Scheme of Studies & Syllabus

For

Bachelor of Technology Degree (B. Tech)

In

Electronics and Communication Engineering

FACULTY OF ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY
Department of ECE & EIE

ITM UNIVERSITY
GURGAON
(Established under Haryana Govt. Notification No. Leg. 33/2010-HARYANA ACT No.25 of 2010)
Scheme Of Studies Batch-2011
# ITM University - Bachelor of Technology in Electronics and Communication Engineering-2011

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**ECT106: In House Training for Minor Projects**
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**ECT208: Industrial Training**
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**ECT314: Industrial Training**
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**Total Credits**: 201
The Overall credits structure

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**Basic sciences (BS) Core**

- ASL121 Physics-I 3-1-2 5
- ASL101 Mathematics- I 3-1-0 4
- ASL150 Applied Chemistry 2-0-2 3
- ASL102 Mathematics-II 3-1-0 4
- ASL203 Applied Mathematics 4-1-0 5
- ASV140 Environmental Studies 3-1-0 4

**Humanities and Social Science (HU) Core**

- HML101 Effective Communication 2-2-0 4
- HML102 Business Communication 1-2-0 3
- HMV104 Learning through Literature 1-0-0 0
- HMV203 Language Skills 1-1-0 2
- HMV202 Interactive Communication 0-1-0 0
- HMP100 Language Lab 0-0-1 0.5
- HML311 Entrepreneurship 3-0-0 3

**Engineering Arts and Science (EAS) Core**

- CSL101 Basic of Computer &C Prog 2-0-2 3
- CSL110 Elementary Data Structures 2-0-0 2
- MEL102 Introduction to of Mech & Prod Eng 3-1-2 5
- MEP150 Workshop Practices 0-0-4 2
- MEP160 Engineering Drawing 1-0-3 2.5
- CSL 214 Data base management System 2-0-2 3

**Department Core (DC)**

- ECL101 Electrical & Electro.Engg-I 3-1-2 5
- ECL102 Electrical & Electro Engg-II 3-1-2 5
- ECL104 Fields and Waves 2-2-0 4
- ECL201 Electrical & Electro Engg–III 3-1-2 5
- ECL203 Analog Electronics 3-1-2 5
- EIL210 Instrumentation & Measurement 3-0-2 4
- ECL202 Analog Communications Systems 3-1-2 5
- ECL206 Digital Electronics 3-1-2 5
- EIL202 Linear Control Systems 3-1-2 5
- ECL301 Antenna and wave Propagation 3-1-2 5
- ECL303 Digital Communication System 3-1-2 5
- ECL340 Introduction to V.L.S.I. 3-0-2 4
- ECL305 Integrated Circuits & Appl. 3-1-2 5
- ECL330 Microprocessor & applications 3-1-2 5
- ECL350 Digital Signal Processing 3-1-2 5
- ECL304 Digital System Design 3-1-2 5
- ECL302 Data Comm. & Networks 3-0-2 4
- ECL401 Wireless & Mobile Comm. 2-1-2 4
- ECL404 Optical Communications 3-1-2 5

- ECL402 Advanced RF Systems 3-1-2 5
- ECL403 Microwave Eng 3-1-2 5
- ECR408 General Proficiency 0-1-0 1
- ECD306 Minor Project 0-0-1 2
- ECD405 Major Project (A) 0-0-4 2
- ECD406 Major Project (B) 0-0-8 4
- ECC407 Seminar 0-1-0 1
- ECT106 In Hs Training Minor Project 4
- ECT208 Industrial Training 4
- ECT314 Industrial Training 4

**Department Elective (DE)**

- ECL316 Information Theory & Coding 2-0-2 3
- ECL308 Nanotechnology 2-0-3 3
- ECL312 Laser Technology 2-0-3 3
- ECL409 Advanced DSP 2-0-3 3
- ECL410 Artificial Neural Networks 2-0-3 3
- ECL411 MEMS & Microsystems Tech. 2-0-3 3
- ECL412 CDMA Systems. 2-0-3 3
- ECL413 Telecom Switching 2-0-3 3
- ECL414 Artificial Intel & exp. Sys. 2-0-3 3
- ECL415 Fuzzy Sets and applications 2-0-3 3
- ECL416 Image processing 2-0-3 3
- ECL417 Reliability Engineering 2-0-3 3
- ECL418 Mobile Computing 2-0-3 3
- ECL422 Genetic Algorithm 2-0-3 3
- ECL424 System Modeling 2-0-3 3
- ECL426 Consumer electronics 2-0-3 3
- EIL306 Power Electronics 2-0-3 3
- EIL411 Optimization Techniques 2-0-3 3
- EIL308 Biomedical Instrumentation 2-0-3 3
- ECL430 Selected Topics 2-0-3 3
- ECL440 Random Processes in estimation & Control 2-0-3 3
- ECL450 System Identification and Parameter Estimation 2-0-3 3

**Humanities & Management (HM) Electives**

- HML212 Fund of Management 2-0-0 2
- HML214 Business Management 2-0-0 2
- HML313 Managerial Economics 2-0-0 2
- HML312 Basic of Marketing mangmt. 2-0-0 2
- HML314 Human Resource mangmt 2-0-0 2
- HML310 Financial Management 2-0-0 2

**Open Courses (OC)**

- ECL110 Basics of Electrical & Electronics Engineering 3-1-2 5
- ECL310 Principles of Communication 2-1-0 3
- ECL410 Artificial Neural Networks 2-0-3 3
- ECL340 Introduction to VLSI 2-0-3 3
- ECL330 Microprocessor & its Apps. 3-1-2 5
- ECL415 Fuzzy Sets and applications 2-0-3 3
- ECL422 Genetic Algorithm 2-0-3 3
- ECL424 System Modeling 2-0-3 3
- ECL417 Reliability Engineering 2-0-3 3
- ECL426 Consumer Electronics 2-0-3 3
Subjects in Brief
Bachelor of Technology in Electronics & Communication Engineering

ECL101 Electrical and Electronics Engineering-I
5 Credits (3-1-2)
Ohm’s law, Star-delta Transformation, Kirchoff’s law, Mesh & Nodal analysis, Superposition Theorem, Thevenin Theorem, Norton’s theorem, Maximum Power Transfer theorem, Complex algebra and phasors, single phase a.c. circuits, series and parallel resonance, three-phase a.c. circuits, bonding, crystal structure, Fermi distribution, concepts and types of materials, conducting, dielectric and magnetic materials.

ECL102 Electrical and Electronics Engineering-II
5 Credits (3-1-2)
Network functions, transfer function, characteristics & parameters of two port networks, interrelationship, time domain behavior from pole-zero plots, network synthesis, transients response of RL, RC & RLC using laplace transform, positive real function & network synthesis, PN junction diode, diode as switch, half wave rectifier, full-wave rectifiers, filter circuits, clipper, clamper, zener diode, zener diode as voltage regulator, photovoltaic effect and photoconductivity, photo diodes, LED, software simulation of various circuit problems, Construction and characteristics of bipolar junction, transistors (BJT’s)-Comm. Base, Comm. emitter, Comm. Collector configuration. BJT as amplifier, BJT as switch, Early effect. Construction and characteristics of junction field effect transistor (JFET), MOSFET (both depletion and enhancement type), CMOSFET’s, parameters and equivalent circuit of an FET

ECL104 Field and wave theory
4 Credits (2-2-0)
Prerequisites: Physics-I, Mathematics-I

EEV101 PDP and Basic Computer Skills
18 Hrs. Modules
PDP will be conducted by external experts in order to build overall personality and preparing our students for placements. Basic computer skills module will include introduction to computer, basic computer hardware, Windows Basics, MS-Word, MS-Excel, MS-PowerPoint, Internet, e-mails, Ethical Hacking.

EEV102 Conversational Skills
18 Hrs. Modules
This module will be held at suitable time during or at end of the semester by experts from external agencies.

EEV103 General Knowledge
0 Credits (0-0-0)
General Knowledge covering areas like:
Who is who (Famous Personalities), Historical Places, Books and Authors, Abbreviations and Acronyms, Political Framework of India (States, Areas, Languages), Wars and Battles, Records, Awards (Books, Music, Science, Nobel Prize, Oscars, etc.), Important Days, Currencies, Autobiographies, Animals, Indian Council of Ministers, etc.

EEV104 General Knowledge, Aptitude and Technical Evaluation (GATE)
0 Credits (0-0-0)
Current affairs and important events from TV and Newspaper. General Knowledge covering areas like:
Who is who (Famous Personalities), Historical Places, Books and Authors, Abbreviations and Acronyms, Political Framework of India (States, Areas, Languages), Wars and Battles, Records, Awards (Books, Music, Science, Nobel Prize, Oscars, etc.), Important Days, Currencies, Autobiographies, Animals, Indian Council of Ministers, etc.
Any important events happening in the year (National or International)
This will also include general aptitude and technical content. The technical evaluation will be inline with the evaluation trends of leading PSU and national Gate examination formed from the subjects studied in current semester.

ECT106 In house training for Minor Projects
4 Credit
This training will be held after the final examinations of second Semester. Students are expected to do a minor project under the guidance of ITM faculty. They will be using the departmental project lab and other facilities of the ITM University during this training.

ECL200 Digital Electronics
5 Credits (3-1-2)
Prerequisites: Basic Electronics and Material Science
Digital signal, Logic gates, Number system, Error detection ad correction codes, Boolean Algebra and Switching functions, Combinational Logic Modules and their functions, Sequential circuits and their applications, Digital Logic families, A/D and D/A converters, Programmable logic devices, Advances in Technology, Current applications of digital electronics, Simulation Softwares (Digslim, Labview), Case studies and analysis of Real time Situations
ECL201 Electrical & Electronics Engineering-III  
5 Credits (3-1-2)  

ECL202 Analog Communications Systems  
5 Credits (3-1-2)  
Prerequisites: Analog Electronics  
Principles of analog communication, Block diagram, Noise, Amplitude Modulation and demodulation, Generation and coherent detection of DSBSC, SSB, SSBSC and VSB Waves, Phase Modulation, frequency Modulation, narrowband and wideband frequency modulation, Clock and Carrier recovery, AM and FM Transmitters and Receivers, Selectivity, Sensitivity and Fidelity of signals, Pre-emphasis, de-emphasis and capture effect, Sampling theory, Sampling and quantizing, A-Law and u-law Comanding, Pulse Modulation, TDM and FDM, PAM, PDM, PWM, PCM, DPCM, ADM,

ECL203 Analog Electronics  
5 Credits (3-1-2)  
Prerequisites: Basic Electronics and Materials  
Transistor biasing and bias stabilization, analysis of various biasing circuits. Bias compensation techniques and thermal runaway. Low and high frequency transistor models, h-parameters, h parameter equivalent circuit of transistor. Hybrid T-model for CB and II model for CE transistor, Multistage amplifiers & its frequency response, merits and demerits, distortion in amplifiers. Feedback amplifier: characteristics of negative and positive feedback. Effect of negative and positive feedback on input impedance, output impedance, gain, noise and frequency response. Oscillators: Classification, frequency and frequency stability of oscillatory circuits, Barkhausen criteria. power amplifiers: efficiency & distortion, higher order harmonic distortion, efficiency. Regulated power supplies.

ECL206 Signals & Systems  
4 Credits (2-1-2)  
Prerequisites: Mathematics 1, Mathematics 2  
Introduction: Discrete time signals, Signal properties, Elementary signals, Discrete time LTI systems and their properties, convolution, Laplace Transform for continuous time signals and systems: Signal representation: Fourier series representation; Fourier Transform and properties, Z-Transform of discrete time signals and systems, Random variable, realization, distribution function, probability density function (PDF) Estimation.

EEV201 Operating Systems  
21 Hrs. Modules  
This is a modular course to introduce the students with different operating systems.

EEV202 Advance C/C++  
18 Hrs Module  
Modular course to make the students proficient in programming, review of programming in C and introduction to C++ with skills required in industry.

EEV203 General Knowledge, Aptitude and Technical Evaluation (GATE)  
0 Credits (0-0-0)  
All that is studied in semester 1 needs to be thorough and reviewed. Understanding India including History of India, Population, Planning, Constitution, Music and Dance, media, Indian theatre, Defense, Transportation, Banking, India R&D, Space Research, etc. Any important events happening in the year (National or International). This will also include general aptitude and technical content. The technical evaluation will be inline with the evaluation trends of leading PSU and national Gate examination formed from the subjects studied in current semester.

EEV204 General Knowledge, Aptitude and Technical Evaluation (GATE)  
0 Credits (0-0-0)  
All that is studied in semester 1 & 2 needs to be thorough and reviewed. International Landscapes including Big and Small Countries, states, international organizations, monuments, languages. Sports including national games. Sports persons, tournaments, people in sports, rules of leading sports, National and International Sports Awards, Records, etc. Any important events happening in the year (National or International). This will also include general aptitude and technical content. The technical evaluation will be inline with the evaluation trends of leading PSU and national Gate examination formed from the subjects studied in current semester.

ECT208 Industrial Training  
4 Credits  
Students will be sent to industries of interest areas to have an hands on experience and exposure to industrial environment.

ECL301 Antenna & Wave Propagation  
5 Credits (3-1-2)  
Prerequisites: Physics-1, Fields and Waves
Radiation of EM waves, retarded potential, electric scalar potential, magnetic vector potential, radiation mechanism, radiation pattern (isotropic, directional, Omni directional) Radiation power density, radiation power intensity, Antenna Parameters, Anechoic chamber design and measurement, Linear Antennas, infinitesimal dipole, small dipole, finite length dipole and half wavelength dipole, Antenna arrays, Synthesis of array, Various types of antennas, Wave propagation. Simulation software, antenna designing.

**ECL302 Data Communication & Networks**  
4 Credits (3-0-2)  
*Prerequisites: Digital Electronics, Digital Communication System*  
Introduction to switching techniques, data communications circuits, communication codes, serial and parallel data interfaces and Modems, Reference Models and layering architecture, Computer networks and topologies, LAN and Access Protocols eg. ALOHA, CSMA etc., DQDB, SDH, ATM, Frame relay, wireless links, recent networks, Introduction to future generations, Simulation Softwares, Case study.

**ECL303 Digital Communication System**  
5 Credits (3-1-2)  
*Prerequisites: Analog Communication System*  
Basics of digital transmission, Line coding, signaling formats, Binary and M-ary modulation techniques, comparison based on various parameters, Multiplexing techniques, Digital carrier systems, synchronization and signaling, ICs, Spread spectrum techniques and systems, various digital communication Systems, Current applications of digital communication, Simulation Software, Case studies and analysis of Real time Situations.

**ECL304 Digital System Design**  
5 Credits (3-1-2)  
Basics of digital systems, Computer Aided Design tools, Introduction to VHDL, Data Types, Operators, Entity Declaration, Introduction to behavioural, dataflow and structural models, Assignment statements, Concurrent and Sequential statements, Packages, Libraries, Array and Loops, Subprograms: Functions and Procedures, overloading, Test Benches and its types, Design of various Combinational and sequential i.e Adders, Subtractors, Multiplexers, Demultiplexers, Decoder, Encoder, Parity generators, Code converters, Comparators, Flip-flops, Registers, Counters and other digital circuits and CPU using vhdl language, State Machine Charts, Programmable Logic Devices: ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA: Xilinx 3000 series FPGAs, Xilinx 4000 series FPGAs, basics of Verilog HDL, Synthesis and Simulation Software, Case studies and analysis of Real time Situations.

**ECL305 Integrated Circuits & Applications**  
5 Credits (3-1-2)  
*Prerequisites: Analog Electronics*  

**ECL320 Embedded System Design**  
5 Credits (3-1-2)  
*Prerequisites: Digital Electronics, Microprocessors and its Applications*  
Different types of microcontroller, PIC Microcontroller architecture, interrupts and i/o ports Development tools/ environments, Assembly language programming style, Interpreters, Instruction set, simple operations. High level languages, Intel hex format object files, Programming and designing using microcontroller

**ECL330 Microprocessor and its Applications**  
5 Credits (3-1-2)  
*Prerequisites: Digital Electronics*  
Introduction to microprocessors, Architecture of typical 16 bit microprocessors (Intel 8086), memory segmentation, Interrupts, Instruction set of 8086, Comparison of 8086 and 8088, Data Transfer techniques, 8155, 8251A, 8259A, 8255, 8257. Microprocessor Interfacing Techniques, Introduction to advance Processors 80186/188, 286, 386 & 486, Pentium pro to Pentium- IV.

**ECL340 Introduction to VLSI**  
4 Credits (3-0-2)  
*Prerequisites: Analog Electronics*  
Enhancement and Depletion type transistor operation, Physics of MOS Transistor, Device equations, threshold voltage, Detailed fabrication Process. MOS inverter and CMOS inverter, Latch up, design of digital circuits using nMOS logic and CMOS logic, Circuit characterization and Performance evaluation, low power approaches. VLSI fabrication, introduction to nanotechnology, ULSI.
ECL350 Digital Signal Processing
5 Credits (3-1-2)
Prerequisites: Signals and Systems
Review of Discrete time signals and Discrete Linear Time Invariant systems, Digital Filter Design (IIR Filter and FIR Filter) Parks-McClellan algorithm and Remez algorithm, least-mean-square error filter design; design of FIR differentiators, Hilbert transformer, DFT and FFT computation, Finite register lengths effects, Programmable digital signal processor TMS320C67xx processors, Multirate signal processing and significance of signal processing in real time applications.

EEV301 Advanced Computing
This modular course will cover latest tools on advanced computing as per the requirements of industry. Largely the contents may comprise of Java, Dot Net and computing software. However, the contents will be decided yearly as per the market trends.

EEV302 Special Software Package
To be offered to external agency experts
21 Hrs. Modules
3Day workshop will be held to introduce the software packages useful for Engineers to simulate electronics and communication circuits. This program will introduce various tool boxes available in OrCAD and MatLab.

EEV303 General Knowledge, Aptitude and Technical Evaluation (GATE)
0 Credits (0-0-0)
All that is studied in semester 1, 2 & 3 needs to be thorough and reviewed.
Understanding your Universe, Solar system, Earth, Earth Movements, Seasons, Atmosphere, Maps and Projections, Moon, Environment, Global Warming, Information Technology, Computers, Internet, Social Networks, Gadgets and Gizmos, Inventions and Discoveries, Food and Nutrition, Human Body etc. Any important events happening in the year (National or International)
This will also include general aptitude and technical content. The technical evaluation will be inline with the evaluation trends of leading PSU and national Gate examination from the subjects studied in current semester.

EEV304 General Knowledge, Aptitude and Technical Evaluation (GATE)
0 Credits (0-0-0)
All that is studied in semester 1, 2, 3, 4 & 5 needs to be thorough, reviewed and continued.
Read one business newspaper daily, e.g. Economic Times / Business Standard (thoroughly) and maintain a register /diary and note down all business updates. Read magazines like Business Today, Business India, etc.
Any important events happening in the year (National or International)
This will also include general aptitude and technical content learnt in current semester. The technical evaluation will be inline with the evaluation trends of leading PSU and national Gate examination.

ECD306 Minor Project
Circuit Design and implementation work under the guidance of a faculty

ECT314 Industrial Training
4 Credits
Students will be sent to industries of interest areas to have an hands on experience and exposure to industrial environment

ECL401 Wireless and Mobile Communication
4 Credits (2-1-2)
Prerequisites: Antenna and Wave Propagation, Digital Communication Systems
Basics of Wireless transmission, Evolution of mobile radio communications, examples of wireless communication, comparison of various wireless systems, concept of frequency reuse channels, co-channel interference, models for path loss, shadowing and multipath fading, Characteristics of antennas, antenna at cell site, mobile antennas, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, GSM, DCS 1800, GPRS,EDG,3G.

ECL402 Advance RF Systems
5 Credits (3-1-2)
Prerequisites: Physics-I, Analog Communication System, Digital Communication System
This course will help the students to know about the working principles, advantages and applications of satellites, television and radar systems. With the help of this course, we will teach our students about the latest satellite technologies such as advanced satellite constellations for mobile communications, navigation, search and rescue operations and special space probes to moon, mars and Jupiter planets. This course will be useful to students to get familiar with the latest digital television transmissions and high definition display screens such as LCD TFT, Plasma and cellular architecture based high capacity TV connections. The course will provide an opportunity to know about the advanced and multipurpose radar systems for trouble-free and efficient air traffic control, climate monitoring and natural disaster warning systems

ECL403 Microwave Engineering
5 Credits (3-1-2)
Prerequisites: Fields and Waves & Analog Electronics
Introduction to microwaves, Waveguides, TEM, TE, TM modes, EMI, EM hazards and EM compatibility. Resonators, Microwave passive devices and other component, Microwave
generators and amplifiers, Microwave solid-state devices, Microwave Measurements, various methods of impedance matching. Smith chart and its uses. Microwave Applications in communication, domestic and industrial fields. Simulation software.

**ECL404 Optical Communications**  
5 Credits (3-1-2)  
*Prerequisites: Physics-I, Fields and Waves*  

**ECD405 Major Project (A)**  
2 Credits (0-0-4)  
Development of a technical project, research and simulation or hardware implementation of new or recent technological trend under the guidance of faculty. Complete literature survey, feasibility testing, circuit design, component arrangement etc

**ECD406 Major Project (B)**  
4 Credits (0-0-8)  
Completion of Project and report undertaken as ECD405.

**ECC407 Seminar**  
1 Credit (0-1-0)  
Independent study on any latest trend in communication technology or any recent research field.

**ECR408 General Proficiency**  
1 Credits (0-1-0)  
A student will be evaluated for his achievements and participation in extra curricular activities throughout four years

**EEV401 Personality Development Program**  
To be offered to external agency experts

**Department Elective**  
**ECL316 Information Theory & Coding**  
3 Credits (2-0-2)  
*Prerequisites: Digital Communication Systems, Applied Mathematics*  
Probability Theory, Joint and Conditional Probability, Discrete Probability, density and distribution functions, Statistical averages, mean, moments, Expectation and Variance of random variables, random Processes, Ergodic Processes, co-relation function, power spectral density, Central Limit theorem, Stationary processes (Wide Sense Stationary and Strict Sense Stationary), error function, regularity, Gaussian processes, Variance information and Entropy, channel Capacity, Shannon’s Theorem, Shannon-Hartley Theorem, Maximization of Entropy , noisy channel, Source coding theorem, Shannon Fano codes, Huffman Codes , arithmetic codes, Block Codes, Convolution Codes, Viterbi codes, Cryptography and Crypto Analysis.

**ECL308 Nanotechnology**  
3 Credits (2-02)  
Wave mechanics, Schrödinger’s equation, Heisenberg’s Uncertainty Principle, Nanoscale, Beyond Moore’s law, Top-down approach to nanolithography, Single electron transistors, coulomb blockade effects in ultra small metallic tunnel junctions, Quantum wells, Landaeur – Buttiker formalism, Quantum point contacts, quantum dots and Bottom up approach, Bottom-up approach. Chemical self-assembly, nanoparticles, nano-clusters, nanotubes, nanowires and nanodots, STM (Scanning Tunnelling Microscopy), SFM/AFM (Scanning Force Microscopy), SNOM (Scanning Near-Field Optical Microscopy) and SICM (scanning ion conductance microscopy).

**ECL312 Laser Technology**  
3 Credits (2-02)  
*Prerequisites: Physics-I*  
This course will help the students to know about the working principles, advantages and applications of LASER-Technology in the field of medicine, surface treatment, and nuclear fusion, laser coding, precision measurements and communication etc. the course will provide the latest in formation of various types of Lasers such as Neon LASER, semiconductor LASER, color LASER etc. the course will be useful to know about various LASER devices such as LASER amplifiers, LASER resonators, Oscillators and sensors. After completing this course the students will be familiar with the advanced and multipurpose applications such as LASER based satellite communication links, LASER based tracking and positioning in deep space.

**ECL409 Advanced Digital Signal Processing**  
3 Credits (2-02)  
*Prerequisites: Signals and systems(ECL206) & Digital Signal Processing(ECL350)*  
Simulation Software, Introduction to RTOS, Introduction to DSP/BIOS and its components, Introduction to software tools for managing DSP/BIOS components and objects, Case studies and analysis of Real time Situations

**ECL410 Artificial Neural Networks**  
3 Credits (2-02)  

**ECL411 MEMS and Microsystems Technology**  
3 Credits (2-02)  

**ECL412 CDMA System**  
3 Credits (2-02)  
*Prerequisites: Digital Communication Systems*  

**ECL413 Telecom Switching**  
3 Credits (2-02)  
Basic Switching System, Simple Tele-phone Communication, Telephone Transmitter, Telephone receiver, Introduction to Electromagnetic Exchanges, Basic line circuits in telephony and telegraphy; long-haul communication circuits; statistical bandwidth sharing, principles of traffic switching, Strowger's and crossbar switches; switching system hierarchy, SPC switching, basic call processing, Space Division Switching, Time Division space switching, Grade of Service and Blocking Probability - Telephone Networks, Subscriber Loops, Switching Hierarchy and Routing, Signaling Techniques, Basic facsimile system, facsimile applications working of FAX machines, recording media, FAX reproduction technique

**ECL414 Artificial Intelligence & Expert Systems**  
3 Credits (2-02)  

**ECL415 Fuzzy sets and applications**  
3 Credits (2-02)  

**ECL416 Image Processing**  
3 Credits (2-02)  
Introduction to Electronic Image Processing, Transforms used in electronic Image Processing, Image Enhancement by Point Operation, Spatial Filtering & Fourier Frequency Method, Colour Image Processing , Image segmentation and Representation, Non-linear Image Processing Techniques

**ECL417 Reliability Engineering**  
3 Credits (2-02)  
Basics of Reliability and reliability functions and their relationships, hazard models, Density and distribution functions, System reliability, Series, parallel and mixed configuration, Methods of solving complex systems, markov models and graphs, redundancy Techniques, Reliability improvement, Fault tree analysis, Tie set and cut set, Maintainability and availability, Applications of reliability

**ECL418 Mobile Computing**  
3 Credits (2-02)  

**ECL422 Genetic Algorithm**  
3 Credits (2-02)  
Introduction to Evolutionary Computation, Search Operators, Mutation for real-valued representations., Selection Schemes, Search Operators and Representations, Evolutionary Combinatorial Optimization, Niching and Speciation, Constraint Handling, Genetic Programming & software simulation, current applications of GA, Case studies and analysis of Real time Situations

**ECL424 System Modeling**  
3 Credits (2-02)

ECL426 Consumer Electronics
3 Credits (2-02)
Categories of consumer goods, Electronic goods, brief functioning and principle of operation of different electronic products, Introduction to electronics gadgets, standards and laws governing consumer electronics.

ECL430 Selected Topics/Electronics Comm.
3 Credits (2-02)
To be decided by the concerned faculty, having expertise in the selected field of interest.

ECL440 Random Process in Estimation and Control
3 Credits (2-02)

ECL 450 System Identification and Parameter Estimation
3 Credits (2-02)

Open Courses (For other departments)

ECL110 Basics of Electrical & Electronics Engineering
5 Credits (3-1-2)

charge densities in semiconductors, concept PN Junction diode – characteristic and analysis, Rectifiers and filter circuits, Clippers, Clampsers. Zener diodes, Photodiodes, Light emitting diodes (LED’s). Construction and characteristics of Bipolar Junction Transistor, Early effect. Construction and characteristics of junction field effect transistor (JFET), MOSFET (both depletion and enhancement type), CMOSFET’s.

ECL310 Principles of Communication Systems
3 Credits (2-1-0)
Basic blocks of Communication system, various types of Noise, SNR, concept of modulation and its types, Amplitude Modulation and demodulation, DSBSC, SSB, VSB, Frequency and Phase Modulation (FM, PM), Pulse Modulation, TDM, FDM, PCM, PAM, Sampling, Aliasing, Quantization, coding efficiency, companding, bandwidth, Digital Modulation techniques, application areas.