Scheme of Studies & Syllabus
For
Master of Technology Degree (M. Tech)
In
Electronics and Communication Engineering

SCHOOL OF ENGINEERING & TECHNOLOGY

Department of EECE

ITM UNIVERSITY
GURGAON
(Established under Haryana Govt. Notification No. Leg. 32/2006-HARYANA ACT No.25 of 2009)
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PREFACE

Yatha Drishti, Thatha Srishti as the Vision, so the World

ITM has always believed in a strong vision of imparting knowledge par excellence and had carried an aim from the beginning to make this Institute the most eminent in the country, in order to draw to it the youth of every State

Committed to making a profound and lasting contribution to society, ITM recognizes no more exalted role than that of "Educated Citizens" - citizens with a powerful sense of fairness, a profound belief in democratic ideals and a willingness to celebrate talents of many kinds. Students who graduate from ITM are expected to understand the technological, environmental and ethical challenges they will face in a World of accelerating change. Recognizing that those challenges will transcend the traditional boundaries between disciplines and nations, ITM encourages education that is distinctively interdisciplinary and international.

Keeping in synchronization with this vision and a belief to achieve that ITM unblocked one of the major hurdles to impart quality education by achieving autonomous status. This did provide ITM flexibility to design its own syllabus and impart students with knowledge not limited to a specific domain, but the one, which would take them par excellence. This challenging process included:

(a) Wide research on existing and recent industry trends,
(b) Analysis of our syllabus viz a viz that of various IITs, NITs and other foreign universities
(c) Close interaction with experts from IITs & NITs to get their inputs on current curriculum requirements.

Outcome of such a rigorous process resulted in enhancement and customization of existing curriculum to suit needs of today’s world and incorporate world’s best teaching practices.
QUICK SNAPSHOT OF THE NEW CURRICULUM SCHEME

• Syllabus is designed keeping in mind logical sequencing of various subjects and contents; is in line with the best available schemes per AICTE norms compared with IITs, NITs and other foreign universities.

• Contents of all subjects revised to bring them up to date with the latest.

• Emphasis on numerical problems, case studies and analysis of real time situations.

• Value Added courses on IT, Personality development Program (PDP), Communication skills & General Knowledge, made integral part of syllabus.

• Special courses on management relevant to engineers.

• Courses on specialized software & simulation packages in Telecom and IT sector.

• Evaluations spread over full semester and designed to test understanding and analytical skills. Student presentations mandatory part of evaluation process.

• Wide range of electives from emerging industrial trends in Technology.

• Students given freedom to choose own interest subject of interdisciplinary nature in final year from among the subjects offered in ongoing semester by other department.

• Practical orientation from beginning with introduction of project works in first summer vacations and industrial training in subsequent vacations.

• VA courses on IT and PDP, based on continuous industry tracking forms part of the syllabus.

• PDP and other special modular courses to be held at the end of respective semesters without disturbing main schedule of regular technical scheme. These courses are separated from regular courses with demarcation “M” in the code and are Audit Courses.

• Specialized subjects on emerging trends like Nanotechnology, Artificial Neural Networks are now included as departmental electives.

• Weightage of 35% given to practical work in a subject to make the learning more wholesome.
• Exclusive Time Slots for Guest Lectures, Seminars and Professional Society Activities.

• Best Text Books / Reference Books prescribed particularly by well known international authors / publishers as well as useful web links.

• Flexibility of adding new topics and technology enhancement in every subject any time.

• Up gradation of existing labs and introduction of new labs.

• Syllabus to be reviewed after every four years, but intermediate check points would be made, so as to check if any alterations make sense.

• Additionally, 7th Unit in each subject has the flexibility to be reviewed on semester / yearly basis so as to add any new topics relevant to the subject there.

• Summer internship/industry training scheme revised to make them more useful.

• To give exposure to teaching, Laboratory teaching training is included in fourth semester where students will be associated with faculty in the labs

POST THIS COURSE, WE EXPECT OUR STUDENT ENGINEERs

• To be well-rounded and professional graduate with a breadth of knowledge.

• To be capable for analytical thinking committed to excellence in personal and professional endeavors.

• To have the vision, courage and dedication to operate successfully in a dynamic, technology driven global environment.

• Should have undergone the current challenges of emerging trends in Science, Technology and Management in the liberalized, dynamic and market driven economic environment. Would have inculcated a flame in them to keep abreast with the ever-changing technology.

• To be a preferred choice for employment and well equipped for competing for higher education opportunities.
Some Highlights of M. Tech (ECE) Program

ITM University course Master of Technology (M. Tech.) in Electronics & Communication is a very comprehensive and in-line with the latest trends in the industry and academia.

Some of the salient features of our M.Tech (ECE) Program:

- Curriculum abreast with latest engineering and technology developments
- All detailed Syllabi are designed in line with the best available schemes and compared with IITs, NITs, UGC/AICTE norms and other leading Universities.
- Syllabus revised/updated regularly considering feedbacks from MNCs, industrial experts, academicians from IITs, other reputed institutions
- High practical content with State-of-art labs in every subject
- Conducive environment and best infrastructure for learning
- MOUs and alliances with top end companies and universities and arrangements for supplementary Guest Lectures
- Value added Specialized and flexible courses for students to develop their communication and soft skills as well as gain command in the industry preferred areas of technology s, conducted by outside expert agencies.
- Industrial oriented program with projects, dissertations and trainings in industry
- Laboratory teaching training to give exposure to teaching

Therefore, our M.Tech (ECE) program helps an overall development of the student in various aspects desired for a successful career in engineering industries/institutions/research while being aware of his societal responsibilities and limitations. We put our best efforts in fulfilling the program objectives and have been able to realize the desired outcomes in the form of:

Ms. Sharda Vashisth
Assistant Professor
Program Coordinator M. Tech (ECE)
# Department of EECE

**M. Tech (Electronics and Communication Engineering) 2013**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Name</th>
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<th>Lecture Course</th>
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* Laboratory teaching training is included in fourth semester where students will be associated with faculty in the labs.
Master of Technology in Electronics & Communication  
Department of EECE

The overall Credit structure

<table>
<thead>
<tr>
<th>Category</th>
<th>PC</th>
<th>PE</th>
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**Programme Core (PC)**

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<td>ECL503</td>
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<td>ECL505</td>
<td>Advanced Digital Communication</td>
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<td>ECL506</td>
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**Total PC**

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**Program Elective (PE)**

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<td>ECL502</td>
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<td>ECL504</td>
<td>Modern Telecom Switching systems</td>
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<tr>
<td>ECL514</td>
<td>Digital System Design</td>
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<tr>
<td>ECL515</td>
<td>Simulation and Modeling</td>
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<td>ECL516</td>
<td>Special Topics in Electronics &amp; Communication</td>
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<td>ECL517</td>
<td>Information Theory and Coding</td>
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<td>ECL521</td>
<td>Random Processes in Control Systems &amp; Estimation</td>
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<tr>
<td>ECL535</td>
<td>Microwave Theory &amp; Circuits</td>
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<tr>
<td>ECL524</td>
<td>Low Power VLSI Design</td>
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<td>ECL537</td>
<td>Detection and Estimation Theory</td>
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<td>ECL526</td>
<td>System Identification</td>
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<td>ECL539</td>
<td>Speech Communication</td>
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<td>ECL562</td>
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<td>ECL564</td>
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<td>ECL572</td>
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<td>ECL578</td>
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<td>ECL611</td>
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Programme Code: EC
Programme Core

ECL501 Digital Signal Processing
4 Credits (3-0-2)

ECL503 Advanced Processors
4 credits (3-0-2)
Advanced microprocessor architecture, addressing modes, Instructions, architecture, Pentium processors, memory management, Pentium –IV architecture, RISC processors architecture and pipelining, AVR microcontroller architecture, assembly language programming and instruction set and hardware interfacing, Microchip PIC family of Microcontrollers and development tools. CPU architecture and instruction set Harvard Architecture and Pipelining, Program memory considerations, Register file structure and addressing modes, software and developments tools, DSP Processors-ADSP21XX, TMS320C6XXX DSPs

ECL505 Advanced Digital Communication
4 Credits (3-0-2)
Random variables and Processes, Communication over additive Gaussian noise channels, Signal Space representation, Scalar and vector communication over Memory less channels, Additive white Gaussian noise, matched filter and error probabilities, AWGN Channels, M-Ary Orthogonal signals and matched filters for them, Carrier recovery and symbol synchronization in signal demodulation, Phase estimation, Freq offset estimation and timing, Communication over band limited channels, Nyquist criterion for zero ISI, Decision feedback equalization and adaptive equalization

ECL506 Optical Communication
4 credits (3-0-2)
Introduction to optical sources and detectors, coherent systems - homodyne and heterodyne systems, coherent systems using PSK, FSK, ASK and DPSK modulations, related noise effects, synchronous, asynchronous and self synchronous demodulation, sub carrier modulation, optical line coding schemes, optical receiver circuit, optical power budgeting line loading, optical multiplexing and signaling schemes, optical amplifiers- Raman amplifier, Brillouin amplifier, optical components, free space optics, FTTH, optical CDMA, PON, EPON.

ECL 507 Microelectronics & VLSI Design
4 Credits (3-0-2)
Basic principle of MOS transistor, The MOS Inverter, MOS Circuit Layout & Simulation, Combinational MOS Logic Design, Dynamic MOS design, Sequential MOS Logic Design, Interconnect and Clock Distribution, BiCMOS Logic Circuits

ECL508 Wireless Mobile Communication
4 Credits (3-0-2)
Access schemes, MAC protocols, problems and limitations of different protocols, cellular concepts, Evolution of mobile communication, GSM standard, call flows, location tracking, mobility management, GPRS, UMTS, Fading and Diversity effects in wireless communication, combining techniques, Spread spectrum, types, CDMA, SCDMA, capacity analysis, bit error analysis, power control, OFDM, MCDMA, MIMO Systems, Capacity analysis. Current applications of Wireless communication, Case studies and analysis of Real time Situations

ECC509 Seminar
1 Credit (0-0-2)
Independent study on any latest trend in communication technology or any recent research field.

ECD 512 Minor Project
2 Credits (0-0-4-2)
Circuit Design and implementation work under the guidance of a faculty.

ECV519 Personality Development Programme
PDP will be conducted by external experts in order to build overall personality and preparing our students for placements.

ECV522 Personality Development Programme
To be offered to external agency experts

ECD602 Dissertation (Phase-2)
12 Credits (0-0-24-12)
Completion of Project and report undertaken as ECD605.

ECV 604 Laboratory Teaching training (4hrs/week)
Students will be associated with faculty in the labs

ECD 605 Dissertation (Phase-1)
3 Credits (0-0-6-3)
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

ECT 607 Summer Industrial Training
2 Credits (6 Weeks)
Students will be sent to industries of interest areas to have an hands on experience and exposure to industrial environment.

ECV609 Special Software Package
To be offered to external agency experts
21 Hrs. Module
3 Day Workshop will be held to introduce the software packages useful for Engineers to simulate electronics and communication circuits.

ECL653 Telecom Systems and Technologies
4 Credits (3-0-2)
Transmission lines, radio frequency communication, optical communication, satellite communication, cellular communication, Functional layers,
protocols and interfaces, packet and circuit networks, introduction to internetworking, signal processing amplifiers, filters, signal generation, frequency conversion, analogue-digital and digital-analogical conversion, PCM, T1/T3, Modem, CDA, CDN, PDH, SDH, xDSL, ISDN, Radio bridge. LAN, MAN, encapsulation and transport of information, switching action, IP, Information routing, router action, architecture and configuration, measures in the field, IP, ATM, ISDN, MPLS, Fast Ethernet, design and choice of the solutions, VoIP, access networks, Intelligent network, VAS, APON, BPON, GPON, GE-PON, WDM-PON, WiFi, WiMax, LTE, and WPAN, Fiber-Optic Services (FiOS)

Program Elective

ECL502 Digital Image Processing
3 Credits (2-0-2)

ECL504 Modern Telecom Switching System
3 Credits (2-0-2)
Overview of Switching. Electronic switching systems: basics of a switching system, non-blocking switches, blocking probability, Elements of traffic engineering: Network traffic load and parameters - grade of service, Poisson process, Signaling: Customer line signaling - outband signaling - inband signaling - PCM signaling - inter register signaling - common channel signaling principles, Introduction to ATM switching, Integrated services digital network: ISDN interfaces and End-user applications, ISDN architecture, Telecommunications Software Applications: Broadband multimedia networks; voice over IP and ATM Networks; VPN; Wireless Applications; WAP; Intelligent Network Software Applications.

ECL514 Digital System Design
3 Credits (2-0-2)
Basics of digital systems, Computer Aided Design tools, VHDL language, Design of basic digital circuits and CPU using vhdl language, state machine charts, design with PLD, FPGA, Current applications of digital system design, Simulation Software, Case studies and analysis of Real time Situations.

ECL515 Simulation & Modeling
3 Credits (2-0-2)

ECL516 Special Topics in Electronics & Communication
3 Credits (2-0-2)

ECL517 Information Theory and Coding
3 Credits (2-0-2)
Entropy and lossless sources, Shannon’s source coding theorem, Kraft’s inequality, Optimal codes, Asymptotic Equipartition property, Shannon’s source coding theorem and its converse, Capacity computation for some simple channels, Joint source channel coding theorem, Differential entropy, Gaussian Channels, Introduction to rate distortion function, rate distortion optimization, finite field arithmetic, Linear Block codes, Cyclic codes

ECL521 Random Process in Control Systems & Estimation
3 Credits (2-0-2)

ECL 524 Low Power VLSI Design
3 Credits (2-0-2)
Need for low power VLSI chips, Sources of power dissipation: Static power dissipation, Dynamic power dissipation, short circuit power, emerging low power approaches, Transistor sizing & gate oxide thickness, Impact of technology Scaling, power estimation, simulation analysis: SPICE circuit simulators, gate level logic simulation, Monte carlo simulation, probabilistic power analysis techniques, Low power design techniques: Circuit level, logic level, Architecture and system level, low power clock distribution.

ECL 526 System Identification
3 Credits (2-0-2)

ECL528 Analog VLSI Design
3 Credits (2-0-2)
Source Amplifiers, Current Mirror Circuits, Frequency Response of Amplifiers, CMOS Operational Amplifiers, Stability and Frequency Compensation, Design of two stage MOS Operational Amplifier, two stage MOS operational Amplifier with cascodes, MOS telescopic-cascode operational amplifiers, MOS Folded-cascode operational amplifiers.

ECL535 Microwave Theory and Circuits
3 Credits (2-0-2)

ECL537 Detection and Estimation Theory
3 Credits (2-0-2)

ECL539 Speech communication
3 Credits (2-0-2)
Speech production mechanism, Classification of speech, purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, Time domain analysis of speech, frequency domain analysis of speech, Central analysis of speech, linear predictive analysis of speech, format and pitch estimation, Applications of speech processing.

ECL541 Electronics System Design
3 Credits (2-0-2)
ECL562 Millimetre Wave Integrated Circuits  
3 Credits (2-0-2)  
Introduction to millimeter wave systems and applications. Working principle and design of millimetre wave devices and circuits. Analysis of basic transmission lines for mm wave frequency. Integrated finlines, H-guide, Groove-guide, Transitions, Bends and discontinuities. HP’s SiGe:C, SiGe:C-BiCMOS and SiGe:C-HBT Technologies - Single Poly-silicon (SGP) self aligned transistor model, Vertical Bi-polar In Company (VBIC) model, comparison between SGP and VBIC models. Millimeter waves passive and active components/devices/sub-systems - Detectors, Attenuators, Power Divider/Combiners, Couplers, Filters, Phase-shifter, Switches, Mixers, Amplifiers, Oscillators, Down Convertors, Low power front-end receivers. SG-25 Series Technologies: On-chip transmission line design, Microstrip design, Coplanar waveguide design, Parasitic modelling, Loss mechanism, High speed static and dynamic circuits.

ECL564 Soft Computing  
3 Credits (2-0-2)  
Introduction to artificial intelligence, expert system, soft computing techniques such as Artificial Neural Network, Fuzzy logic and Genetic Algorithm. Hybrid systems such as fuzzy-neural, neuro-fuzzy, etc. Case studies, Applications and use of MATLAB.

ECL566 Nanotechnology  
3 Credits (2-0-2)  
Basics of Quantum mechanics & Nanotechnology, Nanomaterials & their preparation, Mechanical, Electrical & Optical properties of nanomaterials, Synthesis & analysis of nanomaterials, Nanobiology and Nanomedicine. This course will cover the fundamental principles of nanotechnology and its applications.

ECL568 Research Methodology  
3 Credits (2-0-2)  
Definition of Research, components of research problem, purpose and types of research, research design, Research procedure, data collection sources, procedure, kinds, limitations, type-I and type-II errors, Sample testing, probability theories, Hypothesis testing, Hypothesis Tests, One Sample Test - Two Sample Tests / Chi-Square Test, Association of Attributes - t-Test - Standard deviation - Co-efficient of variations, F test. Applications and Case study.

ECL572 Modern Antenna and Arrays  
3 Credits (2-0-2)  
Conformal antenna arrays - Characteristics, Radiation mechanism, Antenna impedance, Mutual coupling effects, Beam width, Beam steering, Mechanical aspects, Phase scanning, Grating lobes, tapering, Singly curved antenna arrays - Mutual coupling, Radom effects, Embedded elements patterns, Doubly curved array antennas -polarization and element distribution, Mutual coupling and radiation patterns. Circular array antennas - working principle and design, Phase mode and patterns, comparison of linear and circular arrays, Cophasal circular radiation and arrays. Printed Microstrip Rectangular and Circular patch Antenna arrays, Planar arrays, Phased arrays, Adaptive arrays, MEM arrays, Arrays weightage, Arrays blindness, Analysis of
beam forming matrix. Paraboloidal reflector antennas-Feeds configuration, shaped beam antenna, Fresnel-John antenna, Quasi-optical antenna, Smart antenna, Monolithic Integrated antennas.

**ECL 574 Optimization Techniques**
**3 Credits (2-0-2)**
Unconstrained Optimization, Constrained Optimization, Quasi-Newton Methods, Least-square optimization, Linear Programming, Mixed Integer Linear Programming, Dynamic Programming, Game Theory, Multi-objective Optimization, Genetic Algorithm

**ECL 576 Network Security**
**3 Credits (2-0-2)**
Common attacks and defense mechanisms, attacker profiles, basic security model, Data encryption design criterion, DES, multiple DES, AES, standard block cipher mode operations, stream ciphers, key generations, number theory, diffic-hellman key exchange, RSA, Elliptical cryptography, Key distribution and management, Cryptographic hash functions, cryptographic checksums, HMAC, offset codebook mode operations, birthday attacks, digital signature, dual signature and electronic transactions, blind signature and electronic cash, public key infrastructure, IPsec, SSL/TLS, PGP and S/MIME, kerberos, SSH , 802.11 standards, WEP, WPA, WPA2, bluetooth security, wireless mesh security, packet filters, circuit gateways, application gateways, firewall configurations and setup, network address translations

**ECL 578 Broadband Communication**
**3 Credits (2-0-2)**
Broadband networks and services, ISDN, broadband ISDN, B-ISDN standards and interface, B-ISDN protocol, ATM technology - VP, VC, ATM Packet, ATM Network Management, ATM digital exchange interface Management, Internet Telephony and voice over IP (VoIP)-RTP and RTCP, Next generation internet, multicasting in internet, real time communication over internet, Internet and web Traffic measurement and characterization

**ECL 611 Mobile Computing**
**3 Credits (2-0-2)**
Introduction to mobile computing, SS7 and GSM, wireless networking protocols: mobile IP, Adhoc networks, routing, wireless protocols: wireless TCP, data broadcasting, mobile data management, location awareness, adaptations, user interfacing issues, security issues.

**ECL 619 Algorithm for VLSI Design Automation**
**3 Credits (2-0-2)**

**ECL 621 Statistical Signal Processing**
**3 Credits (2-0-2)**
Introduction to Random variables and Random Processes, Detection theory: Binary Hypothesis testing, Detection of

**ECL623 Telecom Network Management**  
3 Credits (2-0-2)  
This course provides a panorama review to the telecommunications sector from policy, business and technology perspectives. It explores the driving forces behind the radical change in the telecommunications policy and the significant impact of this regulatory change on business operation. It includes Data communications and Network Management Overview, SNMPv1 Network Management, SNMPv1 Network Management, SNMP Management, Telecommunications Management Network, Network Management Tools and Systems and Web-Based Management.

**ECL655 Access Networks**  
3 Credits (2-0-2)  
The access loop, wired access technologies include: ADSL, Gigabit Ethernet, and optical access networks (PONs) which include APON, BPON, GPON, GE-PON, WDM-PON, wireless technologies: WiFi, WiMax, LTE, and WPAN, Fiber-Optic Services (FiOS) or U-Verse based on Fiber-to-the-home (FTTH) architecture, comparison with cable-TV technology based on Hybrid Fiber-Coax (HFC) technology, V5.x standards, service, provisioning and inter-networking.

**ECL657 Wireless Sensor Networks**  
3 Credits (2-0-2)  
WSN architecture and protocol Stack, mote platforms, WSN applications, Factors influencing WSN design, physical and MAC layer technologies, channel effects, challenges for routing and transport protocols, cross layered solutions, time synchronization, Network time protocol, Localization, ranging techniques, wireless sensor and actor networks.