TECHNO INDIA UNIVERSITY
W E S T B E N G A L

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)

SIXTH SEMESTER

Sl No	Code	Subject	Contacts			Credits
			L	T	P	
A. Theory						
1	TIU-DEC-T302	Communication Engineering	2	1	0	3
2	TIU-DEE-T306	Industrial Electronics - II	2	1	0	3
3	TIU-DEC-T304	Instrumentation and Control	2	1	0	3
4	TIU-DXX-E3XX	Elective - II	2	1	0	3
5	TIU-DEN-T300	CASD	2	1	0	3
B. Practical						
1	TIU-DEC-L302	Communication Engineering Lab	0	0	3	2
2	TIU-DEC-L304	Measurement and Instrumentation Lab	0	0	3	2
3	TIU-DXX-E3XX	Elective – II Lab	0	0	3	2
C. Sessionals						
1	TIU-DEC-S302	Seminar on Project Work	0	0	4	2
2	TIU-DEC-G302	Viva Voce	0	0	0	3
3	TIU-DES-S398	Entrepreneurship Skill Development	0	0	0	2
Total						28

Elective Subjects List

| TIU-DEC-E302 | Biomedical Electronics |
| TIU-DCS-E306 | Computer Hardware |

Elective Laboratory List

| TIU-DEC-E304 | Biomedical Electronics Lab |
| TIU-DCS-E308 | Computer Hardware Lab |

CASD
TIU-DEN-T300
L-T-P: 2-1-0
Credits: 3

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

Communication Engineering
TIU-DEC-T302
L-T-P: 2-1-0
Credits: 3

Group A

Unit – I Propagation of Waves
Elementary concepts about propagation of waves
Propagation of ground wave, space wave and sky wave
Iono-spheric layers – Skip distance – Plasma frequency – Critical frequency – MUF –Virtual height— Multihop and duct propagation

Unit – II Radar Systems
Block schematic description of simple radar system – Plan position indicator, frequency and

TECHNO INDIA UNIVERSITY
W E S T B E N G A L

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

power range of radar system – Operation of duplexer – RADAR range equation
Block schematic description of pulsed radar system and moving target indicator including Doppler Effect, blind speed

Unit – III Satellite Communication

Kepler's Law – Artificial Satellite – Orbits – Geostationary Orbit Satellite Speed – Power Systems – Satellite Angles – Station Keeping – Satellite Launching – Attitude Control.
Transponder and satellite frequency allocations – Frequency reuse.
Block schematic description of communication satellite
Elementary idea of FDMA ,TDMA and CDMA

Group B
Unit – IV Optical Communication
Concept of fibre optic communication system – Advantages and
limitations of optical fibre communication – Construction of optical fibre – Optical fibre types: Monomode and Multimode.
OPTICAL FIBRE PERFORMANCE: Bandwidth-distance product Transmission loss.
OPTICAL SOURCES: LED and LASER – Modulation of LED and LASER – Functions of optical detectors.
Block schematic description of optical fibre communication system.
Components of optical fibre – Coupler connector splice.
Basic idea of Fibre optic networking
Fibre Distributed Data Interface – Synchronous optical network.
Multiplexing on optical fibre cable – Wavelength division multiplexing , Orthogonal Frequency Division Multiplexing (basic idea only) Applications of fibre optics.

Unit – V Spread Spectrum Modulation
Introduction, PN Sequence
Model of spread spectrum modulation system
Direct sequence spread spectrum signal
Frequency hop spread spectrum, slow frequency hopping, and fast frequency hopping
Application S. S. modulations

Group – C

Unit – VI Modern Telephony
Working of facsimile or fax – Idea of image processing by
Charged Coupled Device.
Concept of cordless telephony.
CELLULAR TELEPHONE SYSTEM: Concept – Mobile Telephone Switching Office –

Cellular telephone unit – Frequency synthesizer – Number Assignment Module – Mobile Identification Number – Digital cellular telephone system – Global
System for Mobile communication – Concept of CDMA.

Concept of 1G, 2G, 3G and 4G
Wireless Communication—Wi-Fi and Wimax (Basic ideas only)
Concept of Video Phone

Recommended Textbooks:
1. W. Tomasi, "Electronic Communication Systems: Fundamentals through Advanced", Pearson
2. T. Pratt, A. Bostian & T. Allnutt, "Satellite Communications", John Wiley
3. D. Roddy, "Satellite Communication", McGraw Hill
4. G. Keiser, "Fibre Optic Communications", McGraw Hill
5. J. M. Senior, "Optical Fiber Communications: Principles and Practice", Pearson
6. T. S. Rappaport, "Wireless Communication – Principles and Practice", Prentice Hall
7. H. Taub & D. L. Schilling, "Principles of Communication Systems", McGraw Hill
8. W. Stallings, "Data and Computer Communication", Prentice Hall
9. T. Viswanathan, "Telecommunication Switching Systems and Networks", Prentice Hall of India

Communication Engineering Lab
TIU-DEC-L302

Credits: 2
List of Experiments
1 To calculate attenuation constant, bending loss and numerical aperture of optical fibre.
2 I-V characteristics of LED (i) using optical fibre between LED and power meter and (ii) without using optical fibre.
3 P-I characteristics of LED (i) using optical fibre between LED and power meter and (ii) without
 using optical fibre.
4 Input-output characteristics using long optical fibre. Calculation of attenuation per unit length
  of optical fibre.
5 TCP/UDP Socket Programming
6 Multicast & Broadcast Sockets
7 Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
8 Implementation of Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
9 Implementation of Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Industrial Electronics - II
TIU-DEE-T306
L-T-P: 2-1-0
Credits: 3

Group A

Unit – I AC Power Regulator
Concept of Automatic AC Regulator and phase control
Principle of operation of: Step Regulator – Solid State Changer – Servo Regulator
Principle of operation of Phase Control AC Regulator
Principle of operation of CVT and Solid State Regulator
SPEED CONTROL OF AC MOTOR: Types of speed variation – Frequency variation – Stator volt variation – Closed loop control – Types of feedback
TYPES OF BREAKING: Regenerative breaking – Plugging

Unit – II Choppers
Principle of operation of chopper and its application
Functional operation of forced, commutated and Jone's chopper and their areas of applications
Principle of operation of 4-quadrant chopper
Principle of operation of Cycloconverter and its applications

Unit – III Inverters & UPS
Principle of operation of self-oscillating and driving inverter
Principle of operation of voltage driver, current driver, half bridge and full bridge inverter. Inverter loads
Three phase inverter, Applications of inverter
Concept of solar cell and inverter
Principle of operation of ON line UPS, standby UPS, cold and warm, utility of static switch.
Use of storage devices and working principle of battery charger along with concept of solar battery charger

Group B

Unit – IV Stepper Motor
Types and principle of operation of stepper motor.
STEPPER MOTOR CONTROL: Stepper Drive – Dual Voltage Drive – Chopper Drive

Unit – V PLC Controller
Evolution and Role of PLC in Automation. Block Diagram & Principle of Working
PLC Characteristics and hardware configuration – CPU, Racks, Power Supply,

![Techno India University logo] **TECHNO INDIA UNIVERSITY**
W E S T B E N G A L

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

Memory, Input & Output Modules, Application Specific Modules, Speed of
Execution, Communication, Redundancy
Introduction to PLC Programming Languages –Ladder,
Instruction List,
Structured Text, Grafcet

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

Instrumentation and Control
TIU-DEC-T304
2L - 1T - 0P
Credits 3

Group – A

Unit – I Transducer Fundamentals
Principle of operation of transducer and sensor
Measurement of physical quantities with transducer, displacement, potentiometer, LVDT, strain
gauge, piezoelectric crystal
TEMPERATURE: RTD – Thermistors – Thermocouple
FLOW: Positive displacement – Electromagnetic heat – Thermal heat
Other applications like measurement of pH and conductivity
Factors for choice of transducer

Unit – II Position, Displacement and Temperature Measurements
Principle of Potentiometric Transducer
Capacitance Transducer
Linear Variable Differential Transformer.
Basic types of temperature transducer: Resistance detectors, thermistors, thermocouple —
Principle of operation, specifications, features and applications
Application of platinum thin film and sensors

Unit – III Pressure or Force & Vibration Measurement
Representative unit of pressure or force
Electrical transducer alignments — Electrical strain gauges: Types – Gauge Factor –
Temperature Specification SEMICONDUCTOR STRAIN GAUGES: Properties of piezoelectric

alignments
Group – B

Unit – IV Signal Conditioning
Signal conditioning requirements for AC and DC transducer signal
Transducer circuit modification
Specification and characteristics of instrumentation amplifier
Signal processing
Features and advantages of computerized data acquisition

Unit – V Introduction to Control Engineering
Examples of control system
Classification of control system
Representation of control system
Transfer function
Block diagram of a feedback control system
Simplification of a feedback control system

Unit – VI System Element Behavior
Standard test
The steady state and transient response
Steady State Error – Rise Time – Delay Time – Settling Time
DAMPING: Over damped – Under damped – Critically damped
Standard test inputs - step, ramp, parabolic & impulse. Need of them, significance, and corresponding Laplace representation Poles & zeros – definition
Analysis of first order control system for unit step input; concept of time constant
Analysis of second order control system for unit step input; concept, definition & effect of damping; time response specifications (no derivations); problems on time response specifications

Group – C

Unit – VII Closed Loop System
s-plane – Introduction stability - stable, unstable, critically stable & conditionally stable system; relative stability
Routh's stability criterion-- basic idea;
Nyquist criteria—basic idea

Unit – VIII Control Actions and Process Controllers
Process control system – block diagram, elements
Role of controllers in process industry; concept of m-sequencing & modulating controllers;
Control actions: discontinuous & continuous modes

TECHNO INDIA UNIVERSITY

W E S T B E N G A L

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

on off controllers: neutral zone
proportional controllers (offset, proportional band) integral & derivative controllers
composite controllers; PI, PD, PID controllers

Recommended Textbooks:
1. B. C. Kuo, "Automatic Control Systems", Prentice Hall
2. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age
3. K. Ogata, "Modern Control Engineering", Prentice Hall
4. P. Ramesh Babu, "Control System Engineering", Scitech
5. A. K. Jairath, "Problems and Solutions of Control Systems", CBS
6. A. K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai
7. D. Patranabis, "Sensors and Transducers", Prentice Hall of India
8. H. S. Kalsi, "Electronic Instrumentation", McGraw-Hill (India)
9. *A. D. Helfrick and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall*

Measurement, Instrumentation and Control Lab
TIU-DEC-L304

Credits: 2
List of Experiments
1. Familiarize with PMMC, Dynamometer, Electrothermal and Rectifier type instrument, Oscilloscope and digital multimeter
2. Calibratemovingiron&electrodynamometertypeammeter/voltmeterbypotentiometer.
     Conversion of Ammeter and Voltmeter and vice-versa
3. Calibrate dynamometer type Wattmeter by potentiometer
4. Calibrate A.C. energy meter
5. Measure the resistivity of material using Kelvin Double Bridge
6. Measurement of Power using Instrument transformer
7. Measurement of Power in Polyphase circuits
8. Measurement of Frequency by Wien Bridge using Oscilloscope
9. Measurement of Inductance by Anderson Bridge
10. Measurement of Capacitance by De Sauty Bridge

Elective - II
TIU-DXX-E3XX
2L 1T 0P
Credits 3

Biomedical Electronics (Under Elective – II)
TIU-DEC-E302

Group A

Unit – I Radiology & Microscopy Equipments
Properties of X-ray – Production of X-ray – Types of X-ray machine photoelectric effect – Crompton effect
Bremostrate lung X-ray tubes – High voltage power sources – Typical X-ray machine, care, maintenance and troubleshooting designs variations.
a.Scatter reductions – Image intensifiers – C.T. scan

Unit – II Analytical Laboratory Instruments and Safety Measures
Introduction & basic principles of PH meter
Blood gas analysis – Densitometers – Electrophoresis
Filter and flame photometers – Spectrometers
Gross current, Micro Current shock, safety standards rays and considerations safety testing instruments, biological effects of X-rays and precautions
Group B

Unit – III Ultrasound
Ultrasonic Pulse Echo techniques – Time Motion Ultra-sonograph

Unit – IV Microscopy
Electron microscopy – Light microscope – Their comparison

Unit – V I. C. U./C. C. U. Systems
Introduction – System configuration – System connection – Recording instrument – Alarm modules – Displaying
Information and servicing considerations in control systems
Strip chart recorder – Introduction recording technique
PMMC Galvanometer – Electronic Recorder – Adjustment & typical faults – Servo recorders

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

Computer Hardware (Under Elective – II)

TIU-DCS-E306

Group A

Unit – I PC Hardware Overview
PC EVOLUTION: Feature of Intel Processors - Pentium, P2, P3, P4, Dual Core, Core i3, i5, i7 and AMD processors : K6, Athlon XP, Athlon 64
INSIDE THE SYSTEM UNIT: Block diagram of the PC system, system box types, system main components and their overview including the rear side connectors
Chipset basic, chipset Architecture: North / South Bridge architecture and Hub architecture, Architecture of Intel chipset 915 G & 945 G
MOTHERBOARD: Motherboard Selection criteria & layouts, upgrades, functional description of important blocks and their interconnection
BUSES &EXPANSION SLOTS:Different bus architecture features, of ISA, PCI-X, PCI-Xpress, AGP, PCMCIA, AGP, Processor BUS (no pin description) PCI versus PCI Express
BIOS: Basic ROM BIOS organization, services, BIOS, DOS, Windows interaction principle.
CMOS:Setup, configuration and utility
Unit – II Main Memory System and Storage Devices
Motherboard Memory: Features of PC's memory organization: Primary,   Secondary,Memory Packages: SIMM & DIMM, Extended Memory, Virtual Memory, Expanded Memory –: DRAM including features of SDRAM, DDR, DDR2, DDR3, Disk Organization in DOS: Sectors, Cluster, DBR, MBR, FAT, root directory.
Concept of cache memory : Internal cache, External cache (L1, L2, L3 cache)
Hard Disk Drive: Hard disk construction and working
Servo Techniques : Wedge servo, Embedded servo, dedicated servo Terms related to Hard Disk : Track, Sector cylinder, cluster, landing zone, MBR, Zone recording, write pre-compensation
Formatting, Low level formatting, High level formatting, Partitioning
FAT basics, Introduction to file system FAT 16, FAT 32, NTFS
Hard disk drive interface : features of parallel AT attachment (PATA), Serial ATA (SATA), ATA devices jumper selections : Master, slave, cable select, ATA cables
ATA RAID : RAID 0, RAID
CDROM drive : Construction, Recording
CD-ROM Disks & Drives: Types, audio, video, DVD – Construction, Recording, Reading, Basics: Speed – Storage capacity – Subassembly components and installation
Blu-ray disk specification and pen drive

Group – B

Unit – III Monitors and Interfacing
MONITORS AND THEIR INTERFACES: Block diagram description of a Video Controller Card and Monitor – Display Adapters: CGA, VGA and SVGA card — Features, Resolution and

Monitor features, Graphics display characteristics – Video attributes
Comparison of CRT display related to LCD display
LCD monitor: functional block diagram of LCD monitor, working principle, advantages and disadvantages Types: Passive matrix and Active matrix, Important characteristics: Resolution, Refresh rate
Response time
Basic block diagram of a video accelerator care.

Unit – IV Input & Output Devices and Ports
Keyboard: Types of key switches and signals: Membrane, Mechanical, Rubber dome, Capacitive and interface
Mouse: Mechanical, Opto-mechanical, optical (New design)-principle of operation and installation
Scanner: Flat bed, sheet-fed, Handheld: Block diagram and specifications, OCR, TWAIN, Resolution, Interpolation
Modem: Internal and External: Block diagram and specifications
Printer: Dot matrix, Inkjet, Laser: Block diagram and specifications, self test of printer, interface requirements. Use of toner and ink cartridge
Plotter: Types, functional principle, capabilities, resolution and installation
PORT: Serial Port: Features, Signals, Connector specification – Parallel Port: Features, Signals, Connector specification – Game Port: Features – Connector
specification
U.S.B.: Features – Specification

Recommended Textbooks:
1. B. Govindarajalu, "IBM PC and Clones", McGraw Hill India
2. R. Gilster, "PC Hardware: A beginner's Guide", McGraw Hill
3. V. Gupta, "Comdex Hardware and Networking Course Kit", Dreamtech Press

Biomedical Electronics Lab (Under Elective – II)
TIU-DEC-E304
Credits: 2

List of Experiments
1 Sphygmomanometer measurement
2 Measurement of bio-potentials (such as ECG, EEG, EMG)
3 Heart and Respiratory rate measurements
4 Measurements with Densitometers and Spectrometers
5 Radiological data acquisition and signal processing with X-ray and CT scan
6 NMR and Spectrophotometry
7 Calibration of biomedical instruments

Computer Hardware Lab (Under Elective – II)
TIU-DCS-E308
Credits: 2

List of Experiments
1) Implementing IPC (Message queue)
2) NIC Installation & Configuration (Windows/Linux)
3) Familiarization with Networking cables (CAT5, UTP) – straight and cross, and with Connectors
    (RJ45, T-connector)
4) Familiarisation with Hubs, Switches, and Routers
5) Assembly, installation and configuration and troubleshooting of complete Computer
    system along with input output devices and UPS
6) Identification of different motherboards & CPU's. Configuration of slot 1 motherboard for
    setting up of a Pentium III processor.
7) Troubleshooting symptom failures in motherboard.
8) Troubleshooting symptom failures in FDDI