood Introduction to Data Compression, Second Edition, Morgan Kaufmann Publishers,2005

5. S. Pandey and M. Pandey. Multimedia : System, Technology a Communication, Katharia and Sons publishing,2010

There will be three questions from each module out of which two questions are to be answered by the students. It shall have 60% problems and 40% theory.

TCI3002 FUZZY SYSTEM

Structure of the course:

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Learning Objectives:

- To introduce the concept of fuzzy systems.
- To study various operations in fuzzy sets.
- To study design of various fuzzy logic system.

Course Outcomes:

- Able to design various fuzzy logic systems and Fuzzy control systems.
- Able to do various operations in a fuzzy set.

Module I

Introduction to Fuzzy sets and systems. Basics of fuzzy sets, membership function, support of a fuzzy set, height - Normalised fuzzy set, α - cuts (decomposition of a fuzzy set), set theoretic definitions on fuzzy sets, complement, intersection and union equality, subsethood - basic definition based on membership functions. The law of the excluded middle and law of contradiction on fuzzy sets.Properties of fuzzy sets operations (logical proof only). Extension of fuzzy sets concepts - type-2 and level 2 fuzzy sets - examples.

Module II

Operations on fuzzy sets - intersection, algebraic sum - product, bounded sum - product, drastic sum product, Extension principle and its applications. Fuzzy relation.Resolution form of a binary fuzzy relation.Operations on fuzzy relations - projection, max.-min. and min and max, compositions cylindric extension.Similarity relations - Reflexivity, symmetry, transitivity.Further operations on fuzzy sets, concentration, dilation, contrast intensification, linguistic hedges. Logical operations on fuzzy sets – Negation – Conjunction, disjunction, implication, fuzzy inference.

Module III

Block diagram of a fuzzy logic system. Fuzzy rule base – simplification of compound rule base – fuzzy inference – max. – min, max product, max drastic product, max bounded product. Defuzzification – Centre of gravity, center of sums, weighted average etc. Fuzzy pattern recognition-Feature analysis, Partitions, of the feature space,Single sample identification, Multifeature recognition. Fuzzy control systems- Review of control theory for fuzzy controls, Simple controllers, General controllers, Stability, Models, Inverted pendulum, Aircraft landing control, Air conditioner control.

References

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley India,2011
2. Ahamad M. Ibrahim : Introduction to Applied Fuzzy Electronics, PHI.1996
3. S. Rajasekharan, G A VijayalakshmiPai: Neural Networks, Fuzzy logic and Genetic Algorithms, PHI.2009
4. Klir and Yuan: Fuzzy Sets and Fuzzy Logic- Theory and Applications, Prentice Hall of India.2009
5. Yen: Fuzzy Logic: Intelligence, Control and Instrumentation , Pearson Education, 2002.

There will be three questions from each module out of which two questions are to be answered by the students. It shall have 60% problems and 40% theory.

TCI3003 MICROCONTROLLER BASED SYTEM DESIGN

Structure of the course:

Lecture : 3 hrs/ Week Credits : 3
Internal Continuous Assessment : 40 Marks
End Semester Examination : 60 Marks

Course Learning Objectives:

- To study the architecture &programming of 8051 micro controller
- To introduce the architecture &programming of PIC microcontroller

Course Outcomes:

- Able to design various micro controller based systems .
- Able to solve issues related to various micro controller systems

Module I

An introduction to embedded systems: Concepts of RISC & CISC. An Embedded System, Processor in The System, Other Hardware Units, Software Embedded into a System.8051 MICROCONTROLLER: Architecture of 8051 - Signals - Operational features - Memory and I/O addressing, Instruction set – Programming

Module II

Programming timer/counter. Interrupts- handling and programming. Serial communication using 8051- Interfacing with RS232. 8051 interfacing - keyboard, stepper motor, ADC , DAC, and LCD Module interface. Applications - square wave and rectangular wave generation, frequency counter and temperature measurement. Development & Debugging tools for microcontroller based system design: software and hardware tools like {cross assembler, compiler, debugger, simulator, in-circuit emulator and logic analyser

Module III

PIC microcontroller: PIC microcontrollers: History and features Comparison of PIC with other CISC & RISC based systems and Microprocessors, 16f877 architecture and pin details ARM CONTROLLER: Architecture – Memory Organization – Pipeline and cache concepts – ARM (32 bit) Architecture , Study of ARM CPU Cores-ARM710T, ARM 720T, ARM 740T.

References

1. Muhammad Ali Mazidi, *The 8051 microcontroller and Embedded System*, 2006, Pearson Education.
2. Kenneth Ayala, The 8051 Microcontroller, 3/e, Thomson Publishing, New Delhi,2000.
3. PIC 16F877 data book &ARM processor Data book.
4.Andrew N Sloss,DominicSymes,Chris Wright, *ARM Developer's Guide,* Elsevier , 2004
5.Wayne Wolf, Computers as Components: Principles of Embedded Computing system design, ElseVier,2005.

There will be three questions from each module out of which two questions are to be answered by the students. It shall have 60% problems and 40% theory.

TNI 3001 **NANO ELECTRONICS**

Structure of the Course

Lecture : 3 hrs/ Week Credits : 3

Internal Continuous Assessment : 40 Marks

End Semester Examination : 60 Marks

Course Objectives

- Introduction to electronics at nano scale.
- Get a thorough understanding of laws governing atomic structure, reversible computation and quantum logic

Learning Outcomes

- After the course the student will be capable to Design, analyze, and develop quantum computing systems

Module I

An atomistic view of electronic conduction, Schrodinger equation, Self-consistent field -Basis functions, Band structure, Sub-bands - Capacitance, Level broadening Coherent transport - Atom to transistor and new paradigms in nano electronics - Modeling and Analysis of single electron transistor (SET).

Module III

Carbon materials – Allotropes of carbon – Structure of carbon nanotubes – Types of CNTs – Electronic properties of CNTs – Band structure of Graphene – Band structure of SWNT from graphene – Electron transport properties of SWNTs – Scattering in SWNTs – Carrier mobility in SWNTs.

Module III

Material Wave Nanotechnology: Nanofabrication Using a de Broglie Wave-Electron Beam Holography – Atomic Beam Holography- Nanometer Lithography Using Organic Positive/Negative Resists – Sub-10 nm Lithography Using Inorganic Resist – 40 nm-Gate-Length Metal-Oxide-Semiconductor Field-Emitter-Transistors-14 nm Gate-Length.

References

1. S. Data, *"Quantum Transport: Atom to Transistor",* Cambridge University Press, 2005
2. David K. Ferry, Shunt Oda, *"Silicon Nanoelectronics",* CRC Press, 2005
3. Ali Javey and Jing Kong, ―*Carbon Nanotube Electronics*‖ Springer Science media, (2009).