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

3-Year Diploma Engineering Curriculum and Syllabus for Electronics & Communication Engineering (ECE)

FIFTH SEMESTER

Sl No	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-DEC-T301	Digital Communication	2	1	0	3
2	TIU-DEC-T303	Electronic Measurement	2	1	0	3
3	TIU-DEC-T305	VLSI Design and Embedded Systems	2	1	0	3
4	TIU-DEE-T309	Industrial Electronics - I	2	1	0	3
5	TIU-DEC-E3XX	Elective - I	2	1	0	3
6	TIU-DTR-T301	CASD	2	1	0	3
B. Practical						
1	TIU-DEC-L301	Digital Communication Lab	0	0	3	2
2	TIU-DEC-L305	VLSI Design & Embedded Systems Lab	0	0	3	2
3	TIU-DEE-L309	Industrial Electronics Lab	0	0	3	2
C. Sessionals						
1	TIU-DEC-I399	Internship Project Work	0	0	0	2
2	TIU-DES-S399	Entrepreneurship Skill Development	0	0	0	2
3	TIU-DEC-P399	Final Year Project	0	0	0	2
Total						30

Elective Subjects List

TIU-DCS-E303	Computer Network
TIU-DEC-E301	Non Conventional Energy Systems

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CASD
TIU-DTR-T301
L-T-P: 2-1-0 **Credits: 3**

Module 1: Preparing and delivering speeches
Module 2: Interview skills
Module 3: Group Discussions

Digital Communication
TIU-DEC-T301
L-T-P: 2-1-0 **Credits: 3**

Group A
Unit-I Digital Modulation
Idea of digital communication –Advantages of digital communication over analog communication
BASIC STEPS IN PCM SYSTEM: Filtering –Sampling – Quantizing – Encoding –Line coding (HDB3, AM1, CM1, NRZ, RZ)
Block schematic description of transmitter and receiver of PCM system
Principles of linear and non-linear quantization – Companding, Inter Symbol Interference
Block schematic description of delta modulation technique. Limitations of delta modulation – Slope overload and granular noise.
Concept of adaptive delta modulation technique

Group B
Unit – II Multiplexing
IDEA of multiplexing and its necessity TYPES of multiplexing: TDM and FDM
TDM: Principles of time division multiplexing and synchronization in a digital communication system
PCM – TDM in modern applications (Plesiochronous digital hierarchy and Synchronous digital hierarchy)
Frequency Division Multiplexing with practical examples, phase locked loop
Merits and demerits of TDM and FDM

Unit – III RF Modulation for Baseband Signaling
Concepts of binary modulation techniques

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Principles of amplitude shift keying, frequency shift keying and phase shift keying
Comparison between ASK, FSK and PSK
Basic idea of QPSK and QAM

Unit – IV Performance and Testing of Digital Communication Link
INFORMATION THEORY: Relationship between data speed and channel bandwidth – Shannon-Hartley theorem – Theory of line coding
Error Correction Techniques: Parity checking and cyclic redundancy check
Brief description of inter-symbolic interference and interpretation of eye pattern.

Group – C
Unit – V Computer Networking
Network Architecture – Network Topology – Routing – Flow Control – Error Control (Basic idea only).
Connection of Networks: Bridge – Router – Gateway
Categories of Network: LAN – MAN – WAN – File Server Network – Client Server Network – Peer to Peer Network.
Idea of network protocol – Idea of layered protocol – Ethernet –CSMA/CD – Token ring – Token bus.
Circuit Switched and Packet Switched network.
Characteristics of modem.
Working of Internet and E-mail – IS

Unit-VI Basic Telephony
Telephone transmitter –Receiver –Dial tone, side tone and anti-side tone circuits –Handset –Ringer –Switch hook –Hybrid –Local loop –Tone dialing–DTMF
Electronic Exchange: Space division switching, time division switching, block diagram of electronic exchange
Discuss the numbering plan of telephone networks (National Schemes &International Numbering)
Describe the operation of EPABX.

Recommended Textbooks:
1. W. Tomasi, “Electronic Communication Systems: Fundamentals through Advanced”, Pearson
2. H. Taub & D. L. Schilling, “Principles of Communication Systems”, Tata McGraw Hill
3. S. Haykin & M. Moher, “Introduction to Analog & Digital Communications”, John Wiley
4. S. Haykin, “Communication Systems”, John Wiley
5. S. Haykin, “Digital Communications”, John Wiley
6. B. P. Lathi, “Modern Digital and Analog Communication Systems”, Oxford University Press
7. B. Sklar, “Digital Communications”, Pearson
8. A. B. Carlson and P. B. Crilly, “Communication Systems”, McGraw Hill
9. S. Haykin, “Digital Communication Systems”, John Wiley
10. R. Singh & S. Sapre, “Communication Systems: Analog and Digital”, Tata McGraw Hill

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11. R. N. Mutagi, "Digital Communication", Oxford
12. D. M. Pozar, "Microwave Engineering", John Wiley
13. E. C. Jordan & K. G. Balmain, "Electromagnetic Fields and Radiating Systems", Tata McGraw Hill
14. S. Y. Liao, "Microwave Devices & Circuits", Prentice Hall
15. J. D. Ryder, "Networks, Lines & Fields", Prentice Hall
16. K. C. Gupta, "Microwaves", New Age
17. G. S. N. Raju, "Microwave Engineering", I. K. International
18. J. P. Agarwal, M. L. Sisodia & V. L. Gupta, "Microwave and Radar Engineering", New Age

Digital Communication Lab
TIU-DEC-L301

Credits: 2

1. Design and Generation of random binary signals.
2. Study of impairments of signals generated in experiment 1 on passing through a simulated channel by observing Eye Pattern.
3. Generation Unipolar NRZ, Polar NRZ, Unipolar RZ and Polar RZ line codes.
4. Generation Manchester and AMI line codes.
5. Conversion of analog signal into PCM format and its study.
6. Design and implementation of Delta Modulator for analog signals.
7. Design, implementation and study of BASK Modulator and demodulator.
8. Design, implementation and study of BPSK Modulator and demodulator.
9. Design, implementation and study of BFSK Modulator and demodulator.
10. Design, implementation and study of multiplexer and de-multiplexer of digital signals using TDM.

Electronic Measurement
TIU-DEC-T303
L-T-P: 2-1-0 **Credits: 3**

Group A

Unit – I Measurement Fundamentals

Explanation of accuracy, precision, sensitivity, resolution, dynamic range, response and repeatability of measuring instruments
Role of Units in measurements and different types of units – Definition of Errors and type of errors – Definition of Primary and Secondary Standards – Concept of Calibration

Unit – II Permanent Magnet Moving Coil Meter

Theory of operation, working principle and construction of PMMC
Measurement of voltage, current and resistance

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Loading effect, extension of range and PMMC Multimeter

Unit – III Measurement of Voltage, Current, Energy and Power

Principle of rectifier type instrument – Average reading and peak reading – Advantages and limitations

Compensated thermocouple type instruments – Construction and working principle of electro-dynamic wattmeter.

Group B

Unit - IV Electronic Voltmeter and Multimeter

Advantages of electronic voltmeter over ordinary voltmeter

Working principle of Digital Multi Meter – Different types of DMM: Integration and successive approximation type. Advantages of DMM over Conventional Multi Meter

Unit - V Impedance Bridge and Q-Meter

DC Wheatstone Bridge and its application – AC bridge-balance – Detection and source of excitation – Maxwell's induction bridge –Hay's bridge – Capacitance comparison bridge – Wien Bridge. Basic principle of Q-Meter and its working circuit

Basic principle and operation of RLC meter

Unit - VI Cathode Ray Oscilloscope

Block diagram of CRO, constructional features of CRT and principle of operation

Block schematic description of:(a) Vertical Amplifier, (b) Time Base Generator, (c) Trace Synchronization, (d) Triggering Modes, (e) Front Panel Controls, (f) Probe Characteristics

Features of dual trace oscilloscopes, chopper beam switch, alternate beam switch

Block schematic description of digital storage oscilloscope

Measurement of amplitude, frequency, time period, phase angle and delay time by CRO

Unit - VII Time and Frequency Measurement

Measurement of frequency by heterodyne method – Block schematic description of digital frequency counter

Measurement of frequency, time period and time interval through frequency counter

Group C

Unit - VIII Signal Generator

Block schematic descriptions, specifications and uses of: Audio & Radio Frequency Signal Generator – Function Generator – Pulse Generator

Unit – IX RF Power Measurement

Bolometer – Method of power measurement – Balance Bridge Bolometer

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Unit – X Frequency Spectrum, Distortion and Wave Analysis
Basic working principle of Heterodyne Wave Analyzer
Block schematic description of Harmonic Distortion Analyzer
Block schematic description of Spectrum Analyzer and its use

Recommended Textbooks:
1. A. K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai
2. *A. D. Helfrick and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall*
3. B. E. Jones, "Instrumentation Measurement and Feedback", McGraw Hill
4. E. W. Golding, "Electronic Measurement and Measuring Instruments", Sir Isaac Pitman & Sons.
5. H. Buckingham and E. N. Price, "Principles of Electronic Measurements"

VLSI Design and Embedded Systems
TIU-DEC-T305
L-T-P: 2-1-0 **Credits: 3**

Group A

Unit – I PIC & 8051 Microcontroller
Features and architecture of PIC microcontroller and its application
Programs using Jump, Loop and Call Instructions, Time Delay Generation and Calculation
I/O Port Programming, Bit manipulation. Arithmetic Programs
Unsigned Addition and Subtraction
Unsigned Multiplication and Division
Signed number concept and Arithmetic operations
Logic Programs
Programs using Logic and Compare Instructions
Programs using Rotate and Swap Instructions
BCD and ASCII Application Programs
Counter / Timer Programming
Serial Communication Programming
Basics of Serial communication
8051 Connection to RS232
8051 Serial Communication Programming
Interrupts Programming 8051 Interrupts
Programming Timer Interrupts
Programming External hardware interrupts
Programming the Serial Communication Interrupt

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Interrupt Priority in the 8051

Unit – II VLSI Design

MOS Structure, Enhancement & Depletion Transistor, Threshold Voltage, MOS device design equations MOS Transistor Models. NMOS, PMOS, CMOS. The NMOS Inverter and Transfer Characteristics pull up and pull down ratios of NMOS, alternative forms of pull up the CMOS Inverter and transfer characteristics. CMOS Inverter Delays. Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters etc.

Group – B

Unit – III Introduction to Embedded Systems
Embedded Systems Overview. What are they? A shortlist of embedded systems, some common characteristics of embedded systems, An embedded system example – A Digital Camera
Processors – General purpose and specific purpose and its application, Overview and application of Digital Signal Processors(DSP) IC Technology, Full Custom / VLSI, Semi Custom ASIC, FPGA (Gate Array & Standard Cell)
PLD (Programmable Logic Device), Draw the block diagram showing the major components of PLC and state each function of each Component, Explain the basic operation of PLC, Describe briefly PLC programming

Unit – IV VHDL, RTOS and Inter-process Communication

Basic idea of VHDL programming
Concepts of RTOS
Requirement, Need, Specification of RTOS in Embedded systems
Multitasking
Task synchronization & Mutual Exclusion
Starvation, Deadlock, Multiple Process
Recommended Textbooks:
1. M. A. Mazidi, J. G. Mazidi &R. D. McKinlay, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson
2. K. Ayala, “The 8051 Microcontroller”, Delmar Cengage
3. V. A. Pedroni, “Circuit Design and Simulation with VHDL”, Prentice Hall

Embedded Systems Lab
TIU-DEC-L305

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Credits: 2

1. Introduction to microcontroller and interfacing modules.
2. To interface the seven segment display with microcontroller 8051.
3. To create a series of moving lights using 8051 on LEDs.
4. To interface the stepper motor with microcontroller.
5. To display the digital output of ADC on 16*2 LCD Module.
6. To display character 'A' on 8*8 LED Matrix.
7. To display the data and time on LCD Module.
8. To switch on and off relay by using keys.
9. To interface the DC motor using H-Bridge.
10. To interface different sensors to microcontroller.
11. To interface a keypad with microcontroller.

Industrial Electronics - I
TIU-DEE-T309
L-T-P: 2-1-0 **Credits: 3**

Group A

Unit – I Power Diode and Power Transistor-level
Power diode: Important constructional feature, Switching characteristics , specifications, series and parallel operation of diodes
Power BJT : Structure of vertical power transistor, Principle of operation, its VI and switching characteristics, Safe operating area.
Base drive circuits and Darlington configuration.
Construction operating principle and Switching characteristics of power MOSFET and IGBT
Study of Losses in power semiconductor devices- calculation of loss in power BJT
Concept of thermal resistance, thermal equivalent circuit and heat sink
Describe different mounting techniques of power semiconductor devices

Group B

Unit – II Thyristor
Switching characteristics & Two transistors method of SCR, Ratings of SCR
Triggering circuits of SCR
Need for series and parallel methods of SCR. Reasons of unequal voltage and current distribution and equalization networks
Layer diagram, Characteristics, operating principle and application of thyristor family devices - Photo sensitive SCR, GTO, SCS, TRIAC & DIAC
Protection by RC networks, MOV and snubber circuits. Transient voltage suppressors dV/dT and dI/dT protection of SCR, Circuit Breaker, opto-isolator

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Commutation circuits of SCR – natural and forced commutation – class A, B, C, D & E

Unit – III Single Phase and Polyphase Controlled Rectifier
Single phase half wave and full wave control rectifier circuit – Principle of operation with resistive and inductive load – Use of free wheel diode
Three phase half wave and full wave control rectifier – Operation with inductive and resistive load – Use of free wheel diode
Calculation of Vdc, Vrms, ripple factor, PIV and efficiency of single phase & three phase control rectifier. Concept of full control and half control rectifier
TYPES OF SPEED CONTROL OF DC MOTOR: Armature Volt – Field Current Control.
DRIVE SYSTEM: Controlled Rectifier Drive – Reversible Drive – Quadrant Drive – Dual Converters

Unit – IV Switch Mode Power Supply
Switching Regulator (SMPS) principle of operation, Block and circuit diagram and PWM control circuit consideration of switching regulator
Principle of operation of buck converter, boost converter and buck-boost CONVERTERS
Review of Linear Regulators
Advantage and disadvantage of switching regulator in comparison with linear regulator.

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

Industrial Electronics – I Lab
TIU-DEE-L309

Credits: 2

1. To measure the reverse recovery time of switching diode and power BJT.
2. To study drive circuits of power BJT.
3. To plot V/I characteristics of Triac.
4. To plot V/I characteristics of Diac
5. To study drive circuit of SCR.
6. To study a single phase rectifier—output waveform with phase control circuit.
7. To study a polyphase rectifier
8. To study SMPS with PWM regulator chip

Elective - I

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TIU-DXX-E3XX
L-T-P: 2-1-0 **Credits: 3**

Computer Network (Under Elective – I)
TIU-DCS-E303

Group – A
Unit – I Network Basics
Definition of computer network – Network components
Distinguish between Network classifications – Classify networks by their
Geography- LAN, MAN & WAN; Classify Networks by their Network role-
Peer to Peer, Server Based Networks
Network Features- File sharing; Printer Sharing, Application Services- E-mail; Remote Access
Application of Network System – General applications like ATM Banking etc. with modern approach to Distributed Computing System

Unit – II Transmission Media and Networking Devices
Classification of Transmissions Media: Guided media - UTP, STP; Coaxial Cable;
Optical Fiber - Optical Fiber Structure, Light Source for Fiber, Propagation Mode,
Advantages of optical fiber and Disadvantages of optical fiber. (brief idea)
Unguided media: Wireless Communication – Communication Band; Microwave Communication; Satellite Communication – Access Method; Cellular (Mobile) Telephone – Band in Cellular Telephony, Calls Using Mobile Phones, Transmitting
receiving operations; New Developments. (brief idea)
Network Control Devices - Hubs; Switches; Routers; Bridges; Repeaters; Gateways; Modems

Group – B
Unit – III Network Structures and Reference Model
Network topology: Bus Topology; Ring Topology; Star Topology; Mesh Topology; Tree Topology; Hybrid Topology
SWITCHING: Circuit Switching – Message Switching – Packet Switching
Layered architecture of network system – Seven layer OSI model – Functions of each OSI layer – Other ISO structure – TCP / IP Layer Structure, Comparison of the OSI and TCP/IP reference models X.25 protocol

Unit – IV Flow Control and Error Control
FLOW CONTROL: Congestion control – Necessity of flow control – Poll / select method – Stop and wait method – Sliding window method
ERROR CONTROL:
Error detection & correction – Types of error – Checksum – Forward error control – Automatic repeat request – Cyclic redundancy check
ALGORITHMS: Routing, Fixed and Adaptive

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Recommended Textbooks:
1. A. S. Tanenbaum & D. J. Wetherall, "Computer Networks", Pearson
2. L. L. Peterson, "Computer Networks – A Systems Approach", Morgan Kaufmann
3. B. A. Fourozan, "Data Communications and Networking", McGraw Hill
4. W. Stallings, "Data and Computer Communications", Pearson

Non Conventional Energy Sources (Under Elective – I)
TIU-DEC-E301

UNIT-I
Introduction:
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III
Geothermal Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations.
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV
Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V
Bio-mass:

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Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants.

Recommended Textbooks:

1. Raja, “Introduction to Non-Conventional Energy Resources”, Scitech
2. John Twideu &Tony Weir, “Renewal Energy Resources” BSP Publications
3.M.V. R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications
4. D. S. Chauhan,”Non-conventional Energy Resources” New Age
5. C. S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press

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