BTech Courses for Semester VIII

Computer Science and Engineering

Sl. No.	Sem	Subject Code	Name of the subject	L	T	P	C
Core Courses							
1	VIII	CS499	Project - II	0	0	16	16
Departmental Elective Courses							
2	VIII	CSxxx	Departmental Elective - III	3	0	0	6
3	VIII	CSxxx	Departmental Elective - IV	3	0	0	6
Open Elective Courses							
4	VIII	XX4xx	Open Elective - II	3	0	0	6
HSS Elective Course							
5	VIII	HS4xx	HSS Elective	3	0	0	6
			Total	**12**	**0**	**16**	**40**

List of Departmental Elective Courses for Computer Science and Engineering:							
Sl. No.	**Sem**	**Subject Code**	**Name of the Subject**	**L**	**T**	**P**	**C**
1	VIII	CS449	Computer and Network Security	3	0	0	6
2	VIII	CS452	Internet Protocols	3	0	0	6
3	VIII	CS453	Wireless Sensor Networks	3	0	0	6

Electrical Engineering

Sl. No.	Sem	Subject Code	Name of the subject	L	T	P	C
Core Courses							
1	VIII	EE499	Project - II	0	0	14	14
Departmental Elective Courses							
2	VIII	EExxx	Departmental Elective - III	3	0	0	6
3	VIII	EExxx	Departmental Elective - IV	3	0	0	6
Open Elective Courses							
4	VIII	XX4xx	Open Elective - II	3	0	0	6
HSS Elective Courses							
5	VIII	HS4xx	HSS Elective	3	0	0	6
			Total	**12**	**0**	**14**	**38**

List of Departmental Elective Courses for Electrical Engineering:							
Sl. No.	**Sem**	**Subject Code**	**Name of the Subject**	**L**	**T**	**P**	**C**
1	VIII	EE483	Distributed Energy Resources	3	0	0	6
2	VIII	EE491	Visual Surveillance Systems	3	0	0	6

Mechanical Engineering

Sl. No.	**Sem**	**Subject Code**	**Name of the subject**	**L**	**T**	**P**	**C**
Core Courses							
1	VIII	ME499	Project - II	0	0	16	16
Departmental Elective Courses							
2	VIII	MExxx	Departmental Elective - III	3	0	0	6
3	VIII	MExxx	Departmental Elective - IV	3	0	0	6
Open Elective Courses							
4	VIII	XX4xx	Open Elective - II	3	0	0	6
HSS Elective Courses							
5	VIII	HS4xx	HSS Elective	3	0	0	6
			Total	**12**	**0**	**16**	**40**

List of Departmental Elective Courses for Mechanical Engineering:							
Sl. No.	**Sem**	**Subject Code**	**Name of the Subject**	**L**	**T**	**P**	**C**
1	VIII	ME442	Aerodynamics	3	0	0	6
2	VIII	ME446	Composite Materials and Engineering	3	0	0	6
3	VIII	ME448	Rotor Dynamics	3	0	0	6

List of Open Elective - II Courses:							
Sl. No.	**Sem**	**Subject Code**	**Name of the Subject**	**L**	**T**	**P**	**C**
1	VIII	MA412	Matrix Computation	3	0	0	6
2	VIII	PH403	Photovoltaics & Fuel Cell Technology	3	0	0	6

List of HSS Elective Courses:							
Sl. No.	**Sem**	**Subject Code**	**Name of the Subject**	**L**	**T**	**P**	**C**
1	VIII	HS421	Fundamentals of Cognitive Science	3	0	0	6
2	VIII	HS441	Industrial and Organizational Psychology	3	0	0	6

Department of Computer Science and Engineering

Detailed Syllabi

CS499 **Project-II** **(0 0 16 16)**

Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members.

Computer Science and Engineering Departmental Elective Courses

CS449 **Computer and Network Security** **3-0-0-6**

Prerequisites: Operating Systems (CS341) and Computer Networks (CS348)

Overview, vulnerabilities, risk assessment, incidents. Cryptography: Classical Cryptography, Symmetric Cryptography, Public Key (Asymmetric cryptography), Modern Cryptography, Hash Functions, Key Exchange. Review: Installing Unix and common service daemons (Unix Security, Windows NT Security, Ping, traceroute, TCP Dump, sniffer etc.), Networking. Security issues: Terminology (Integrity, Availability, Confidentiality, Non-repudiation, Authentication, Authorization/Access Control, accounting, auditing, Passive and Active Attacker, Interruption, Interception, Modification, Fabrication, Social Engineering), Vulnerabilities and Counter Measures (Viruses, worms, Trojan horses, backdoors, unused services, buffer overflows, RPC), Exploits (Buffer overflow, Port Scanning etc). Applications Security (System Security, Audit Logs Intrusion Detection, Wrappers, Password and remote authorization tools e.g. PGP, S/MIME, SSH, Netscape/SSL, SET, IPsec, Kerberos, Firewalls, VPN etc, Secure (commerce) Transaction over a network, Network Anonymity.

Texts:

1. W. Stallings, Cryptography and Network Security: Principles and Practice, 3rd Ed, Prentice Hall, 2003.

References:

1. B. Schneier, Applied Cryptography, 2nd Ed, John Wiley & Sons, Inc., 1996.
2. A. Menezes, P. van Oorshot and S. Vanstone, Handbook of Applied Cryptogrphy, CRC Press, 1997.
3. C. Kauffman, R. Perham and M. Speciner, Network Security: Private Communication in a Public World, Prentice-Hall, 1994.
4. H. C. A. van Tilborg, Fundamentals of Cryptology, Kluwer Academic Publishers, 2000.

5. P. Garrett, Making and Breaking Codes: An Introduction to Cryptology, Prentice-Hall, 2001.
6. P. Wayner, Disappearing Cryptography, 2nd Ed, Morgan Kaufmann, 2002.
7. W. Cheswick, S. Bellovin and A. Rubin, Firewalls and Internet Security. Repelling the Wiley Hacker, 2nd Ed, Addison-Wesley, 2003.
8. Related publications in Journals/Conferences.

CS452 Internet Protocols 3-0-0-6

Prerequisites: CS348 or equivalent

Overview of IPv4, TCP, IPv6, ICMP, ARP, DHCP; Routing Protocols: OSPF, RIP, BGP, Ad hoc network routing (AODV, DSR); IP Security: NAT, IPSEC, Socks, SSL; Quality of Service related protocols: Intserv, diffserv, Queuing techniques (WFQ, RED, etc.); Multi-Protocol Label Switching (MPLS) and GMPLS; Virtual Private Network (VPN) Protocols: L2TP, PPTP; Overview of Application Layer Protocols: DNS, LDAP, SMTP, POP3, IMAP4, SNMP; Voice over IP Protocols (VOIP) and videoconferencing: SIP, H323. Server Load Balancing Techniques.

Texts:

1. Adolfo Rodriguez, et. al, *TCP/IP Tutorial and Technical Overview*, IBM Redbook, available online at http://www.redbooks.ibm.com/pubs/pdfs/redbooks/gg243376.pdf, 2001.

References:

1. Charles. M.Kozierek, TCP/IP Guide, Shroff Publishers, Mumbai, 2005.
2. Uyless Black, MPLS and Label Switching Networks, Pearson Education (LPE), 2002.
3. Request for Comments (RFC) from www.ietf.org.

CS453 Wireless Sensor Networks 3-0-0-6

Prerequisites: Nil

Introduction to ad hoc networks. Routing- Proactive routing protocols, Reactive routing protocols, backbone, Position based routing, power efficient routing; Introduction to sensor networks and its applications: Architecture and factors influencing the sensor network design. Routing protocols-data centric routing protocols, hierarchical routing protocols, location based routing, energy efficient routing etc; Node Scheduling and coverage issues, topology control. Querying, data collection and processing, Collaborative information processing and group connectivity. Target tracking and identity management using sensor networks. Localization . Application & future research Challenges.

Texts :

1. Wireless Sensor Networks : A systems perspective By Nirupama Bulusu and Sanjay Jha, editors Artech House, August 2005.
2. F. Zhao and L. Guibas. Wireless Sensor Networks: An Information Processing Approach. Elsevier/Morgan-Kaufmann, 2004.
3. Wireless Sensor Networks : Architecture and Protocols By Jr., Edgar H. Callaway.
4. Wireless Sensor Networks, An Edited Book Editors : C.S Raghavendra, Krishna M. Sivalingam and Taieb Znati.

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EE499 **Project-II** **(0 0 14 14)**

Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members.

Electrical Engineering Departmental Elective Courses

EE483 **Distributed Energy Resources** **3-0-0-6**

General Overview of electricity demand and supply, and industry structure: Vertically integrated electricity supply industry, Restructuring, Electric energy management in restructured environment, Electricity markets.
Distributed generation technologies for increased efficiency: Distributed generation technologies, Integration issues, Future network architectures with DGs, Microgrids, Economics of distributed resources.
Wind turbine generation systems: Types, Power in the wind, Impact of tower height, Rotor efficiency, Wind turbine generators, Speed control, Performance of grid connected WTG, Economics, Environmental impacts.
Solar resources and photovoltaic (PV) systems: Solar spectrum, Insolation measurement, Photovoltaic systems and its engineering aspects, Standalone and grid connected PV systems.
Other renewable energy sources: Elementary concepts of fuel cell, Biomass, Tidal energy, Microturbines and their analysis for engineering application.
Energy Storage: Lead acid batteries, Ultra capacitors, Fly wheels, Superconducting magnetic storage, Pumped hydro electric storage, Compressed air energy storage.
Demand side management: Application of smart devices, Distribution automation, Demand Optimization.

Texts:

1. N. Jenkins, J.B. Ekanayake, G. Strbac, *Distributed Generation*, IET, Renewable Energy Series, 2010
2. Gilbert M. Masters, *Renewable and Efficient Electric Power Systems*, Wiley, 2004.

References:

1. A. Keyhani, M.N. Marwali, *Integration of Green and Renewable Energy in Electric Power Systems*; Wiley, 2010.
2. F.A. Farret, M. Godoy Simoes, *Integration of Alternative Sources of Energy*; IEEE Press, 2006.
3. L. Freris, D. Infield, *Renewable Energy in Power Systems*; Wiley, 2008.

4. D. Pimentel, *Biofuels, Solar and Wind as Renewable Energy Systems*; Springer, 2008.
5. P. A. Rizzi, *Wind and Solar Power Systems: Design, Analysis and Operation*; 2/e, Taylor & Francis, 2006.

EE491 Visual Surveillance Systems 3-0-0-6

Prerequisites: Image Processing

Basics of Image and Video Processing: Introduction to Image Processing methods, Image Transforms, Color spaces, An overview of Video Compression Standards: H. 261, H. 263, MPEG-1, MPEG-2, MPEG-4, MPEG-7, and MPEG-21, Video shot boundary detection, motion modeling and segmentation techniques.
Object Detection and Classification- Shape based object classification, motion based object classification, Silhouette-Based Method for Object Classification, Haar like feature based object detection, Viola Jones object detection framework, Multiclass classifier boosting.
Multi-Object Tracking- Classification of multiple interacting objects from video, Region-based Tracking, Contour-based Tracking, Feature-based Tracking, Model-based Tracking, Hybrid Tracking, Particle filter based object tracking, Mean Shift based tracking, Tracking of multiple interacting objects.
Human Activity Recognition- Template based activity recognition, Sequential recognition approaches using state models (Hidden Markov Models), Human Recognition Using Gait, HMM Framework for Gait Recognition, View Invariant Gait Recognition, Syntactic and Statistical approaches, Description based approaches, Human interactions, group activities, Applications and challenges.
Camera Network Calibration - Types of CCTV (closed circuit television) camera- PTZ (pan-tilt zoom) camera, IR (Infrared) camera, IP (Internet Protocal) camera, wireless security camera, Multiple view geometry, camera network calibration, PTZ camera calibration, camera placement, smart imagers and smart cameras
Security and Privacy of visual surveillance- Reliable visual data protection technique without sacrificing perceptual utility, secure authentication and privacy of visual surveillance.
Implementation of algorithms based on OpenCV (or Matlab) is covered in the course.

Text Books

1. Murat A. Tekalp, "*Digital Video Processing*", Prentice Hall, 1995.
2. Y. Ma and G. Qian (Ed.), "*Intelligent Video Surveillance: Systems and Technology***"**, CRC Press, 2009.
3. Q. Huihuan, X. Wu, Y. Xu, "*Intelligent Surveillance Systems*", Springer Publication, 2011.
4. H. Aghajan and A. Cavallaro (Ed.), *Multi-Camera Network: Principles and Applications***"**, Elsevier, 2009.
5. A senior (Ed.), "*Privacy Protection in Video Surveillance"*, Elsevier, 2009.

Reference Books

1. Dr. Richard Szeliski, "*Computer Vision: Algorithms and Applications*", Springer Publication, 2010.

Department of Mechanical Engineering

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ME499 Project-II (0 0 16 16)

Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members.

Mechanical Engineering Departmental Elective Courses

ME442 Aerodynamics 3-0-0-6

Prerequisites: ME 204, ME 206

Review of Fluid Mechanics: Navier-Stokes equations, Boundary layer theory, Potential flows, Concepts of lift and drag, Turbulence, Compressible flows, Shock and expansion waves
Incompressible Flow Applications: Incompressible flow over airfoils: Kutta condition, Kelvin's circulation theorem, Classical thin airfoil theory, Incompressible flow over finite wings: Prandtl's classical lifting line theory, Delta wings, Three-dimensional incompressible flows, Panel techniques.
Compressible Flow Applications: Subsonic compressible flow over airfoils: linear theory, critical Mach number and Drag-divergence Mach number, Supercritical Airfoil, Supersonic flows: Non-linear techniques. Elements of hypersonic flow.
Practical Applications: Flow over a complete airplane, Motion of kite and insect/bird, Motion of a Helicopter, Oscillating wings, Aerodynamics for high lift devices, High angle of attack aerodynamics.

Texts Book/Reference Book:

1. J. D. Anderson, *Fundamentals of Aerodynamics*, McGraw-Hill Inc. (Indian Edition), 2005.
2. Josep Katz and Allen Plotkin, *Low-Speed Aerodynamics*, Cambridge University Press, 2001.
3. Wei Shyy, Yongsheng Lian, Jian Tang and Dragos Viieru, *Aerodynamics of Low Reynolds Number Flyers*, Cambridge University Press, 2008.

ME446 Composite Materials and Engineering 3-0-0-6

Prerequisites: Nil

Module 1: Introduction and Classification of Composites

Introduction to Composites: General Introduction, Historical development, Concept of Composite materials

Classification of Composites: Classification based on Matrix Material, Classification based on reinforcements

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Metal fibers, Alumina fibers, Boron Fibers, etc., Mechanical properties of fibres

Matrix Materials: Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.,

Advantages and Applications of Composites materials: Comparison with Metals, Advantages and limitations of Composites, Applications of composite materials

Module 2: Manufacturing of Composite Materials

Hand-layup technique, Filament winding, Autoclave forming, resin transfer molding, Pultrusion, Diffusion bonding, Hot pressing method, Low pressure carbonization etc.,

Module 3: Micro mechanical Analysis of Laminae

Rule of mixture, Prediction of elastic constants, Tsai-Halpin equation

Module 4: Macromechanical Analysis of Lamina

Stress-strain relations of orthotropic lamina along principal and arbitrary material direction, Transformation of elastic constants

Module 5: Failure Mechanics of Composite Materials

Micro and macro-mechanics of failure

Module 6: Analysis of laminated composites

Introduction to composite laminates, Lamination code, Constitutive classical lamination theory, Classification of laminates, Hygrothermal stresses in composite laminates, Analysis of laminated beams

Module 7: Mechanical Testing of Composites

Specimen preparation, tensile testing, compressive testing, shear testing, flexure testing, fracture toughness testing, characterization with stress concentrations

Module 8: Design of composites

Design criteria, design allowable, material selection, selection of configuration and manufacturing process. Examples: Design of tension member, Design of joints, Design of pressure vessels, Composite design for stiffness at minimum mass, Composite design for controlled thermal response

Module 9: Finite Element Analysis of Composite Materials

Isoparametric element for the analysis of laminated plate, formulation of the composite stiffener element, formulation of the composite beam element, finite element analysis of laminated composite shell, FEM of laminated plates, Numerical examples

Textbook and reference books:

1. A. Kaw, *Mechanics of Composite Materials*, 2nd edition, CRC Press, 2006
2. M. Mukhopadhyay, *Mechanics of Composite Materials and Structures*, Orient BlackSwan, 2004
3. D. Gay and S. Hoa, *Composite Materials: Design and Applications*, 2nd edition, CRC Press, 2007

4. I.M. Daniel and O.Ishai, *Engineering Mechanics of Composite Materials*, 2nd edition, Oxford University Press, USA, 2005.
5. B.D. Agarwal and L.J. Broutman, *Analysis and Performance of Fiber Composites*, John Wiley and Sons, 2006.
6. M. Ashby, *Material Selection in Mechanical Design*, Butterworth-Heinemann, 2010.
7. R.M. Jones, *Mechanics of Composite Materials*, 2nd edition, CRC Press, 1998.
8. M.W. Hyer, *Stress Analysis of Fiber Reinforced Composite Materials*, Destech Pubns Inc, 2008.
9. R.F. Gibson, *Principles of Composite Material Mechanics*, 3rd edition, CRC Press, 2011.
10. F.L. Matthews, G.A.O. Davies, D. Hitchings and C. Scouts, *Finite Element Modeling of Composite Materials and Structures*, Woodhead Publishing, 2000.

ME448 Rotor Dynamics 3-0-0-6

Prerequisites: Engineering Mechanics (ME101); Dynamics of Machinery (ME 308)

Rotor-Bearing Interaction, Flexural Vibration, Critical Speeds of Shafts, Jeffcott Rotor Model, Unbalance Response, Effect of Damping, Campbell Diagram, Effects of Anisotropic Bearings, Unbalanced Response of an Asymmetric Shaft, Parametric Excitation, Gyroscopic Effects, Rotor with Non-central Disc, Rigid-rotor of Flexible Bearings, Stodola Model, Effect of Spin Speed on Natural Frequency, Forward and Backward Whirling Motion, Aerodynamic Effects, Rotor-shaft Continuum, Effect of Rotary Inertia and Shear-Deformation within the Shaft, Equivalent Discrete System, Finite Element model for Flexural Vibration, Torsional Vibration, Geared and Branched Systems, Transfer Matrix Model, Fluid Film Bearings: Steady State Characteristics of Bearings, Raynold's Equation, Oil-Whirl, Rigid And Flexible Rotor Balancing, Active Vibration Control of Rotor-Bearing System: Active Magnetic Bearing, Condition Monitoring of Rotating Machinery, Measurement Techniques.

Texts:

1. J. S. Rao, *Rotor Dynamics*, Third ed., New Age, New Delhi, 1996 (2009 reprint).
2. M. J. Goodwin, *Dynamics of Rotor-Bearing Systems*, Unwin Hyman, Sydney, 1989.

Reference:

1. E. Krämmer, *Dynamics of Rotors and Foundation*, Springer-Verlag, New York, 1993.
2. G. Genta, *Dynamics of Rotating Systems*, Springer, New York, 2005.
3. J.M. Vance, *Rotordynamics of Turbomachinery*, Wiley, New York, 1988.
4. M.L. Adams, *Rotating machinery vibration: from analysis to troubleshooting*, Second ed., CRC Press, Boca Raton, 2010.
5. J. Kicinski, *Rotor dynamics*, Tech. Book, New Delhi, 2010.
6. D. Childs, *Turbomachinery Rotordynamics: Phenomena, Modeling and Analysis*, Wiley, New York, 1993.

Journals:

Journal of Vibration and Accoustics, Trans. ASME
Journal of Gas Turbine for Power, Trans. ASME
Journal of Applied Mechanics, Trans. ASME
Journal of Dynamic Systems Measurement and Control, Trans. ASME
Journal of Mechanical Design, Trans. ASME
Journal of Sound and Vibration, Elsevier
Mechanical Systems and Signal Processing, Elsevier
Mechanism and Machine Theory, Elsevier

Open Electives

MA412 Matrix Computation (3-0-0-6)

Introduction to Direct Methods: Diagonalization, Jordan Canonical Forms, SVD and POD, Direct Method for solving linear systems and Application to BVP, Discritization of PDE's, Sparse Matrices.

Basic iterative methods: Iterative method for solving linear systems: Jacobi, Gauss-Seidel and SOR and their convergence, projection method: general projection method, steepest descent, MR Iteration, RNSD method.

Krylov subspace methods: Introduction to Krylov subspace, Arnoldi's method, GMRES method, Conjugate gradient algorithm, Lanczos Algorithm.

Convergence & Preconditioners: Convergence check for Krylov subspace methods, Preconditioned CG, ILU preconditioner, Approximate inverse preconditioners, Multigrid methods.

Parallel implementation: Architecture of parallel computers, introduction to MPI & openMP, parallel preconditioners, domain decomposition method.

Texts:

1. Yousef Saad, *Iterative Methods for Sparse Linear Systems*, SIAM 2003.
2. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, *Introduction to Parallel Computing*, Addison-Wesley, 2003.
3. Gene H. Golub, Charles, F. Van Loan, *Matrix Computation*, John Hopkins University Press, 1996.

References:

1. W. H. Press, Teucolsky, S. A., Vetterling, W. T., Flannery, B. P. *Numerical Recipes in C, Fortran*, Cambridge University Press, 1996.
2. R. S. Varga, *Matrix iterative Analysis*, Prentice Hall 1962.
3. Gilbert W. Stewart, *Introduction to matrix computation*, Academic Press 1973.
4. James M. Ortega, *Introduction to Parallel and Vector Solution of linear Systems*, Plenum Press 1984.
5. S. D. Conte and Carlde Boor, *Elementary Numerical Analysis*, McGraw-Hill Pub. Com Ltd 2005.
6. K Atkinson, W Han, *Elementary Numerical Analysis*, Willay India Pvt. Ltd. 200.
7. William F. Ames, *Numerical Methods for Partial Differential Equation*, Academic Press 1977, 3rd edition.
8. L.N. Trefethen, D. Bau, *Numerical Linear Algebra*, SIAM, 1997.

PH403 Photovoltaics & Fuel Cell Technology (3-0-0-6)

Pre-requisites: nil

Photovoltaics: Global energy scenario and impending energy crisis, Basic introduction of energy storage/conversion devices, State-of-the art status of portable power sources, Solar/photovoltaic (PV) cells, PV energy generation and consumption, fundamentals of solar cell materials, Elementary concept of solar cell and its design, solar cell technologies (Si-wafer based, Thin film and concentrator solar cells), Emerging solar cell technologies (GaAs solar cell, dye-sensitized solar cell, organic solar cell, Thermo-photovoltaics), Photovoltaic system design and applications, Analysis of the cost performance ratio for the photovoltaic energy and problems in wide-spread commercialization of the technology.

Fuel Cells: Fuel cells and its classification; Transport mechanism in fuel cells and concept of energy conversion; Fuels and fuel processing, Fuel cell design and its characterization; Technological issues in Solid oxide fuel cells (SOFC); PEM fuel cells; Direct methanol fuel cells (DMFC), Molten carbonate fuel cell (MCFC), Power conditioning and control of fuel cell systems.

Text Books:

1. Energy Storage, R. A. Huggins, Springer, 2010.
2. Fundamentals of Photovoltaic Modules and their Applications, G. N. Tiwari, S. Dubey & Julian C. R. Hunt, RSC Energy Series, 2009.
3. Solar Photovoltaics: Fundamentals, Technologies and Applications (2^{nd} ed.), C. S. Solanki, Prentice Hall of India, 2011.
4. Solar Cell Device Physics, Stephen Fonash (2^{nd} ed.), Academic Press, 2010.
5. Fuel Cell Technology, Nigel Sammes (ed.), 1^{st} edition, Springer, 2006
6. Clean Energy, R. M. Dell & D. A. J. Rand, Royal Society Publications, 2004
7. Hydrogen Energy: Challenges & Prospects, R. M. Dell & D. A. J. Rand, Royal Society Publications, 2008.
8. Fuel Cell Engines, Matthew M. Mench, John Wiley & Sons, 2008.

Reference Books:

1. Fuel Cell Technology Handbook, G. Hoogers (ed.), CRC Press, 2003.
2. Fuel Cell Technologies: State & perspectives; N. Sammes, A. Smirnova and O. Vasylyev (eds.), Springer, 2004.
3. Electrochemical Impedance in PEM Fuel Cells: Fundamentals and applications; Xiao-Zi Yuan, C. Song, H. Wang and J. Zhang; Springer-Verlag, 2010.
4. Electrochemical Nanotechnology, T. Osaka, M. Dutta, Y. S. Diamand (eds.), Springer, 2010.

HSS Electives

HS421 Fundamentals of Cognitive Science (3-0-0-6)

Cognitive Science: nature, history, and major findings and applications; Philosophy of language and mind; Psycholinguistic approach to the child language and cognitive development; Linguistics and the study of language in society: language, dialects, and varieties, native speakers and language acquisition, language as a mental phenomenon vs. language as behavior; multilingualism; Artificial Intelligence: Turing Test and Chinese-Room Argument, Natural language vs. artificial language; fuzzy logic; Culture as cognitive construction, culture and society, culture and language, cognition and human evolution.

Texts and References:

1. Wilson, Robert A., & Keil, Frank C. (eds.) , The MIT Encyclopedia of the Cognitive Sciences, Cambridge, MA: MIT Press, 2001.
2. Bechtel, William, & Graham, George (eds.), A Companion to Cognitive Science, Malden, MA: Blackwell, 1998.
3. Cummins, Robert, & Cummins, Denise Dellarosa (eds.), Minds, Brains, and Computers: The Foundations of Cognitive Science, Malden, MA: Blackwell, 2000.
4. Rapaport, William J., "Cognitive Science", in Anthony Ralston, Edwin D. Reilly, & David Hemmendinger (eds.), *Encyclopedia of Computer Science*, 4th edition (New York: Grove's Dictionaries): 227-233, 2000.

HS441 Industrial and Organizational Psychology (3-0-0-6)

Pre-requisites: nil

Aim of the Course:
Today, many of the engineering students after passing out are joining some kind of organization. Therefore, they need to know how they will be successful as job applicants, trainees, employees, team players, and managers. This course will help them in knowing about all these and applying psychological principles in industries and organizations.

Course Contents:

Introduction: Psychology as a science of Behaviour and Mental Processes: Nature, Scope and Subject Matter of Industrial and Organizational Psychology; Time and Motion Study, Classical Hawthorne Studies.
Employer Selection: Recruitment Process; Selection Process - Job and Worker Analyses, Matching Job with the Person; Selection Methods - Application Blank, Biographical Inventories, References and Recommendation Letters, Interviews.
Psychological Testing: Characteristics of Psychological Tests; Types of Psychological Tests; Tests of Knowledge, Skills and Abilities - Interest, Aptitude and Personality Tests; Limitations of Psychological Testing Programmes.
Training and Learning: Need Identification; Psychological Factors in Learning; Training Methods in the Workplace; Effective Training Programme; Career Planning and Development.
Motivation: Needs, Incentives and Motives; Financial and Non-financial Motives; Theories of Motivation; Management of Motivation; Organizational Commitment and Job Satisfaction.

Leadership: Changing Views of Leadership; Theories of Leadership; Leadership Styles; Pole of Power in Leadership; Charismatic and Effective Leaders.
Group Behaviour: Formal and Informal Organizations in Industry; Conflicts in Organization; Resolution of the Conflicts; Decision Making Process.
Characteristics of the Workplace: Working Conditions - Physical and Psychological; Accident, Safety and Health; Management of Stress; Spirituality at Work.
Organizational Communication: Process of Communications; Upward, Downward and Horizontal Communications; Barriers to Communication; Effective Communication.

Text and references:

1. Schultz, D. & Schultz, S. E., *Psychology & Work Today: An Introduction to Industrial and Organizational Psychology*, 10th Ed., New Jersy: Prentice Hall, 2009.
2. Landy, F. J. & Conte, J. M., *Work in the 21st Century: An Introduction to Industrial and Organizational Psychology*, 3rd Ed., New York: Wiley- Blackwell, 2009.
3. Robins, S. P. & Judge, T. A., *Organizational Behaviour*, 14th Ed., New Jersey, Prentice Hall, 2010.
4. Pierce G.F, *Spirituality at Work: 10 Ways to Balance Your Life on the Job*, 1ST Ed., Illinois, Loyola Press, 2005.