TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

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

SEVENTH SEMESTER

Sl No	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-UEC-T401	RF & Microwave Engineering	3	1	0	4
2	TIU-UEC-T403	Optoelectronic Devices & Circuits	3	1	0	4
3	TIU-UEE-T411	Power Electronics	3	1	0	3
4	TIU-UEC-E4XX	Elective - I	3	1	0	3
5	TIU-UTR-T401	CASD	2	1	0	3
B. Practical						
1	TIU-UEC-L401	RF &Microwave Lab	0	0	3	2
2	TIU-UEE-L411	Power Electronics Lab	0	0	3	2
C. Sessionals						
1	TIU-UES-S499	Entrepreneurship Skill Development	0	0	0	2
2	TIU-UEC-I499	Internship Project	0	0	2	2
3	TIU-UEC-P499	Final Year Project	0	0	2	3
4	TIU-UEC-S499	Seminar	0	0	2	2
Total						30

Elective Subjects List

TIU-UEC-E403	Telecommunication Engineering
TIU-UCS-E4XX	Database Management System

TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

TIU-UCS-E4XX	Artificial Intelligence & Soft Computing
TIU-UCS-E4XX	Operating Systems
TIU-UEC-E401	Embedded Systems
TIU-UCS-E4XX	Energy Resource Technology

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

CASD
TIU-UTR-T401
L-T-P: 2-1-0 **Credits: 3**

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

RF & Microwave Engineering
TIU-UEC-T401
L-T-P: 3-1-0 **Credits: 4**

Module 1:
Microwave & its property, Rectangular and Circular Waveguide: modes, cutoff frequency; Transmission Line: Current and Voltage Distribution,Input impedance, Short Circuit and Open Circuit, Quarter Wave Transformer. (L-8)

Module 2:
Smith chart and impedance matching techniques, S-matrix: representation, properties, shift in reference planes, generalized S-matrix. (L-8)

Module 3:
Wave propagation in planar lines: design, effective dielectric constant, attenuation, dispersion, power- handling capability; lumped elements and their design. (L-8)

Module 4:
Passive components (i) Reciprocal Type: Resonators/cavities, Attenuators, Junction Tees, Magic Tee, Directional couplers, power splitters/combiners, filters; (ii) Non- reciprocal components: isolators, circulators and Gyrators. (L-8)

Module 5:
Microwave sources: Klystron, Magnetron, TWTs, transistor amplifier and oscillator design, Gunn oscillator; Tunnel diode oscillator, microwave systems. (L-8)

Recommended Textbooks:
1. D. M. Pozar, “Microwave Engineering”, John Wiley
2. E. C. Jordan & K. G. Balmain, “Electromagnetic Fields and Radiating Systems”, Tata McGraw Hill
3. R. E. Collin, “Foundations for Microwave Engineering”, John Wiley
4. S. Y. Liao, “Microwave Devices & Circuits”, Prentice Hall
5. P. A. Rizzi, “Microwave Engineering: Passive Circuits”, Prentice Hall
6. R. Ludwig & P. Bretchko, “RF Circuit Design”, Pearson
7. K. C. Gupta, “Microwaves”, New Age
8. G. S. N. Raju, “Microwave Engineering”, I. K. International
9. J. P. Agarwal, M. L. Sisodia& V. L. Gupta, “Microwave and Radar Engineering”, New Age

TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Optoelectronic Devices & Communication
TIUECE-702
L-T-P: 3-1-0

Credits: 3

Module-1
INTRODUCTION: Propagation within the fiber, Numerical aperture of fiber, diffraction, step index and graded index fiber, Modes of propagation in the fiber, Single mode and multi mode fibers, Splices and connectors, Fiber materials, fiber fabrication.

Module-2
Losses and dispersion: Rayleigh scattering Losses, Absorption Losses, Leaky modes, mode Coupling losses, Bending Losses, Combined Losses in the fiber;
Intermodal dispersion, Material dispersion, Wave guide dispersion, Total dispersion, Transmission rate.

Module-3
Optical sources: LED structure, LED characteristic, Semiconductor LASER, Direct current modulation, Quantum well LASER.
Optical Detector: p-i-n photodiodes, Avalanche photodiodes, Quantum efficiency, speed of response, Infrared sensors.

Module-4
OPTICAL NETWORKS: Optical coupler, space switches, linear divider-combiners, wavelength division multiplexer and de-multiplexer, optical amplifier, optical link network-single hop, multi-hop, hybrid and photonic networks
SONET/SDH layers, SONET/SDH frame structure, SONET/SDH physical layer, Elements of SONET/SDH infrastructure;

Recommended Textbooks:
1. G. Keiser, “Fibre Optic Communications”, McGraw Hill
2. J. E. Midwinter, “Optical fibers for transmission”, John Wiley
3. T. Tamir, “Integrated Optics, (Topics in Applied Physics Vol.7)”, Springer-Verlag
4. J. Gowar, “Optical Communication Systems”, Prentice Hall India
5. S. E. Miller & A. G. Chynoweth, eds., “Optical Fibre Telecommunications”, Academic Press
6. G. Agrawal, “Nonlinear Fibre Optics”, Academic Press
7. G. Agrawal, “Fiberoptic Communication Systems”, John Wiley
8. F. C. Allard, “Fiber Optics Handbook for Engineers and Scientists”, McGraw Hill
9. J. M. Senior, “Optical Fiber Communications: Principles and Practice”, Pearson
10. P. Bhattacharya, “Semiconductor Optoelectronic Devices”, Prentice Hall

TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Power Electronics
TIU-UEE-T411
L-T-P: 3-1-0 **Credits: 3**

Module-1
Introduction: need for power conversion with efficient, high frequency, light weight converters; Power electronic converters classifications and scope;

Module-2
Power semiconductor switches: power/fast diodes, SCR, and transistors(BJT, MOSFET and IGBT) Ratings, static and dynamic characteristics, drive and switching aid circuits and cooling; isolation; protection;

Module-3
DC to DC conversion: Choppers: non-isolated: Buck, Boost and Buck-Boost converters; circuit configuration and analysis with; continuous and discontinuous loads;

Module-4
H-bridge converter multi-quadrant operation; isolated: forward, fly-back converters; example of a typical drive circuit;

Module-5
AC to DC conversion: Rectifiers: controlled/half-controlled/uncontrolled: single phase and three phase operation, Operation with R, R-L, back emf load; power factor, harmonics and effect of source inductance; Cascade operation; dual converters; a typical trigger / drive circuit;

Module-6
DC to AC conversion: Inverters: current source and voltage source inverters, active and reactive power handling, Speed control of DC motor.;

Module-7
Single phase and three phase voltage source and PWM inverters; PWM techniques; active front-end rectifier; a typical trigger / drive circuit; AC to AC conversion: Single phase AC static switches; transient-free switching of inductive loads; voltage regulators; cycloconverter.

Recommended Textbooks:
1. P. C. Sen, “Power Electronics”, McGraw Hill
2. P. S. Bimbhra, “Power Electronics”, Khanna Publications
3. M. H. Rashid, “Power Electronics: Circuits, Devices and Applications”, Pearson
4. Mohan, Undeland, Riobbins, “Power Electronics”, John Wiley
5. M. D. Singh & K. S. Khanchandani, “Power Electronics”, McGraw Hill

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Elective-I
TIU-UEC-E403
L-T-P: 3-1-0 **Credits: 3**

Telecommunication Engineering (under Elective-I)
TIUECE-704.1

Evolution of Telecommunications, General principle of switching, Classification of Switching Systems, Elements of Switching System, Signalling tones, DTMF, Common Control and Direct Control Electronic Space Division Switching: Stored Program Control (SPC), Centralised SPC, Distributed SPC, Enhanced Services, Two-Stage Networks, Three-Stage Networks.

Time Division Switching: Principle of Time Division Space Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Introduction to Combination Switching.

Traffic Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modelling Switching systems, Erlang B formula, Delay Systems.

Integrated Services Digital Networks: ISDN and its Motivation, New Services, Network and Protocol Architecture, Transmission Channels, Internetworking, BISDN.

Telephone Networks: Network Subscriber Loop Systems, Switching Hierarchy & Routing, Transmission Plan, Numbering Plan, National and International numbering schemes
Introduction to Asynchronous Transfer Mode (ATM), Protocol, Architecture, ATM Logical Connection, ATM Cells, Transmission of ATM Cells, ATM Adaptation Layer, Traffic and congestion control.
Introduction to Wireless Networks

Recommended Textbooks:
1. T. Viswanathan, “Telecommunication Switching Systems and Networks”, Prentice Hall of India
2. J. E. Flood, “ Telecommunications Switching, Traffic and Networks”, Pearson
3. T. S. Rappaport, “Wireless Communication: Principles and Practice”, Prentice Hall
4. W. Stallings, “Data and Computer Communication”, Prentice Hall

Database Management Systems (under Elective-I)
TIU-UCS-E4XX

Introduction - General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators: selection, projection, cross product, various

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF,

3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Transaction processing and Error recovery - concepts of transaction processing, ACID properties,

concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

Recommended Textbooks:
1. A. Silberschatz, S. Sudarshan& H. F. Korth, “Database System Concepts”, McGraw Hill International Edition
2. M. L. Gillenson, “Fundamentals of Database Management Systems”, John Wiley
3. R. Elmasri& S. B. Navathe, “Fundamentals of Database Systems”, Pearson

Artificial Intelligence and Soft Computing (under Elective-I)
TIU-UCS-E4XX

Artificial Intelligence
Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfactionLogical agents – propositional logic – inferences – first-order logic – inferences in firstorderlogic – forward chaining – backward chaining – unification – resolutionPlanning with state-space search – partial-order planning – planning graphs – planningand acting in the real worldSoft Computing

Fuzzy Sets and Applications:
Crisp sets, definition, operations, and properties.
Fuzzy sets, introduction, types of fuzzy sets, membership functions, some definitions, operations, examples, measures of fuzziness.
Fuzzy logic controller, Mamdani approach, Takagi-Sugeno approach, examples, advantages and disadvantages of FLC.
Fuzzy clustering, methods, Fuzzy C-Means Clustering and Entropy based clustering, examples.
Neural networks and Applications:

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Neurons, transfer functions, layers of neurons, static & dynamic neural networks, types of training of neural networks.
Multi-Layer Feed Forward Neural Network, forward computation and training using Back-propagation algorithm, example, steps to be followed for designing a suitable neural network, advantages and disadvantages of NN.
Radial Basis Function Network, forward computation and training using Back-propagation algorithm.Introduction to Self-organizing Map, Recurrent Neural Network.
Evolutionary Computation techniques and Applications:
Deficiencies of Classical traditional techniques, Algorithmic descriptions of a fewevolutionary algorithms like Genetic Algorithm, Particle Swarm Optimization.

Recommended Textbooks:
1. A. Konar, "Artificial Intelligence and Soft Computing", CRC Press
2. S. Haykin, "Neural Networks", Pearson
3. Ritch& Knight, "Artificial Intelligence", Tata McGraw Hill
4. D. K. Pratihar, "Soft Computing, Fundamentals and Applications", Narosa

Operating Systems (under Elective-I)
TIU-UCS-E4XX

Evolution of Operating Systems, Structural overview, Concept of process and Process synchronization, Process Management and Scheduling, Hardware requirements: protection, context switching, privileged mode; Threads and their Management; Tools and Constructs for Concurrency, Detection and Prevention of deadlocks, Dynamic Resource Allocation, Design of IO systems, File Management, Memory Management: paging, virtual memory management, Distributed and Multiprocessor Systems, Case Studies

Recommended Textbooks:
1. A. Silberschatz, P. B. Galvin & G. Gagne, "Operating System Concepts", John Wiley
2. A. S. Tanenbaum, "Modern Operating Systems", Prentice Hall

Embedded Systems (under Elective-I)
TIU-UEC-E401

Overview of 8085 and 8086 Microprocessor systems and peripherals; assembly language programming of 8085/8086; Arithmetic Coprocessor; System level interfacing design; Advanced Microprocessor Architectures- 286, 486, Pentium; Microcontrollers 8051 systems; Introduction to RISC processors; ARM microcontrollers; Embedded system design methodologies, embedded controller design for communication, digital control.

Recommended Textbooks:
1. R. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Penram
2. D. V. Hall, "Microprocessors and Interfacing", McGraw Hill

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

3. K. M. Bhurchandi& A. K. Ray, "Advanced Microprocessors and Peripherals", Tata McGraw Hill
4. M. A. Mazidi, J. G. Mazidi&R. D. McKinlay, "The 8051 Microcontroller and Embedded \ Systems using Assembly and C", Pearson
5. M. A. Mazidi, R. D. McKinlay& D. Cousay, "PIC Microcontrollers and Embedded Systems", Pearson
6. K. Ayala, "The 8051 Microcontroller", Delmar Cengage

Energy Resource Technology
TIU-UCS-E4XX (under Elective-I)

Energy
Airborne wind turbine, Artificial photosynthesis, Concentrated solar power, Cryogenic Treatment, Electric double-layer capacitor, Energy harvesting, Flywheel energy storage, Fusion power, Generation IV reactor, Grid energy storage, Home fuel cell, Lithium-air battery, Lithium iron phosphate battery, Lithium–sulfur battery, Magnesium battery, Molten salt reactor, Nanowire battery, antenna, Ocean thermal energy conversion, Smart grid, Space-based solar power, Thorium fuel cycle, Vortex engine, Wireless energy transfer, Zero-energy building.

Entertainment: Computer-generated imagery, Immersive virtual reality, Ultra-high-definition television

RF &Microwave Lab TIU-UEC-L401
L-T-P: 0-0-3

Credits: 2

List of Experiments:

1. Study of Reflex Klystron characteristics.
2. Study of Gunn diode characteristics.
3. Radiation pattern of horn antenna.
4. Measurement of VSWR and reflection coefficient of a standing wave pattern in a waveguide.
5. Measurement of frequency and wavelength of a microwave signal.
6. Measurement of dielectric constant of solid and liquid.

TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

Power Electronics Lab TIU-UEE-L411
L-T-P: 0-0-3

Credits: 2

List of Experiments:

1.I-V characteristics of SCR.
2.1-φ Half wave and full wave controlled rectifier using SCR. 3.Buck,boost and Buck-Boost choppers circuit.
4.1-φ sin wave PWM inverter.
5.1-φ Half wave and full wave voltage source inverter.