## EC010 801 WIRELESS COMMUNICATION

**Teaching Schemes** **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

*Objective: To give the students an idea about the cellular communication theory and technology.*

**Module 1 (12 hrs)**

Cellular concept-frequency reuse, channel assignment, hand off, interference, trunking and grade of service, cell splitting, sectoring, microcell concept.

**Module 2 (12 hrs)**

Introduction to radio wave propagation-free space propagation model, round reflection (2-ray) model, impulse response model of a multipath channel, parameters o mobile multipath channels, type of small scale fading, fading effect due to multipath time delay spread and Doppler spread, diversity technique for mobile wireless radio system.

**Module 3 (12 hrs)**

Multiple access technique for wireless communication-FDMA, TDMA, spread spectrum multiple access-FHMA, CDMA, hybrid spread spectrum technique-space division multiple access- packet radio.

**Module 4 (12 hrs)**

GSM-GSM network architecture, GSM channel type, frame structure for GSM,( signal processing in GSM-speech coding, channel coding, interleaving, ciphering, burst formatting, modulation, frequency hopping, demodulation) authentication and security in GSM, GSM call procedures, GSM hand off procedures.

**Module 5 (12 hrs)**

CDMA digital cellular standards- Introduction, frequency and channel specification, forward and reverse CDMA channel, CDMA call processing, soft hand off, performance of a CDMA system, comparison of CDMA with GSM, digital cellular standards- DECT, PDC, PHS

**References:**


1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Person Education, 2007.
3. T. S. Rappaport, “Wireless Communication, Principles & Practice”, Dorling Kindersley (India) Pvt. Ltd., 2009.
4. G. L. Stuber, “Principles of Mobile Communications”, 2nd Edition, Springer Verlag. 2007.
5. Kamilo Feher, 'Wireless Digital Communication', Dorling Kindersley (India) Pvt. Ltd., 2006.

6. R. L. Peterson, R. E. Ziemer & David E. Borth, “Introduction to Spread Spectrum Communication”, Prentice Hall, 1995.
7. A. J. Viterbi, “CDMA- Principles of Spread Spectrum”, Prentice Hall, 1995.

# EC010 802 COMMUNICATION NETWORK

**Teaching Schemes** **Credits:4**
2 hours lecture and 2 hours tutorial per week

*Objectives:*

- *To impart a basic knowledge on networking techniques.*
- *To provide a strong foundation to students about the internet protocols and network security.*

**Module 1 (12 hrs)**
Network services and layered architecture.Network topology, Switching: basics of message switching, packet switching, circuit switching and cell switching. :Layering architecture, the OSI reference model, Layers, protocols and services, overview of TCP/IP architecture, TCP/IP protocol.

**Module2 (12 hrs)**
Multiple access communications, local area networks (LAN) structure, the medium access control sub layer, the logical link control layer, random access, ALOHA, slotted ALOHA, CSMA, CSMA/CD, scheduling approaches to medium access control, reservation systems, polling, token passing rings, comparison of random access and scheduling. Medium access controls, IEEE 802.3 standards for 10Mbps and 1000 Mbps LANs, repeaters and hubs, LAN bridges, transparent bridges, source routing bridges, mixes media bridges, LAN switches.

**Module 3 (12 hrs)**
Internetworking: Inter network, datagram forwarding in IP, ARP, DHCP, ICMP, Virtual networks and Tunnels. Routing: Distance vector routing, Link state Routing. Routing for Mobile hosts. Global internet: Subnetting, CIDR, BGP. IPV4 and IPV6.

**Module4 (12 hrs)**
Asynchronous Transfer Mode (ATM):Addressing, signaling and routing. ATM header structure, ATM adaptation layer, management and control, Internetworking with ATM. Control of ATM networks.

**Module 5 (12 hrs)**
Network security: Symmetric and asymmetric key cryptography. Security services, Digital signature, IPsecurity(IPsec),SSL/TLS,PGP, Firewalls.

**References:**

1. Jean Walrand & Pravin Varaiya, “High Performance Communication Networks” , Elsevier
2. Behrouz.a. Forouzan, “Data Communication and Networking”, Tata McGraw Hill
3. Larry L. Peterson, Bruce S. Davie, “Computer networks”, 4th edition, Elsevier
4. Andrew S Tanenbaum, “Computer Networks”, Pearson Education
5. William Stallings,”Data and computer communication”, Pearson Education

# EC010 803 LIGHT WAVE COMMUNICATION

**Teaching Schemes** **Credits: 4**

2 hours lecture and 2 hours tutorial per week

**Objectives**

- *To understand the behaviour of light wave*
- *To know principle of light wave communication and the characteristics of optical devices.*

**Module 1 (12hrs)**

Recollection of basic principles of optics: ray theory- critical angle- total internal reflection - Optical wave guides - Propagation in fibre- expression for acceptance angle-numerical aperture- V number – modes, mode coupling - SI fibre and GI fibre - single mode fibers

**Module 2 (12 hrs)**

Transmission characteristics – Attenuation – absorption losses – scattering losses – bend losss –Dispersion- chromatic dispersion – intermodal dispersion –Optical fiber cables – cable design -- Optic fibre connections– fibre alignment and joint loss - splicing techniques- optical fibre connectors – fiber couplers

**Module 3 (12 hrs)**

Optical sources- LEDs – LED structures – LED characteristics –semiconductor injection LASER- LASER structures- LASER characteristics – Optical detectors - principles of photo detection –quantum efficiency, responsivity - PIN diode – APD – operating principles – source to fibre power launching – lens coupling to fiber.

**Module 4 (12 hrs)**

Optical amplifiers- Semiconductor optical amplifiers – Erbium doped fiber amplifiers-comparison between semiconductor and fiber amplifiers - wavelength conversion – Optical modulation – Mach Zender interferometer – MZ optical modulator – operating requirements.

**Module 5 (12 hrs)**

Optical networks – wavelength routing networks – wavelength switching networks – network protection and survivability - Optical fiber link design – long haul systems, power budget, time budget, maximum link length calculation.

## References


1. John M Senior, “Optical fiber Communications Principles and Practice:”, Pearson Education
2. Djafer K Mynbaev, “Fibre optic communication technology:”, Pearson Education.
3. Franz and Jain , “Optical Communications Components and Systems”,: Narosa
4. Harold Kolimbiris, “Fiber Optics Communications”, Pearson Education
5. John Gower , “Optical communication system”, Prentice Hall of India
6. Sharma, “Fibre optics in telecommunication”, Mc Graw Hill
7. Subir Kumar Sarkar, “Optical fibre and fibre optic communication”, S Chand & co. Ltd

8. M Mukund Rao , “Optical communication”, Universities press.
9. Palais, “Fiber Optic Communication”, Pearson Education.
10. Black, “Optical Networks - 3rd Generation Transport systems”, Pearson Education.

# EC010 804L01 NANO ELETCRONICS

**Teaching Schemes** **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

**Objectives**

- *To introduce students to the nano electronics and the systems.*
- *To understand the basic principles of carbon nano tubes.*

**Module I (12hrs)**

Challenges going to sub-100 nm MOSFETs Oxide layer thickness, tunnelling, power density, non-uniform dopant concentration, threshold voltage scaling, lithography, hot electron effects, sub-threshold current, velocity saturation, interconnect issues, fundamental limits for MOS operation.

**Module II (12 hrs)**

Novel MOS-based devices Multiple gate MOSFETs, Silicon-on-insulator, Silicon-on-nothing, Fin FETs, vertical MOSFETs, strained Si devices.

**Module III (12 hrs)**

Quantum structures quantum wells, quantum wires and quantum dots, Single electron devices charge quantization, energy quantization, Coulomb blockade, Coulomb staircase, Bloch oscillations.

**Module IV (12 hrs)**

Hetero structure based devices Type I, II and III hetero junctions, Si-Ge hetero structure, hetero structures of III-V and II-VI compounds - resonant tunnelling devices.

**Module V (12 hrs)**

Carbon nanotubes based devices CNFET, characteristics; Spin-based devices spin FET, characteristics.

**Reference Books:**

1. Mircea Dragoman and Daniela Dragoman, " Nano electronics Principles & devices", Artech House Publishers, 2005.
2. Karl Goser, "Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices", Springer 2005.
3. Mark Lundstrom and Jing Guo, "Nanoscale Transistors: Device Physics Modelling and Simulation", Springer, 2005.
4. Vladimir V Mitin, Viatcheslav A Kochelap and Michael A Stroscio, "Quantum hetero structures", Cambridge University Press, 1999.
5. S M Sze (Ed), " High speed semiconductor devices", Wiley, 1990.

# EC010 804L02MICRO ELECTRO MECHANICAL SYSTEMS

**Teaching Schemes** **Credits: 4**

2hours lecture and 2 hours tutorial per week

**Objectives**

- *To introduce students to the MEMS systems, its hardware.*
- *To introduce devices and their working principles..*

**Module I (12hrs)**

Overview of MEMS and Microsystems –Typical MEMS product – Evolution of Microfabrication – Multidisciplinary nature of MEMS – Applications.

**Module II (12 hrs)**

Working Principle of Microsystems – Microsensors – Microactuation – Microaccelerometers - Microfluidics

**Module III (12 hrs)**

Engineering Science for Microsystem Design - Atomic Structure of Matter – Ions – Molecular Theory – Intermolecular Force – Doping of Semiconductors – Diffusion Process – Electrochemistry – Quantum Physics – Materials for MEMS and Microsystems – Substrate and Wafer – Silicon as Substrate Material – Silicon compounds – Silicon Piezoresistors – Gallium Arsenide – Quartz – Piezoelectric Crystals – Polymers.

**Module IV (12 hrs)**

Micro system Fabrication Process – Photolithography – Ion implantation – Diffusion – Oxidation – Chemical Vapour Deposition – Physical Vapour Depostion – Deposition of Epitaxy - Etching

**Module V (12 hrs)**

Overview of Micromanufacturing – Bulk Micromanufacturing – Surface Micromachining – The LIGA Process.

**Reference Books:**

1. Tai-Ran Hsu , “MEMS & Microsystems Design and Manufacture”, Mc Graw Hill.
2. Nitaigur Premchand Mahalik , “MEMS”, Tata Mc Graw Hill
3. James D. Plummer, Michael D.Deal, Peter B. Griffin, “Silicon VLSI Technology’, Pearson Education.

# EC010 804L03 SECURE COMMUNICATION

**Teaching Schemes** **Credits: 4**

2 hours lecture and 2 hours tutorial per week.

*Objective: To impart the students about the theory and technology behind the secure communication..*

**MODULE 1 (12 hrs)**

Modular arithmetic : Groups, Ring, Fields. The Euclidean algorithm-Finite fields of the form GF(p). Polynomial arithmetic: Finite fields of the form GF($2^n$).

**MODULE 2 (12 hrs)**

Introduction, security attacks-security services- Symmetric Ciphers-Symmetric Cipher Model-Substitution Techniques-Caesar Cipher-Mono alphabetic Cipher-Play fair cipher-Hill cipher-Poly alphabetic Cipher – one time pad.

**MODULE 3 (12 hrs)**

Transposition techniques- Block Ciphers.

Data encryption Standards- DES Encryption-DES decryption-Differential and Linear Crypt analysis Advanced Encryption standard- The AES Cipher- substitute bytes transformation-Shift row transformation-Mix Column transformation.

**MODULE 4 (12 hrs)**

Public key cryptosystem- Application for Public key cryptosystem- Requirements-RSA algorithm. Key management-Distribution of public key, public key certificates ,Distribution of secret keys.

**MODULE 5 (12 hrs)**

Intruders: Intrusion techniques, Intrusion detection, Statistical anomaly detection, Rule based intrusion detection, Distributed intrusion detection, Honey pot, Intrusion detection exchange format.

Password management: Password protection, password selection strategies.

Reference:


1. William Stallings, “Cryptography and Network Security” ,4th Edition, Pearson Education ,2009
2. Ferouzen,’ Cryptography and network security”, Tat Mc GrawHill
3. Tyagi and Yadav ,” Cryptography and network security”, Dhanpatrai
4. Douglas A. Stinson, “Cryptography, Theory and Practice”, 2nd Edition, Chapman & Hall, CRC Press Company, Washington, 2005.
5. Lawrence C. Washington, “Elliptic Curves: Theory and Cryptography”, Chapman & Hall, CRC Press Company, Washington, 2008.
6. David S. Dummit & Richard M Foote, “Abstract Algebra”, 2nd Edition, Wiley India Pvt. Ltd., 2008.

## EC010 804L04 MANAGEMENT INFORMATION SYSTEMS

**Teaching Schemes** **Credits :4**

2hours lecture and 2 hours tutorial per week.

*Objectives:*

*Describe the various types of information systems by breadth of support. Identify the major information systems that support each organizational level. Describe how information resources are managed, and discuss the roles of the information systems*

**Module I (12hrs)**

Information systems, dimensions of information systems, approaches to information systems, information processing systems, characteristics, types, impacts and applications, moral dimensions of information systems, information rights, property rights

**Module II (12 hrs)**

Information Technology infrastructure, levels, infrastructure components, competitive model for information technology infrastructure, types of information system controls, risk assessment, security, auditing

**Module II (12hrs)**

Enterprise systems, architecture, process, supply chain management systems, push verses pull based supply chain management, internet driven enterprise integration.

**Module IV (12hrs)**

Knowledge management systems, dimensions, organizational learning, knowledge management value chain, types of knowledge management systems, enterprise wide KMS, structured KMS, semi structured KMS, knowledge network, knowledge work systems, intelligent techniques, expert systems, fuzzy logic, neural networks, genetic algorithms

**Module V (12hrs)**

Decision support systems, decision making, systems and technologies in decision making and business intelligence, decision making levels, types of decisions, stages in decision making process, difference between MIS and DSS, types of DSS, components of DSS, group decision making systems, Executive support systems

**Reference:**

1. Kenneth C. Laudon and Jane Price Laudon, “Management Information systems Managing the digital firm”, Pearson Education Asia.
2. James AN O’ Brein, “Management Information Systems”, Tata McGraw Hill, New Delhi,
3. Gordon B.Davis, “Management Information system: Conceptual Foundation, Structure and Development”, McGraw Hill,
4. Joyce J. Elam, “Case series for Management Information System Silmon and Schuster”, Custom Publishing.

5. Steven Alter, “Information system – A Management Perspective” – Addison – Wesley,
6. Ralph M.Stair and George W.Reynolds “Principles of Information Systems – A Managerial Approach Learning”,

# EC010 804 L05 : PATTERN RECOGNITION

**Teaching Schemes** **Credits:4**
2 hours lecture and 2 hours tutorial per week

*Objectives:*

- *To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.*
- *To provide a strong foundation to students to understand and design pattern recognition systems.*

**Module I (12 hrs)**
Introduction: introduction to statistical, syntactic and descriptive approaches, features and feature extraction, learning and adaptation. Bayes Decision theory, introduction, continuous case, 2-categoryclassification, minimum error rate classification, classifiers. Discriminant functions and decision surfaces.

**Module 2 (12 hrs)**
Introuction- Maximum likelihood estimation - General principle,Gaussian case ; bias. Bayesian estimation – class conditioned density, parameterdistribution, Bayesian Parameter estimation – General Theory,Gibb's Algorithm – Comparison of Bayes Method with Maximum likelihood.

**Module 3 (12 hrs)**
Introduction,Density Estimation. Parzen Windows – Convergence of mean, variance,Kn – Nearest Neighbourestimation,Nearest neighbor rule,Converge error rate, error bound , partial distance.

**Module 4 (12 hrs)**
Linear discriminate functions and decision surfaces:-Introduction, training error, Threshold weight, discriminate function – two category case, multicategory case. Generalized discriminant function, Quadratic discriminant functions, Polynomial discriminant, PHI functions. Augmented vector.Two category linearly separable case: weight space, solution region, margin, learning rate ,algorithm(Gradient descent – newton)Relaxation procedures.

**Module 5 (12 hrs)**
Syntactic approach to PR : Introduction to pattern grammars and languages ,higher dimensional grammars, tree, graph, web, plex, and shape grammars, stochastic grammars , attribute grammars, Parsing techniques, grammatical inference.

**Reference Books**

1. R.O Duda, Hart P.E, "Pattern Classification And Scene Analysis", John Wiley
2. Gonzalez R.C. & Thomson M.G., "Syntactic Pattern Recognition - An Introduction", Addison
   Wesley.
3. J. T. Tou and R. C. Gonzalez, "Pattern Recognition Principles", Wiley, 1974
4. Fu K.S., "Syntactic Pattern Recognition And Applications", Prentice Hall,

5. Rajjan Shinghal, “Pattern Recognition: Techniques and Applications”, Oxford University Press, 2008.

# EC010 804L06: RF CIRCUITS

**Teaching Schemes** **Credit: 3**

2 hours theory and 1 hour tutorial per week.

**Objectives**

- *To give the basic ideas about the characteristics of components in Radio frequency*
- *To understand the working of various active devices and circuits in Radio frequency*

**Module 1: (10 hrs)**

**Introduction, Components and systems** : Wire – Resistors – Capacitors – Inductors – Toroids – Toroidal Inductor Design – Practical Winding Hints. Resonant Circuits: Some Definitions – Resonance (Lossless Components) – Loaded *Q* – Insertion Loss – Impedance Transformation – Coupling of Resonant Circuits.

**Module 2: (15 hrs)**

**Filter Design:** Background – Modern Filter Design – Normalization and the Low-Pass Prototype – Filter Types – Frequency and Impedance Scaling – High-Pass Filter Design – The Dual Network – Bandpass Filter Design –Bandpass Filter Design Procedure – Band-Rejection Filter Design – The Effects of Finite *Q*.

**Module 3: (12 hrs)**

**Impedance Matching:** Background – The L Network – Dealing With Complex Loads – Three-Element Matching – Low-*Q* or Wideband Matching Networks – The Smith Chart – Impedance Matching on the Smith Chart.

**Module 4: (15 hrs)**

**Small-Signal and Large signal RF Amplifier Design:** RF Transistor Materials – The Transistor Equivalent Circuit – Y Parameters – S Parameters. Transistor Biasing – Design Using Y Parameters – Design Using S Parameters. RF Power Transistor Characteristics – Transistor Biasing – RF Semiconductor Devices – Power Amplifier Design – Matching to Coaxial Feed lines.

**Module 5: (8 hrs)**

**RF Front-End Design and RF Design Tools:** Higher Levels of Integration, Basic Receiver Architectures, ADC'S Effect on Front-End Design, Software Defined Radios. Design Tool Basics – RFIC Design Flow – RFIC Design Flow, Modelling – PCB Design – Packaging.

**References:**


1. Christopher Bowick, John Blyler and Cheryl Aljuni , " RF Circuit Design", 2nd Edition, Elsevier ,2008.
2. Reinhold Ludwig & Powel Bretchko, "RF Circuit Design – Theory and Applications", 1st Ed., Pearson Education Ltd., 2004.
3. Davis W. Alan, "Radio Frequency Circuit Design", Wiley India, 2009.
4. Joseph J. Carr, "RF Components and Circuits", Newnes, 2002.
5. Mathew M. Radmanesh, "Advanced RF & Microwave Circuit Design-The Ultimate Guide to System Design", Pearson Education Asia, 2009.
6. David M. Pozzar , " Microwave Engineering", 3r Ed., Wiley India, 2007.
7. Ulrich L. Rohde & David P. NewKirk, "RF / Microwave Circuit Design", John Wiley & Sons, 2000.

# EC010 805 G01 TEST ENGINEERING

**Teaching Schemes** **Credits : 4**

2 hrs lecture and 2 hrs tutorial per week

***Objectives***

1. *To provide an insight into multi-disciplinary approach to test engineering including test economics and management.*
2. *To understand practical, concise descriptions of the methods and technologies in modern mechanical, electronics and software testing.*
3. *To provide an insight into the developing interface between modern design analysis methods and testing practice.*
4. *To understand why products and systems fail, which testing methods are appropriate to each stage of the product life cycle and how testing can reduce failures.*
5. *To provide an overview of international testing regulations and standards.*

**Module 1 (12 hrs)**

Introduction: need for test, analysis and simulation, good and bad testing, test economics, managing the test programme

Stress, Strength and Failure of Materials: mechanical stress and fracture, temperature effects, wear corrosion, humidity and condensation, materials and component selection

Electrical and Electronics Stress, Strength and Failure: stress effects, component types and failure mechanisms, circuit and system aspects

**Module 2 (12 hrs)**

Variation and Reliability: variation in engineering, load-strength interference, time-dependent variation, multiple variations and statistical experiments, discrete variations, confidence and significance, reliability

Design Analysis: Quality Function Deployment, design analysis methods, analysis methods for reliability and safety, design analysis for processes, software for design analysis, limitations of design analysis, using analysis results for test planning

**Module 3 (12 hrs)**

Development Testing Principles: functional testing, testing for reliability and durability, testing for variation, process testing, 'Beta' testing

Materials and Systems Testing: materials, assemblies and systems, system aspects, data collection and analysis, standard test methods, test centres

Testing Electronics: circuit test principles, test equipment, test data acquisition, design for test, electronic component test, EMI / EMC testing

**Module 4 (12 hrs)**

Software: software in engineering systems, software errors, preventing errors, analysis of software system design, data reliability, managing software testing

Manufacturing Test: manufacturing test principles, manufacturing test economics, inspection and measurement, test methods, stress screening, electronics manufacturing test options and economics, testing electronic components, statistical process control and acceptance sampling

Testing in Service: in-service test economics, test schedules, mechanical and systems, electronic and electrical, sotaftware, reliability centred maintenance, stress screening of repaired items, calibration

**Module 5 (12 hrs)**

Data Collection and Analysis: FRACAS, acceptance sampling, probability and hazard plotting, time series analysis, software for data collection and analysis, reliability demonstration and growth measurement, sources of data

Laws, Regulations and Standards: safety and product liability, main regulatory agencies in USA, Europe and Asia, International standards, BIS, ISO standards, industry / technology standards

Management: organization and responsibilities, procedures for test, development test programme, project test plan, training and education for test, future of test.

**References:**

1. Patrick D. T. O'connor, "A Concise Guide to Cost-effective Design, Development and Manufacture", John Wiley & Sons, 2001
2. Patrick D. T. O'connor, "Practical Reliability Engineering", Wiley India, 2008
3. Naikan V. N. A., "Reliabilty Engineering and Life Testing", PHI Learning, 2008
4. Kapur K. C., Lamberson L. R., "Reliability in Engineering Design", Wiley India, 2009
5. Srinath L. S., "Reliability Engineering", East West Press, 2005

# EC010 805G02 E-LEARNING

**Teaching scheme** **Credits : 4**

2 hrs lecture and 2 hrs tutorial per week

**Objectives**

1. *To understand the basic concepts of e-learning.*
2. *To understand the technology mediated communication in e-learning.*
3. *To learn the services that manage e-learning environment.*
4. *To know the teaching and learning processes in e-learning environment.*

**Module 1 (12 hrs) – Introduction**

Evolution of Education – Generations of Distance Educational Technology – Role of e-learning – Components of e-learning: CBT, WBT, Virtual Classroom – Barriers to e-learning

Roles and Responsibilities: Subject Matter Expert – Instructional Designer – Graphic Designer – Multimedia Author – Programmer – System Administrator – Web Master

**Module 2 (12 hrs) – Technologies**

Satellite Broadcasting – Interactive Television – Call Centres – Whiteboard Environment

Teleconferencing: Audio Conferencing – Video Conferencing – Computer Conferencing

Internet: e-mail, Instant Messaging, Chat, Discussion Forums, Bulletin Boards, Voice Mail, File Sharing, Streaming Audio and Video

**Module 3 (12 hrs)– Management**

Content: e-content, Dynamic Content, Trends – Technology: Authoring, Delivery, Collaboration – Services: Expert Service, Information Search Service, Knowledge Creation Service – Learning Objects and E-learning Standards

Process of e-learning: Knowledge acquisition and creation, Sharing of knowledge, Utilization of knowledge – Knowledge Management in e-learning

**Module 4 (12hrs) – Teaching-Learning Process**

Interactions: Teacher-Student – Student-Student – Student-Content – Teacher-Content – Teacher-Teacher – Content-Content

Role of Teachers in e-learning – Blended Learning – Cooperative Learning – Collaborative Learning – Multi Channel learning – Virtual University – Virtual Library

**Module 5 (12 hrs) – Development Issues**

Assessment in e-learning – Quality in e-learning – Tools for Development – Costs for Developing and Using E-learning Environments – Challenges and Careers – Future of e-learning

**References:**

1. Michael W. Allen, “Michael Allen’s Guide to E-learning”, John Wiley & Sons, 2003.
2. Michael W. Allen, “Successful E-learning Interface: Making Learning Technology Polite, Effective and Fun”, Pfeffer & Company, 2011.
3. Michael W. Allen, “Michael Allen’s 2012: E-learning Annual”, Pfeffer & Company, 2011.

4. Gourishankar Patnaik, “E-learning”, Vdm Verlag, 2010.
5. Gaurav Chadha & Nafay Kumail S. M., “E-Learning: An Expression of the Knowledge Economy”, Tata McGraw-Hill Publication, 2002.
6. Singh P. P. & Sandhir Sharma, “E-Learning: New Trends and Innovations”, Deep & Deep Publications, 2005.

# EC010 805 G03 MECHATRONICS

**Teaching Schemes** **Credits: 4**

2 hours lecture and 2 hours tutorial per week

*Objective: Mechatronics is a synergistic combination of Mechanical, Electrical and Computer Engineering and Information Technology, which includes control systems as well as numerical methods to design products. This subject shall lay the foundations of this multidisciplinary field of engineering.*

**Module 1 (12 hrs)**

Introduction to Mechatronics: Mechatronics key elements, Mechatronics design process, approaches in Mechatronics Modeling and Simulation of Physical System Simulation and Block Diagrams, Analogies and Impedance Diagrams, Electrical Systems, Mechanical Translation systems, Mechanical rotational system, Electromechanical coupling, Fluid systems

**Module 2 (12 hrs)**

Sensors and Transducers: Introduction to Sensors and transducers, Sensors for motion and position Measurement, force, torque, and Tactile sensors, flow sensors, Temperature – sensing devices, Ultrasonic sensors, range sensors, active vibration control Using agnetostrictive transducers, Fiber optic devices in mechatronics.

**Module 3 (12 hrs)**

Actuating Devices- Direct current motor, permanent magnet stepper motor, fluid power actuation, Fluid power design elements, Piezoelectric Actuators. Hardware components for Mechatronics. Transducer signal conditioning and devices for data conversion, programmable Controllers.

**Module 4 (12 hrs)**

Signals, systems and controls: Introduction to signals, systems, and controls, system representation, Linearization of Nonlinear systems, time delays, measures of system Performance, root locus and bode plots. Real- Time Interfacing. Introduction, Elements of a Data Acquisition and Control system, overview of the I/O process, Installation of the I/O card and software, installation of the Application software, examples of interfacing

**Module 5 (12 hrs)**

Closed Loop controllers Continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller, digital controllers, control system performance, controller tuning, velocity control and Adaptive control Advanced applications in mechatronics -Sensors for condition monitoring, Mechatronic control in automated Manufacturing, artificial intelligence in mechatronics, Fuzzy logic applications in Mechatronics, Micro sensors in mechatronics.

**References:**

1. Devdas Shetty and Richard.A.Kolk, “Mechatronics system design”, Thomson Asia Pte. Ltd. Second reprint, 2001

2. W.Bolton, “Mechatronics”, Pearson Education Asia, Third Indian Reprint 2001.
3. David G Alciatore and Michael.B.Histand, “Introduction to Mechatronics and Measurement systems”, Tata McGraw Hill, Second Edition, 2003.

# EC010 805 G04 BIO INFORMATICS

**Teaching Schemes** **Credits: 4**
2 hours lecture and 2 hours tutorial per week.

*Objective: To cater the needs of students who want a comprehensive study of the principle and techniques of bioinformatics..*

**Module 1 (12 hrs)**

Nature and scope of life science, Various branches of life sciences, Organization of life at various levels, Overview of molecular biology, The cell as basic unit of life- Prokaryotic cell and Eukaryotic cell - Central Dogma: DNA-RNA-Protein, Introduction to DNA and Protein sequencing, Human Genome Project, SNP, **Bioinformatics databases**, - Nucleotide sequence databases, Primary nucleotide sequence databases-EMBL, GeneBank, DDBJ; Secondary nucleotide sequence databases Protein sequence databases- SwissProt. Protein Data Bank

**Module 2 (12 hrs)**

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Scoring matrices- PAM and BLOSUM matrices, Pairwise sequence alignments: Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. BLAST and FASTA. Multiple sequence alignments (MSA)- CLUSTALW.

**Module 3 (12 hrs)**

Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees. Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining. Evaluation of phylogenetic trees- reliability and significance; Boot strapping; Jackknifing

**Module 4 (12 hrs)**

Computational approaches for bio-sequence analysis - Mapping bio-sequences to digital signals – various approaches – indicator sequences – distance signals – use of clustering to reduce symbols in amino acid sequences - analysis of bio-sequence signals – case study of spectral analysis for exon location.

**Module 5 (12 hrs)**

Systems Biology: System Concept- Properties of Biological systems, Self organization, emergence, chaos in dynamical systems, linear stability, bifurcation analysis, limit cycles, attractors, stochastic and deterministic processes, continuous and discrete systems, modularity and abstraction, feedback, control analysis, Mathematical modeling; Biological Networks- Signaling pathway, GRN, PPIN, Flux Balance Analysis, Systems biology v/s synthetic biology

**References.**


1. Claverie & Notredame, "Bioinformatics - A Beginners Guide", Wiley-Dreamtech India Pvt.
2. Uri Alon, "An Introduction to Systems Biology Design Principles of Biological Circuits", Chapman & Hall/CRC.
3. Marketa Zvelebil and Jeremy O. Baum, "Understanding Bioinformatics", Garland Science.
4. Bryan Bergeron, "Bioinformatics Computing, Pearson Education", Inc., Publication.
5. D. Mount, "Bioinformatics: Sequence & Genome Analysis", Cold spring Harbor press.
6. Charles Semple, Richard A. Caplan and Mike Steel, "Phylogenetics", Oxford University Press.
7. C. A. Orengo, D.T. Jones and J. M. Thornton, "Bioinformatics- Genes, Proteins and Computers", Taylor & Francis Publishers.
8. Achuthsankar S. Nair et al. "Applying DSP to Genome Sequence Analysis: The State of the Art, CSI Communications", vol. 30, no. 10, pp. 26-29, Jan. 2007.
9. Resources at web sites of NCBI, EBI, SANGER, PDB etc

# EC 010 805 G05: Intellectual Property Rights

**Teaching scheme** **Credits:4**

2 hour lecture and 2 hour tutorial

**Objectives**

1. *To appreciate the concept of Intellectual Property and recognize different kinds of Intellectual Property*
2. *To appreciate the rationale behind IP and underlying premises*
3. *To know the position of IP under the constitution of India*

**Module 1(12 Hours)**

Concept of intellectual property – different types of IP-Rationale behind Intellectual property-Balancing the rights of the owner of the IP and the society – Enforcement of IPRs – IP and constitution of India.

**Module 2 (12 Hours)**

World intellectual Property Organization (WIPO) – WTO/TRIPS Agreement – India and the TRIPS Agreement – Patent law in India –Interpretation and implementations – Transitional period.

**Module 3 (12 Hours)**

Patent system – Patentable Invention – Procedure for obtaining patent – Rights of a patentee – Limitations on Particular's Rights – Revocation of patent for Non – working Transfer of patent – Infringement of patent.

**Module 4 (12 Hours)**

Indian Designs Law – Meaning of Design Registration and Prohibitions – Copyright in Designs – Piraiy of Design and Penalities – Steps for foling an Application – Copyright law in India –Owner of the copyright – Rights of Broad Casters and Performers – Registration of Copyright – Assignment, Licensing and Transmission – Infringement – International Copyright and Copyright Societies

**Module 5 (12 Hours)**

Trade Mark Law in India – Functions of a Trade Mark – Registration of Trade Mark Exploiting Trade Mark – Infringement –Offenses and Penalties – Indian Trade Mark Act 1999; salient features. Geographical Indications – Registration of Geographical Indication – Term and Implication of Registration – Reciprocity and Prohibition on Registration.

**Text books**


1. Jayasree Watal **-Intellectual Property Rights:** In the WTO and Developing Countries -Oxford University Press
2. V.Sarkar-Intellectual Property Rights and Copyright- ESS publications


**References**


**1**. R..Anita Rao and Bhanoji Rao - Intellectual Property Rights –Eastern Book Company

**2**. Arthur R Miller and Michael H Davis – Intellectual Property in a Nutshell: marks patents, Trade and Copy Right

3. Richard Stim - Intellectual Property marks patents, Trade and Copy Right – Cangage Learning
4. Christopher May and Susan K Sell - Intellectual Property Rights –A critical History - Viva Books

# EC010 805G06 PROFESSIONAL ETHICS

**Teaching Schemes** **Credit: 4**

2 hours lecture and 2 hours tutorial per week.

*Objectives:*

- *To create awareness on professional ethics for engineers*
- *To instil human values and integrity*
- *To respect the rights of others and develop a global perspective*

**Module 1 (12 hrs)**

Understanding Professional Ethics and Human Values Current scenario – contradictions – dilemmas – need for value education and self esteem – Human values – morals – values – integrity – civic virtues - work ethics – respect for others – living peacefully – caring – honesty – courage – valuing time – co operation – commitment – empathy – self confidence - character

**Module 2 (12 hrs)**

Ethics for Engineers Ethics – its importance – code of ethics – person and virtues – habits and morals – 4 main virtues – ethical theories – Kohlberg's theory – Gilligan's theory – towards a comprehensive approach to moral behaviour – truth – approach to knowledge in technology

**Module 3 (12 hrs)**

Environmental Ethics and sustainability problems of environmental ethics in engineering - engineering as people serving profession – engineer's responsibility to environment – principles of sustainability - industrial, economic, environmental, agricultural and urban sustainability - Sustainable development.

**Module 4 (12 hrs)**

Social Experimentation, Responsibility and Rights Engineers as responsible experiments – safety and risk – confidentiality – knowledge gained confidentiality – experimental nature of engineering – Intellectual Property Rights – professional rights – employee rights – occupational crime

**Module 5 (12 hrs)**

Global Issues Globalisation – unethical behaviour – computer ethics – weapons development – engineers as expert witness and advisors – moral leadership

**Reference**

1. Mike W Martin, Roland Schinzinger, " Ethics in Engineering", Tata McGraw -Hill, 2003
2. Govindarajan M, Natarajan S, Senthil Kumar V S, "Engineering Ethics" PHI India, 2004
3. P Aarne Vesblind, Alastair S Gunn, " Engineering Ethics and the Enviornment"
4. Edmund G Seebauer, Robert L Barry, " Fundamentals of Ethics for scientists and engineers" Oxford University Press 2001

5. R RGaur, R Sangal, G P Bagaria, " A foundation course in value education and professional ethics"

# EC010 806 VLSI & EMBEDDED SYSTEM LAB

**Teaching Schemes** **Credits : 2**

3 hour practical per week

## VLSI LAB

1. Verilog implementations of
   a) Multiplexer
   b) Demultiplexer
   c) Full adder & Full subtractor
   d) Decoder
   Using data flow style of modelling.
2. Using Structural modelling implement
   a) 4:1 multiplexer using 2:1 multiplexer.
   b) Four bit full adder using one bit full adder.
   c) 4 bit counters.
3. Using behavioural modelling implement
   a) D Flip Flop
   b) J K Flip Flop
4. Using switch level modelling implement
   a) One bit Full adder
   b) Multiplexer – 2 channel
   c) CMOS AND gate
   d) CMOS OR gate
5. Verilog implementation of Moore and Mealy FSM.

## EMBEDDED LAB (PIC)

1. Four bit binary counter using LEDs.
2. Interfacing 7 segment LED and a character LCD.
3. Timers and counters.
4. Analog to digital convertor.
5. DC motor control using.
6. Understanding interrupts.
7. Asynchronous Serial Communication.

*Program the PIC microcontroller and realize the circuits in breadboard (Avoid use of readymade kits).

# EC010 807 Project Work

**Teaching scheme** **credits: 4**

6 hours practical per week

The progress in the project work is to be presented by the middle of eighth semester before the evaluation committee. By this time, the students will be in a position to publish a paper in international/ national journals/conferences. The EC can accept, accept with modification, and request a resubmission.

The progress of project work is found unsatisfactory by the EC during the middle of the eighth semester presentation, such students has to present again to the EC at the end of the semester and if it is also found unsatisfactory an extension of the project work can be given to the students.

**Project report:** To be prepared in proper format decided by the concerned department. The report shall record all aspects of the work, highlighting all the problems faced and the approach/method employed to solve such problems. Members of a project group shall prepare and submit **separate** reports. Report of each member shall give details of the work carried out by him/her, and only summarise other members' work.

The student's sessional marks for project will be out of 100, in which 60 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation committee.

**For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.**

## EC010 808 Viva -Voce

**Teaching scheme** **credits: 2**

A comprehensive oral Viva-voce examination will be conducted to assess the student's intellectual achievement, depth of understanding in the specified field of engineering and papers published / accepted for publication etc. At the time of viva-voce, certified bound reports of seminar and project work are to be presented for evaluation. The certified bound report(s) of educational tour/industrial training/ industrial visit shall also be brought during the final Viva-Voce.

An internal and external examiner is appointed by the University for the Conduct of viva voce University examination.

**For Viva-voce, the minimum for a pass shall be 50% of the total marks assigned to the Viva-voce.**

*Note: If a candidate has passed all examinations of B.Tech. course (at the time of publication of results of eighth semester) except Viva-Voce in the eighth semester, a re-examination for the Viva-Voce should be conducted within one month after the publication of results. Each candidate should apply for this 'Save a Semester examination' within one week after the publication of eighth semester results.*