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 Electrical Engineering (EE)

Sixth Semester

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIU-UTR-T300	Career Advancement & Skill Development	2	1	0	3
TIU-UMG-T316	Industrial Economics, Accountancy & Costing	3	0	0	3
TIU-UEE-T302	Electrical Power Systems II	3	1	0	4
TIU-UEE-T304	Instrumentation & Process Control	3	1	0	4
TIU-UEE-T306	Microprocessors & Microcontrollers	3	0	0	3
Practical					
TIU-UEE-L306	Microprocessors & Microcontrollers Lab	0	0	3	2
TIU-UEE-L304	Instrumentation & Process Control Lab	0	0	3	2
TIU-UEE-L302	Electrical Power Systems Lab II	0	0	3	2
Sessional					
TIU-UES-S398	Entrepreneurship Skill Development	0	0	2	2
TIU-UEE-S302	Electrical Machine Design	0	0	3	2
Total Credits					27

Detailed Syllabus

Career Advancement & Skill Development
TIU-UTR-T300
LTP: 2-1-0
Credits: 3

The detailed syllabus to be provided by the Department of Training & Placement.

Industrial Economics, Accountancy & Costing
TIU-UMG-T316
LTP: 3-0-0
Credits: 3

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The detailed syllabus to be provided by the Department of Management.

Electrical Power Systems II
TIU-UEE-T302
LTP: 3-1-0
Credits: 4

Per-Unit representation of Power system– Selection of base quantities, percent and per unit values, advantage of per unit system. AC Transmission – Power flow through a line, power circle diagram, line charts, active power flow and voltage control in transmission system. Line loadability and voltage dependence. Power flow in interconnected systems and load flow analysis – Gauss –Seidel method. Symmetrical fault analysis . Elements of HVDC Power transmission. Basic concept of active and reactive power control of Synchronous generator. Interdependence of active power with frequency and reactive power with voltage and concept of decoupling. Speed Governing System: Description ofSpeed Governor, Speed changer and main components of speed governing system, principle of operation. Load frequency control: Representation of speed governing system, effect of governor droop on load sharing among generators ,dependence of load on frequency, system inertia. Modeling and analysis of single area load-frequency control, supplementary control, concept of control area. Multi area load frequency control problem and concept of tie line control. Reactive power control: Role of excitation system, main & pilot exciters, description of different types of excitation systems. Economic operation of power plant – cost curves, heat rate, incremental rate, economic load sharing among generating units. Power system stability: Steady state and transient stability, Swing equation and its numerical solution, equal area criterion for transient stability, improvement of transient stability.

Recommended Textbooks

- Power System Engineering: I.J.Nagrath & D.P.Kothari
- A Course in Power System: JB Gupta
- Electrical Power Systems: Wadhwa
- Power System Analysis: J.J.Grainger & W.D.Stevension
- Power System Analysis, Operation and Control: Chakrabarti and Halder

Instrumentation & Process Control
TIU-UEE-T304
LTP: 3-1-0
Credits: 4

General measurement system. Introduction to transducers. Signal conditioning systems for transducers. Linearization of sensors.

Measurement of displacement using linear variable differential transducers (LVDTs). Null reduction techniques. Phase compensation circuits. Phase sensitive demodulation.Synchronous demodulation. Introduction to rotary variable differential transducers(RVDTs).

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Capacitive transducers: variable air gap, variable plate overlap, variable dielectric. Level gauge. Thickness gauge. Humidity sensor. Capacitive microphone. Signal conditioning circuits for capacitive transducers: reactive bridges, transformer ratio bridges, multivibrator circuits, op-amp based circuits.

Piezoelectric transducers. Fundamental concepts, materials, charge sensitivity, voltage sensitivity. Force/displacement transducers. Buffer amplifiers, charge amplifiers. Static and dynamic responses. Accelerometers.

Measurement of flow. Hot wire anemometers: constant-current and constanttemperaturevarieties for measurement of static and dynamic flow. Dynamic compensation.

Electromagnetic flowmeters: DC, AC and interrupted DC excitation for magnet system. Ultrasonic transit-time flowmeters: ultrasonic link, wetted-type and nonwettedtype varieties.

Force balance transducers. Fundamental concepts. Accelerometers. Static and dynamic responses.

Pressure transducers. Primary sensing elements: bourdon tube, diaphragm, bellows.
Electronic pressure gauges. Capacitive pressure transducers.

Magnetostrictive transducers. Basic concepts. Torque measurement using magnetostrictive sensing.

Active filters. Filter approximations Techniques: Butterworth, Chebyshev. Realization of
Active Filter circuits. State-variable filter. Switched capacitor filter circuits.
Data Converters. DAC: Binary-weighted register, R-2R ladder. DAC characteristics &specifications. DAC errors. ADC: Successive-approximation, Dual-slope, Delta-sigma.
ADC codes and errors.

Waveform display devices& applications: CRT, LCD, LED. PLL and its applications.

Introduction to process control loop and salient components. Process control terminology. Process instrument diagram. Self-regulating and non self-regulatingprocesses.

Controller implementation. Electronic analog P, PI, PD, PID controllers. Pneumatic controllers: baffle-nozzle amplifiers, relay valve, pneumatic P, PI, PD, PID controllers.

Recommended Textbooks

•Measurement Systems-Application and Design: Doebelin
•Instrument Transducers: Neubert
•Principle of Industrial Instrumentation: Patranabis
•Analog and Digital Filters: Design and Realization. H. Y. F. Lam
•Passive and Active Filters: Theory and Implementations: W. K. Chen

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- Principles of Electronic Instrumentation, D. Patranabis
- Process Control: Bhanot
- Process Control: Sai Krishna
- Chemical Process Control: Stephanopoulos

Microprocessors & Microcontrollers
TIU-UEE-T306
LTP: 3-0-0
Credits: 3

Microprocessor Architecture : Address / Data and Control lines, Timing diagrams, Internal registers, Interrupt mechanism (Hardware/Software), DMA mechanism - [NB. Study mainly based on Intel 8085 and other popular microprocessors]. Detailed description of a typical 8-bit Microprocessor (preferably 8085). Interfacing with support chips : Programmable Peripheral Interface (8255), Programmable time/counter (8253), Programmable UART (8251), Programmable Interrupt Controller (8259), DMA Controller (8257), Programmable Keyboard and Display Controller (8279) - signals and timing details along with hardware/software interfacing techniques.

Microprocessor vs. Microcontroller, Architecture of MCS51 microcontroller, PIC microcontroller family, features, Architecture, Memory organization: program memory(ROM, PROM, E2PROM) and data memory (RAM, FLASH), Register organization, various modules like Timer, ADC, capture, compare, PWM, serial, External interface: inter-chip communication standard (I2C, SPI), device interface (switch, keyboard, LED, seven-segment display, alpha-numeric and graphic LCD, external E2PROM, external serial and parallel interface), PIC Development System, Assembler and Cross-compiler, Programming methodology, Advanced microcontroller: 16-bit and 32-bit, VHDL model of microcontrollers, IP cores.

Programmable Logic Controllers (PLC): Architecture and functional components, I/OProcessing Methodologies, Programming Languages. Sequence Function Chart, LadderDiagram, PLC input/output Diagram. Case Studies.

Programmable Logic Devices : Concepts of PLA, PAL and FPGAs, Architecture, Basic Design Process. Introduction to VHDL language basics. Modeling combinational and sequential logic systems. Simulation and tasting.

Recommended Textbooks

- Microprocessor Architecture, Applications: Ramesh S. Gaonkar
- 8051 Microcontrollers: Mazidi, Mazidi