



4-Year Bachelor of Technology (B.Tech.) Curriculum and Syllabus for Electronics & Communication Engineering (ECE)

EIGHTH SEMESTER

Sl No	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-UEC-T402	Advanced Communication	3	1	0	4
2	TIU-UEC-T404	VLSI Design	3	1	0	4
3	TIU-UMG-T408	Values & Ethics of Profession	3	1	0	3
4	TIU-UEC-T4XX	Elective - II	3	1	0	3
5	TIU-UEN-T400	CASD	2	1	0	3
B. Practical						
1	TIU-UEC-L404	VLSI Design Lab	0	0	3	2
C. Sessionals						
1	TIU-UES-S498	Entrepreneurship Skill Development	0	0	0	2
2	TIU-UEC-G498	Grand Viva	0	0	0	3
3	TIU-UEC-P498	Final Year Project	0	0	2	4
4	TIU-UEC-S498	Seminar	0	0	2	2
Total						30

Elective Subjects List

TIU-UEC-E402	Biomedical Instrumentation
TIU-UCS-E4XX	Distributed Computing
TIU-UCS-E4XX	Software Engineering
TIU-UEC-E404	Consumer Electronics
TIU-UEC-E406	Digital Image Processing
TIU-UEC-E4XX	Emerging Technology



CASD
TIU-UEN-T400
L-T-P: 2-1-0

Credits: 3

The Course material is announced at the start of each semester considering the changing demand.

Advanced Communication
TIU-UEC-T402
L-T-P: 3-1-0

Credits: 4

Module-1

Mobile Communication

Introduction to mobile communication, Cellular Structure, Description of cellular system, Uplink and downlink, antenna sectoring, Co-channel and Adjacent channel interferences, Second, third and fourth generation Networks, Principle and working. 5G cellular communications, Atomtronics, Carbon nanotube field-effect transistor, Civic technology, Counterparty (technology), Mobile collaboration and e-learning, Augmented reality, Block chain or distributed ledger technology,

Module-2

Radar Communication Principle of Radar, Radar Targets, Radar transmitters and receivers, Propagation of radar waves, MTI radar, Navigation and remote sensing radar, Atmospheric radar, Doppler radar and other modern radars

Module-3

Satellite Communication

Kepler's Laws, Orbital Parameters, Different sub-system of satellite, Passive and Active Satellites, Polar, Geosynchronous and Geostationary Satellites, Propagation and polarization, Satellite transmitting and receiving antennas, Communication satellites, Multiple access technique, The Space link, Spacecraft.

Module-4

Nano radio Technology and Accessories Nanoradio, Radio-frequency identification, Semantic Web or answer machine, Smart speaker, Software-defined radio.

Recommended Textbooks:

1. G. Keiser, "Fibre Optic Communications", McGraw Hill
2. G. Keiser, "Fibre Optic Communications", McGraw Hill
3. M. I. Skolnik, "Introduction to Radar Systems", McGraw Hill
4. M. Mitra, "Satellite Communications", Prentice Hall of India
5. I. Saha Mishra, "Wireless Communications: 3G and Beyond", McGraw Hill
6. G. S. N. Raju, "Radar Engineering", I. K. International
7. G. Agrawal, "Nonlinear Fibre Optics", Academic Press
8. G. Agrawal, "Fiberoptic Communication Systems", John Wiley



9. F. C. Allard, "Fiber Optics Handbook for Engineers and Scientists", McGraw Hill
10. J. M. Senior, "Optical Fiber Communications: Principles and Practice", Pearson
11. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall of India
12. T. S. Rappaport, "Wireless Communication – Principles and Practice", Prentice Hall
13. T. Pratt, A. Bostian & T. Allnut, "Satellite Communications", John Wiley
14. D. Roddy, "Satellite Communications", McGraw Hill

VLSI Design
TIU-UEC-T404
L-T-P: 3-1-0

Credits: 4

Module-1

Introduction: Design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles, packaging styles, design automation principles;

Module-2

Fabrication Technology: Basic steps of fabrication, bipolar, CMOS and Bi-CMOS fabrication processes, layout design rules; MOS and Bi-CMOS characteristics and circuits: MOS transistor characteristics, MOS switch and inverter, Bi-CMOS inverter, latch-up in CMOS inverter, super-buffers, propagation delay models, switching delay in logic circuits, CMOS analog amplifier;

Module-3

Logic Design: switch logic, gate restoring logic, various logic families and logic gates, PLA; Dynamic Circuits: Basic concept, noise considerations, charge sharing, cascading dynamic gates, domino logic, np-CMOS logic, clocking schemes;

Module-4

Sequential Circuits: Basic regenerative circuits, bistable circuit elements, CMOS SR latch, clocked latch and flip-flops;

Module-5

Low-power Circuits: low-power design through voltage scaling, estimation and optimization of switching activity, reduction of switched capacitance, adiabatic logic circuits; Subsystem Design: design of arithmetic building blocks like adders, multipliers, shifters, area-speed-power tradeoff;

Module-6

Semiconductor Memories: SRAM, DRAM, non-volatile memories; Bipolar ECL Inverter: Features of ECL gate, robustness and noise immunity, logic design in ECL, single-ended and differential ECL gates;

Module-7

Testability of VLSI: Fault models, scan-based techniques, BIST, test vector generation; Physical Design: Brief ideas on partitioning, placement, routing and compaction.

Recommended Textbooks:

1. S. Kang & Y. Leblebici, "CMOS Digital Integrated Circuits", McGraw Hill
2. P. E. Allen & D. R. Holberg, "CMOS Analog Circuit Design", Oxford University Press
3. R. Geiger, P. E. Allen & N. R. Strader, "VLSI Design Techniques for Analog and Digital Circuits", McGraw Hill
4. J. M. Rabaye, A. Chandrakasan & B. Nikolic, "Digital Integrated Circuits: A Design Perspective", Prentice Hall



5. A. Sarkar, S. De & C. K. Sarkar, "VLSI Design and EDA Tools", Scitech
6. D. A. Pucknell & K. Ershaghian, "Basic VLSI Design", Prentice Hall
7. D. Das, "VLSI Design", Oxford

Values and Ethics of Profession

TIU-UMG-T408

: 3-1-0

Credits: 3

Module-1

- Definitions, theories of ethics and ethics projects.
- Need for ethics in corporate governance.
- Corporate social responsibility-social responsibility of business with respect to its different stake holders.
- Corporate governance in financial sector.
- Ethics in managerial evaluation and revert system.
- Ethics in industry government interface.

Module-2

- The code of ethics as an instrument of strategic management.
- Ethics, privatization and liberalization.
- Ethics in technology transfer.
- Ethical issue in business practice: Conflicts between business demands and professional ideas.

Module-3

- Appropriate technology movement of Schumacher: Later development.
- Rapid technological growth and depletion of resources: reports from the Club Of Rome.
- Whistle blowing and beyond, case studies, codes of professional ethics.
- Environmental degradation and pollution: Eco friendly technologies.

Module-4

- Work culture and selfishness: The Indian dilemma and response.
- Leadership and organized team work in India.
- Values needed for Indian managers.
- Ethics in visioning and modeling by leaders: Roll of CEO and his impact on the business culture.

Elective - II

TIU-UEC-E4XX

L-T-P: 3-1-0

Credits: 3

Biomedical Instrumentation (under Elective-II)

TIU-UEC-E402

Module-1

PHYSIOLOGY AND TRANSDUCERS



Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse – transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperaturesensors.

Module-2

ELECTRO – PHYSIOLOGICAL MEASUREMENTS

Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments

Module-3

NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound –Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers : pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

Module-4

MEDICAL IMAGING

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Gamma camera – Thermography – Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems

Module-5

ASSISTING AND THERAPEUTIC EQUIPMENTS

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy

Recommended Textbooks

1. R. S. Khandpur, “Hand Book of Bio-Medical instrumentation”, McGraw Hill Publishing Co Ltd. 2003.
2. L. Cromwell, F. J. Weibell and E. A. Pfeiffer, “Bio-Medical Instrumentation and Measurements”, Pearson

Distributed Computing(under Elective-II)

TIU-UCS-E4XX

Introduction to distributed computing systems (DCS), DCS design goals, Transparencies,



Fundamental issues, Distributed Coordination, Process synchronization, Inter-process communication, Deadlocks in distributed systems, Load scheduling and balancing techniques
Distributed database system: A Case study

Recommended Textbooks:

1. A. D. Kshemkalyani & M. Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge University Press
2. A. S. Tanenbaum & M. Van Steen, "Distributed Systems: Principles and Paradigms", PHI Learning

Software Engineering (under Elective-II) **TIU-UCS-E4XX**

Introduction, software life-cycle models, software requirements specification, formal requirements specification and verification â axiomatic and algebraic specifications, function-oriented software design, object-oriented design, UML, design patterns, user interface design, coding and unit testing, integration and systems testing, debugging techniques, software quality â SEI CMM and ISO-9001. Software reliability and fault-tolerance, software project planning, monitoring, and control, software maintenance, computer-aided software engineering (CASE), software reuse, component-based software development, extreme programming

Recommended Textbooks:

1. R. Mall, "Fundamentals of Software Engineering", Prentice Hall of India
2. R. S. Pressman, "Software Engineering: a Practitioner's Approach", Tata McGraw Hill
3. D. Bell, "Software Engineering for Students", Pearson

Consumer Electronics (under Elective-II) **TIU-UEC-E404**

Module-1

Loudspeakers and Microphones: Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

Module-2

Television Standards and systems: Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

Module-3

Optical Recording and Reproduction: Audio Disc – Processing of the Audio signal – read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.



Module-4

Telecommunication Systems: Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

Module-5

Home Appliances:

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

Recommended Textbooks:

1. S. P. Bali, “Consumer Electronics”, Pearson
2. R. R. Gulati, “Monochrome and Colour Television”, New Age
3. A. M. Dhake, “TV and Video Engineering”, McGraw Hill Education
4. R. G. Gupta, “Audio and Video Systems”, McGraw Hill
5. T. Viswanathan, “Telecommunication Switching Systems and Networks”, Prentice Hall of India

Digital Image Processing (under Elective-II)

TIU-UEC-E406

Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Basic Framework, Interactive Restoration, Image deformation and geometric transformations, imagemorphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local



processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation. Ambient intelligence, Artificial brain, Artificial general intelligence, Cryptocurrency, DNA digital data storage, Exascale computing, Gesture recognition, Internet of Things, Emerging memory technologies, Emerging magnetic data storage technologies, Fourth-generation optical discs (3D optical data storage, Holographic data storage), General-purpose computing on graphics processing units, Exocortex, Li-Fi, Machine translation, Machine vision, Optical computing, Quantum computing, Quantum cryptography, Speech recognition, Subvocal recognition, Virtual Reality.

Recommended Textbooks:

1. R. C. Gonzalez and R. Woods, "Digital Image Processing", Pearson
2. A. K. Jain, "Digital Image Processing", Prentice Hall of India
3. W. K. Pratt, "Digital Image Processing", John Wiley
4. B. Chanda and D. DuttaMajumdar, "Digital Image Processing and Analysis", Prentice Hall of India

Emerging Technology (under Elective-II)
TIU-UEC-E4XX

Military

Laser weapon, Stealth technology

Aviation

Drones, Micro air vehicle, Neural-sensing headset (trans-cranial neural sensing and characterization)

Displays

3D displays, Ferro Liquid Display, Field emission display, Holography (Holographic display, Computer-generated holography), Inter-ferrometric modulator display, Laser video displays, OLED displays, Phased-array optics, Screen less display (Virtual retinal display), Bionic contact lens), Eye Tap, Telescopic pixel display, Time-multiplexed optical shutter, Volumetric display.

VLSI Design Lab
TIU-UEC-L404
L-T-P: 0-0-3

Credits: 2

List of Experiments:

1. Simulation Of Basic Gates using VHDL.



- 2.a) Design A Half Adder.
 - b) Design A Full Adder.
- 3.a) Design A Half Subtractor.
 - b) Design A Full Subtractor.
4. Design A Multiplexer.
5. Design A S-R Flip-Flop.

Telecommunication Systems: Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

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method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation. Ambient intelligence, Artificial brain, Artificial general intelligence, Cryptocurrency, DNA digital data storage, Exascale computing, Gesture recognition, Internet of Things, Emerging memory technologies, Emerging magnetic data storage technologies, Fourth-generation optical discs (3D optical data storage, Holographic data storage), General-purpose computing on graphics processing units, Exocortex, Li-Fi, Machine translation, Machine vision, Optical computing, Quantum computing, Quantum cryptography, Speech recognition, Subvocal recognition, Virtual Reality.

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Aviation

Drones, Micro air vehicle, Neural-sensing headset (trans-cranial neural sensing and characterization)

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