GOVT. COLLEGE OF ENGINEERING, AMRAVATI

(An Autonomous Institute of Government of Maharashtra)

B. Tech. (Electronics and Telecommunication)

VII and VIII Semester
CURRICULUM

Department of Electronics and Telecommunication

2013-14

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

Department of Electronics and Telecommunication Engineering

Scheme for B. Tech. (Electronics and Telecommunication)

SEM III

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
SHU303	Engineering Mathematics - III	3	--	---	3	10	15	15	60	---	---	100	3
ETU301	Network analysis	3	---	---	3	10	15	15	60	---	---	100	3
ETU302	Components, Devices and Instruments Technology	3	1	---	4	10	15	15	60	---	---	100	4
ETU303	Electronics Devices and Circuits	3	1	---	4	10	15	15	60	---	---	100	4
ETU304	Digital Electronics	3	---	---	3	10	15	15	60	---	---	100	3
SHU305	General Proficiency - II	1	---	2	3	---	---	---	---	25	25	50	2
ETU305	Network Analysis Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU306	Components, Devices and Instruments Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU307	Electronics Devices and Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU308	Digital Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
Total		**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**23**

SEM IV

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
SHU401	Engineering Mathematics - IV	3	--	---	3	10	15	15	60	---	---	100	3
ETU401	Signals and Systems	3	1	---	4	10	15	15	60	---	---	100	4
ETU402	Analog Circuits	3	1	---	4	10	15	15	60	---	---	100	4
ETU403	Microprocessor and its Interfacing	3	---	---	3	10	15	15	60	---	---	100	3
ETU404	Control System Engineering	3	---	---	3	10	15	15	60	---	---	100	3
ETU405	Object Oriented Programming Lab	1	---	2	3	---	---	---	---	50	-	50	2
ETU406	Signals and Systems Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU407	Analog Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU408	Microprocessor and its Interfacing Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU409	Control System Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
Total		**16**	2	**10**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Continuous Assessment ESE Duration for Th: 2Hrs 30Min

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI
Department of Electronics and Telecommunication Engineering
Scheme for B. Tech. (Electronics and Telecommunication)
SEM V

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
ETU501	Linear Integrated Circuits and Applications	3	---	---	3	10	15	15	60	---	---	100	3
ETU502	Analog Communication	3	---	---	3	10	15	15	60	---	---	100	3
ETU503	Power Electronics	3	---	---	3	10	15	15	60	---	---	100	3
ETU504	Microcontroller and Its Applications	3	---	---	3	10	15	15	60	---	---	100	3
ETU505	Humanities and Economics	3	---	---	3	10	15	15	60	---	---	100	3
ETU506	Linear Integrated Circuits and Applications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU507	Analog Communication Lab	---	---	2	2	---	---	---	---	25	---	25	1
ETU508	Power Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU509	Microcontroller and Its Applications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU510	Data Structure Lab	1	---	2	3	---	---	---	---	25	25	50	2
ETU511	Self Study - I	---	---	----	---	25	---	---	---	---	---	25	2
Total		**16**	---	10	**26**	**75**	**75**	**75**	**300**	**125**	**100**	**750**	**23**
ETU511 Self Study- I is based on one class test each on the basis of 20 % curriculum of the courses ETU501 to ETU504 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week													

SEM VI

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
ETU601	Electromagnetic Fields	3	--	---	3	10	15	15	60	---	---	100	3
ETU602	Audio and Video Engineering	3	---	---	3	10	15	15	60	---	---	100	3
ETU603	Electronic Measurements	3	---	---	3	10	15	15	60	---	---	100	3
ETU604	Digital Signal Processing	3	---	---	3	10	15	15	60	---	---	100	3
ETU605	Industrial Management and Operation Research	3	---	---	3	10	15	15	60	---	---	100	3
ETU606	Audio and Video Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU607	Electronic Measurements Lab	---	---	2	2	---	---	---	---	25	---	25	1
ETU608	Digital Signal Processing Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU609	Circuit Simulation Lab	---	---	2	2					25	25	50	1
ETU610	Mini Project	----	----	2	2	---	----	---	----	25	25	50	2
ETU611	Self Study - II	---	---	----	---	25	---	---	---	---	---	25	2
ETU612	Industrial Lecture - I	1	---	----	1	---	---	---	---	---	---	---	---
Total		**16**	**---**	10	**26**	**75**	**75**	**75**	**300**	**125**	**100**	**750**	**23**
1) ETU611 Self Study- II is based on one class test each on the basis of 20 % curriculum of the courses ETU601 to ETU604 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week													
2) Assessment of ETU612 Industrial Lecture- I is scheduled in VII semester with ETU711 Industrial Lecture- II													
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GOVERNMENT COLLEGE OF ENGINEERING, AMRAVTI
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SEM VII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical		Total	
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE		
ETU701	Digital System Design	3	---	---	3	10	15	15	60	---	---	100	3
ETU702	Digital Communications	3	---	---	3	10	15	15	60	---	---	100	3
ETU703	Elective - I	3	---	---	3	10	15	15	60	---	---	100	3
ETU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
ETU705	Digital System Design Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU706	Digital Communications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU707	Elective - I Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU708	Project Phase - I	---	---	4	4	---	---	---	---	50	--	50	2
ETU709	Seminar	---	---	2	2	---	---	---	---	50	--	50	2
ETU710	Industrial Training/ Visit	---	---	---	---	---	---	---	---	50	---	50	1
ETU711	Industrial Lecture - II	1	---	---	1	---	---	---	---	25	---	25	1**
ETU712	Self Study - III	---	---	---	----	25	---	---	---	---	---	25	2
Total		13	---	12	25	65	60	60	240	250	75	750	23

1) ETU712 Self Study - III is based on one class test each on the basis of 20 % curriculum of the courses ETU701 to ETU703 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week

2) ** Credit shall be awarded on the basis of combined assessment of ETU612 Industrial Lecture - I and ETU711 Industrial Lecture - II

3) Students of this department shall select any one INTERDISCIPLINARY ELECTIVE offered by other department. INTERDISCIPLINARY ELECTIVE shown below will be offered to students of other department.

SEM VIII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
ETU801	Computer Networks and Communications	3	---	---	3	10	15	15	60			100	3
ETU802	Microwave Engineering	3	---	---	3	10	15	15	60	---	---	100	3
ETU803	Elective - II	3	---	---	3	10	15	15	60	---	---	100	3
ETU804	Elective - III	3	---	---	3	10	15	15	60	---	---	100	3
ETU805	Computer Networks and Communications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU806	Microwave Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU807	Elective - II Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU808	Project Phase- II	---	---	6	6	---	---	---	---	75	100	175	6
ETU809	Self Study - IV	---	---	---	---	25	---	---	---	---	----	25	2
Total		12	---	12	24	65	60	60	240	150	175	750	23

ETU809 Self Study - IV is based on one class test each on the basis of 20 % curriculum of the courses ETU801 to ETU804 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Continuous Assessment ESE Duration for Th: 2Hrs 30Min

ETU704 Interdisciplinary Elective

A) Electronic Instruments and Applications
B) Industrial Electronics

ETU703 Elective - I

A) Fiber Optic Communications
B) Embedded Systems
C) System Software
D) Artificial Intelligence
E) Biomedical Engineering

ETU803 Elective - II

A) Wireless Communications
B) Very Large Scale Integration Design
C) Open Source Operating Systems
D) Fuzzy Logic and Neural Networks
E) Bioinformatics

ETU804 Elective - III

A) Satellite Communication Systems
B) Electronic Design Techniques
C) Antenna and Radar
D) Digital Image Processing
E) Industrial Automations

ETU701 DIGITAL SYSTEM DESIGN

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Combinational Logic: Recapitulation of digital logic and minimization techniques, combinational logic design, binary parallel adders, look-ahead carry adder, multiplexers, demultiplexer, multiplexer trees, encoders, decoders, comparators, code converters, priority encoders, parity generator/checker.

Programmable Logic Devices: Read only memory (ROM) as programmable logic devices (PLD), Programmable Logic Array (PLA): block diagram, input, output buffers, AND, OR, INVERT and NON-INVERT matrix, programmable array logic (PAL): combinational, registered and configurable PALs, complex programmable logic devices (CPLD): block diagram, programming, packaging, field programmable gate array (FPGA): basic architecture, process technologies.

Synchronous Sequential Circuits: Design of shift registers and counters, analysis of clocked sequential networks, general models of sequential machines, Mealy and Moore machine, equivalence and minimization networks, derivation of state graph and tables, reduction of state assignments.

Asynchronous Sequential Circuits: Analysis of asynchronous sequential circuits, derivation and reduction of primitive flow tables, state assignments and realization of flow tables, hazards, asynchronous sequential circuit design.

Fault Detection and Location: Fault detection and location in combinational circuits, path sensitizing method, equivalent-normal-form (ENF) method, Two-level fault detection, fault detection and location in sequential circuits using circuit test approach.

Text Books

1. Fundamental of Logic Design, C. H. Roth Jr., 4th edition, Jaico Publication, 2003
2. Digital Circuit and Logic Design, S.C. Lee, 3rd edition, Prentice Hall of India Pvt. Ltd, 2002

Reference Books

1. Modern Digital Electronics, R. P. Jain , 4th edition, TMH Publication, 2009
2. Digital Electronic Circuits and Systems, N.M. Morris., 1st edition, McMillan Press, London
3. Fault Tolerant and Fault Testable Hardware Design, P. K. Lala, 1st edition, BS Publications, 2006

ETU702 DIGITAL COMMUNICATIONS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Pulse Modulation Techniques: Sampling theory, uniform and non-uniform quantization in pulse code modulation (PCM), μ-law and A-law PCM, differential PCM, delta modulation and adaptive delta modulation (DM/ADM), bandwidth requirement of pulse amplitude modulation (PAM), pulse position modulation (PPM), pulse width modulation (PWM), pulse code modulation (PCM), time division multiplexing (TDM), frequency division multiplexing (FDM) and code division multiple access (CDMA).

Digital Communication System: Introduction, elements of digital communication system, source encoder, decoder, channel encoder, decoder, modulator and demodulator, importance of digital system.

Information Theory and Channel Capacity: Measure of information, entropy and information rate of independent and dependent sequences, source encoding, Shannon's encoding algorithm, Huffman encoding algorithm, discrete communication channel and its capacity, Shannon's theorem on channel capacity.

Baseband Transmission: Discrete PAM signals, power spectra of discrete PAM signals, baseband binary data transmission system, inter symbol interference, Nyquist's criteria for distortionless baseband binary transmission, correlative coding, duobinary signaling, modified duobinary technique, equalization, eye diagram, self synchronization for baseband PAM system, scrambler and unscrambler.

Digital Modulation Techniques: Digital carrier modulation schemes: binary amplitude shift keying (ASK), phase shift keying (PSK), frequency shift keying (FSK), coherent scheme, probability of errors, comparison of digital modulation systems, basics of differential phase shift keying (DPSK) and quadrature phase shift keying (QPSK), M-ary shift keying (MSK) and synchronization: carrier synchronization, symbol synchronization.

Error Control Coding: Introduction, methods, types, linear block codes and its matrix description, error detection and correction capabilities of linear block code, cyclic code.

Spread Spectrum Techniques: Introduction, pseudo noise (PN) sequences, direct sequence spread spectrum signals, processing gain, probability of error, frequency hop spread spectrum signals.

Text Books

1. Digital and Analog Communication Systems, K. S. Shanmugam, 2nd edition, John Wiley and Sons, 1996
2. Digital Communication, S. Haykin, 4th edition, John Wiley and Sons, reprint 2009

Reference Books

1. Digital Communication, J. K. Proakis, 5nd edition, Mc-Graw Hill Book Co., New York, 2008
2. Principles of Communication Systems, H. Taub, D. L. Schilling, G. Saha, 3rd edition, Mc-Graw Hill Publication Co. Ltd., 2008
3. Digital Communications Fundamentals and Applications, B. Sklar, 2nd edition, Pearson Education, 2006

ETU703 ELECTIVE-I
(A) FIBER OPTIC COMMUNICATIONS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction to Fiber Optic: Basic optic principles, Snell's law, different manufacturing and splicing techniques, and connectors.

Optical Fiber Properties: Theory of circular wave guide, modes of optical fibers, numerical aperture (NA), power flow, attenuation, losses: absorption, bending, scattering, dispersion: intra modal, intermodal, nonlinear effects, introduction to Soliton propagation.

Optical Sources and Detectors: Optical emission from semiconductors, light emitting diode (LED), double heterojunction LED, power efficiency, basic concept of LASERS, semiconductor injection LASERS, optical detection principle, absorption, quantum efficiency, responsivity, positive intrinsic negative (PIN) photodiode, detector noise characteristics, avalanche photodiode(APD) and noise in photodiode, mid-infrared and far-infrared photodiodes, phototransistors, metal semiconductor metal (MSM) photo-detectors.

Principles of Fiber Optic Communication: Analog and digital transmission, digital coding, electrical and optical bandwidth, dispersion effects, bandwidth and data rate, dynamic range, noise and bit error rate.

Optical Transmitters, Receivers, Fiber Optic Test and Measurement: Optical transmitter, receiver, digital system planning consideration, power penalty, optical link design, power budgeting coherent and non coherent system, modulation and demodulation scheme, multiplexing and demultiplexing, optical switches, measure fiber output power, use of optical time domain reflectometer (OTDR).

Optical Amplifiers and Networks: Semiconductor optical amplifiers, fiber and wave guide amplifiers, wavelength conversion, wavelength conversion, optical switches, photonic switching, optical– synchronous optical network/ synchronous digital hierarchy (SONET/SDH), fiber channel, local area network (LAN) standard, optical interfaces.

Text Books

1. Optical Fiber Communication and Application, J.M. Senior, 3rd edition, PHI, 2009
2. Optical Fiber Communication, G. Keiser, 4th edition, TMH, 2008

Reference Books

1. Optical Communication System, J. Gowar, 3rd edition, PHI, 2000
2. Fiber optic communication technology, D. F. Mynbaev and L. Scheiner, 6th Impression, Pearson Education, 2001
3. Fiber Optics Communication, H. Kolimbiris, 2nd edition, Pearson Education, 2004
4. Fiber-Optic Communications Systems, G. P. Agrawal, 3rd, John Wiley and Sons, 2002

ETU703 ELECTIVE-I
(B) EMBEDDED SYSTEMS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction to Embedded Systems: Design challenge - optimizing design metrics, Processor technology, IC technology, Design technology, Tradeoffs- Design productivity gap.

Embedded System Architecture: Complex instruction set computer (CISC) and reduced instruction set (RISC) architectures, basic embedded microcontroller architecture, CISC examples: Motorola (68HC11) examp8051, RISC example ARM, DSP processors Harvard architecture, PIC, memory system architecture, I/0 sub-system, co-processors and hardware accelerators, processor performance enhancement, pipelining, super-scalar execution, CPU power consumption.

Designing Embedded Computing Platform : Bus protocols, organization, memory and I/O devices: characteristics and its interfacing; timers and counters, watchdog timers, interrupt controllers, DMA controllers, A/D and D/A converters, displays, keyboards, infrared devices interfacing; communication protocols: General purpose interface bus (GPIB), FireWire, universal serial bus (USB), inter-integrated circuit connect (I^2C), internet protocol (IP).

Embedded Control Applications: Open-loop and closed loop control systems, software coding of a PID controller, fuzzy logic controller; applications: washing machine, automotive systems, digital camera, and air-conditioner.

Embedded System Development: Design methodologies, architectural design, hardware-software partitioning and integration, design examples, fault-tolerance and reliability evaluation techniques.

Text Books

1. Embedded Systems Architecture, Programming and Design, R. Kamal, 3rd reprint, Tata McGraw- Hill, 2009.
2. An Embedded Software Primer, D. E. Simon, 8th Indian Reprint, Pearson Education, 2009.

Reference Books

1. Embedded Systems Design, S. Heath, 2nd edition, Newnes Pub. , 2003
2. Embedded Systems Design – A unified Hardware /Software Introduction, F. Vahid, T. Givargis, 3rd edition, John Wiley and Sons, 2009

ETU703 ELECTIVE-I
(C) SYSTEM SOFTWARE

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Evolution of Components of Programming System: Introduction**,** assemblers, loaders, compilers, macros, pseudo codes, machine language, assembly language and higher level languages, evolution of operating system, functions of batch control language, facilities, machine structure.

Design of Assemblers: One-pass, two-pass algorithms, symbol table construction and processing, searching and sorting, microinstructions, features of macro facility, implementation of single and two pass algorithms, macro calls within macros.

Linker and Loader: Concept of static and dynamic relocation, external symbol, design of linker.

Compilers: General model of a compiler, various phases of compiler.

Run Time System: Storage organization, activation tree, activation record, parameter passing symbol table, dynamic storage allocation.

Features of High Level Language: Functional modularity, asynchronous operation and multitasking.

Text Books

1. System programming, J. J. Donovan, 1st edition, Tata McGraw Hill, 2001
2. Introduction to Systems Software, D. M. Dhamdhere, 2nd edition, Tata Mc-Graw Hill, 2009

Reference Books

1. Compilers: Principles, Techniques, and Tools, A.V. Aho, R. Sethi, J. D. Ulman, M. Lam, 2nd edition, Addison Wesley Publication, 2007

ETU703 ELECTIVE-I
(D) ARTIFICIAL INTELLIGENCE

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction to Artificial Intelligence: Intelligent agents and its classes, problem solving by searching, search methods: informed and uninformed, knowledge representation: syntax, semantics and terminologies, reasoning.

Neural Networks: Biological neurons and artificial neurons, characteristics, artificial neural network (ANN) terminology, model of a neuron, topologies and activation functions used in ANNs.

Mathematical Foundations and Learning: Types of learning: supervised, unsupervised, reinforcement, basic learning laws, learning methods, multilayered perceptron, back propagation networks, counter propagation networks, Hop field model, Kohonen`s feature maps, Radial basis function, K-means clustering algorithm.

Application of Neural Network: Pattern recognition, hand written and printed characters recognition networks, associative memories, neural network control application.

Neurofuzzy Modeling: Background of fuzzy sets and logic, Basics: fuzzification, fuzzy rules, defuzzification and inference, adaptive inference system, control system design, cognitive modeling, and applications.

Text Books

1. Neural Networks: A comprehensive foundation, S. Hykin, 2nd edition, Pearson Education Asia, 2002
2. Neural Network Fundamentals, N. K. Bose, P. Lling, 1st edition, Tata McGraw Hill,1998

Reference Books

1. Neural Networks: A classroom approach, S. Kumar, 2nd edition, McGraw Hill, 20012
2. Introduction to Artificial Neural Systems, J. M. Zurada,1st edition, Jaico Books, 1999
3. Fuzzy Logic with Engineering Applications, T. J. Ross, 3rd edition, Wiley India, 2011
4. Fuzzy Engineering, B. Kasko, 1st edition, PHI, 1996

ETU703 ELECTIVE-I
(E) BIOMEDICAL ENGINEERING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Anatomy and Physiology: Elementary ideas of cell structure, action potential, propagation, heart and circulatory system, central nervous system, muscle-skeletal system, respiratory system, and reproductive system.

Biomedical Signals and Equipment: Bioelectric signals electrocardiogram (ECG), electromyogram (EMG), electrooculogram (EOG) and electroretinogram (ERG) and their characteristics, electrodes: types, interface issues, diagnostic, therapeutic and clinical laboratory equipment, electric safety: micro and macro shocks, grounding.

Transducers for Biomedical Application: Resistive transducers - muscle force and stress - strain gauge, spirometry - potentiometer, humidity - gamstrers, respiration - thermistor**,** inductive transducers: flow measurements, muscle movement - LVDT, capacitive transducers: heart sound measurement, pulse pickup, photoelectric transducers: pulse transducers, blood pressure, oxygen analyses, piezoelectric transducers: pulse pickup, ultrasonic blood flow meter, chemical transducer-silver (Ag)-silver chloride (AgCl) electrodes, pH electrode.

Signal Recording and Patient Monitoring System: Physiological pre-amplifier and specialized amplifiers, electrode systems and machines: ECG, EMG, and EEG; measurements: heart rate, pulse rate, respiration rate, blood pressure, computerized aided ECG analysis, computerized catheterization, audiometer and audiometric tests, microprocessor applications in patient monitoring, artificial respirator, defibrillators and pacemakers.

Scanning Techniques: Basic X-ray components and circuits, types of X-ray machines e.g. general purpose, dental image intensifier system, table shooting and maintenance of X- ray machine, gross current, micro current shock, safety standards (rays) and considerations, safety, testing instruments, biological effects of X-rays and precautions, operation and function of all the controls of dental X-ray machine, computerized axial tomography (CAT), ultrasonic and MRI Techniques: Fetus monitoring and other, introduction to T-rays.

Text Books

1. Biomedical instrumentation and measurements, L. Cromwell, F. J. Weibell, E. A. Pfeiffer 2nd edition, PHI Learning, 2011
2. Biomedical Instrumentation and Measurement, J. J. Carr, J. M. Brown, 3rd edition, Pearson Education, 1996

Reference Books

1. Biomedical Instrumentation, R.S. Khandpur, 6th edition, TMH, 2004
2. Principles of Applied Biomedical Instrumentation, Goddes and Baker, 4th edition, John Wiley, 1986
3. Biomedical Instruments, D. S. Chaudhari, 1999
4. Medical Instrumentation, John. G. Webster, 2nd edition, John Wiley, 2006
5. Principles of Medical Electronics and Biomedical Instrumentation, C. S. R. Rao, S. K. Guha,1st edition, Universities Press, 2001

ETU704 INTERDISCIPLINARY ELECTIVE
(A) ELECTRONIC INSTRUMENTS AND APPLICATIONS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Digital Time Measurement Techniques: Vernier technique for small time interval measurement, Measurement of periodic time, Measurement of phase, capacitance, quality factor, time constant and decibel.

Digital Frequency Measurement Techniques: Measurement of ratio, product and difference between two frequencies, high frequency measurement, peak frequency measurement, fast low frequency measurement, time reciprocating circuit.

Signal Analyzers: Spectrum analyzer, network analyzer, wave analyzer, distortion analyzer, logic analyzer, protocol analyzer.

Automated Measurement System: Need and requirement of automatic test equipment (ATE), computer based and computer controlled ATE switches, ATE for printed circuit board (PCB), component testing, IEEE-488 electronic instrument bus standard, field bus application, and instrumentation in a hazardous area.

Data acquisition system: Introduction to smart sensors, digital sensors, case studies of real time PC based instrumentation systems, virtual instruments, intelligent instruments and role of software.

Computer control: Hierarchy of computer control for industry, direct digital control, distributed computer control: system architecture and implementation concepts, buses and communication networks of distributed computer control system (DCCS), supervisory control data acquisition (SCADA) system.

Text Books

1. Electronic Instruments Handbook, 3rd edition, McGraw Hill, 1997
2. Applied Electronic Instrumentation and Measurement McLachlan and Buchla, 1st edition, Prentice Hall International, 1992

Reference Books

1. Digital Measurement Techniques, T.S. Rathore, 3rd edition, Narosa Publishers, New Delhi, 2004
2. Handbook of Bio-medical Instrumentation, R.S. Khandpur, 2nd edition, TMH, 2003

ETU704 INTERDISCIPLINARY ELECTIVE
(B) INDUSTRIAL ELECTRONICS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Solid State Devices: Metal oxide semiconductor field effect transistor (MOSFETs), insulated gate bipolar transistor (IGBT), gate turn off thyristor (GTO), integrated gate commutated thyristor (IGCT), etc., power modules, intelligent power modules, gating circuits, thermal design, protection,

Converters and Control: Phase controlled converters, four quadrant operation, choppers, AC to DC converters.

Electric Drives: Introduction, classification, requirements and applications of electric drives

DC Motor Drives: Speed-torque characteristics of DC shunt, permanent magnet direct current (PMDC): series motors, speed and position control methods.

Inverters: Voltage source, current source; pulse width modulation (PWM) techniques: sinusoidal, selected harmonic elimination, hysteresis current controllers, space vector.

AC Motor Drives: Induction motor, speed and position control methods, d-q model, constant flux speed control structure, vector control model, vector control structure; synchronous motor, speed control methods.

Industrial Applications: Rolling mill, paper mill, textile mill drives.

Text books

1. Modern Power Electronics and AC Drives, B. K. Bose, Prentice Hall India, 1st edition, 2002
2. Thyristor Control of Electric Drives, V. Subramanyam, McGraw Hill Education, India, 1st edition, 1987

Reference books

1. Electric Drives, N. K. De, P. K. Sen, 12th reprint, PHI Learning Pvt. Ltd., 2009
2. Fundamentals of Electric Drives, G. K. Dubey, 2nd edition, Alpha Science International Ltd., 2002
3. Power Electronics, Converter, Application and Design, N. Mohan, T. M. Undeland and W. P. Robbins, 3rd edition, John Willey and Sons, 2004
4. Power Electronics, circuits, Devices and Applications, M. H. Rashid, Pearson, 2002.
5. Power Electronics and Variable Frequency Drive, B. K. Bose, Standard Publishers Distributors, 2000

ETU705 DIGITAL SYSTEM DESIGN LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU701. The list given below is just a guideline.

List

1. Design and realize 4-bit binary subtractor using IC
2. Design and realize full adder using 4:1 multiplexers
3. Design and realize 5-bit comparator using IC
4. Design and realize 4-bit even parity checker using EX-OR gates
5. Design and realize a BCD to seven segment decoder based one-digit display
6. Design and realize a 3-bit asynchronous counter with seven segment display
7. Introduction to VHDL coding
8. To implement basic Gates, combinational circuits using VHDL

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU706 DIGITAL COMMUNICATIONS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU702. The list given below is just a guideline.

List

1. Verify sampling theorem
2. Verify different pulse modulation techniques
3. Verify time division multiplexing and de-multiplexing
4. Analyze pulse code modulation (PCM) for uniform and non-uniform quantization
5. Measure signal to noise ratio for pulse code modulation (PCM) system with uniform quantization
6. Compare delta modulation and adaptive delta modulation systems
7. Generate phase shift keying and its spectral analysis
8. Spectral analysis of line codes
9. Detection of digital baseband signal using matched filter in the presence of noise
10. Generation and detection of direct spread spectrum (DS-SS) binary shift keying (BPSK)
11. Simulation of any digital communication system using COMPSIM/MATLAB

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU707 ELECTIVE-I Lab
(A) FIBER OPTIC COMMUNICATIONS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU703 (A). The List given below is just a guideline.

List

1. Verify analog and digital fiber optic link
2. Intensity modulation technique using analog and digital input signal
3. Verify frequency modulation
4. Verify pulse width modulation
5. Verify propagation loss and bending loss in optical fiber
6. Measure optical power at 660 nm and 950 nm
7. Measure propagation loss in optical fiber using power meter
8. Measure numerical aperture of optical fiber
9. Verify characteristic of electrical to optical converter
10. Verify characteristics of fiber optic communication link

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU707 ELECTIVE-I Lab
(B) EMBEDDED SYSTEMS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU703 (B). The List given below is just a guideline.

Simulation can be performed using suitable software.

List

1. Interface liquid crystal display (LCD) and keypad to ARM microcontroller
2. Interface on-chip ADC using interrupt and LCD display
3. Multitasking in µCOS-II RTOS using min 4 tasks (LED, LCD, SERIAL, KEYPAD)
4. Semaphore as signaling and Synchronizing on ARM
5. Mailbox implementation for message passing on ARM

Write a program to

6. use of semaphore using µCOS-II RTOS on ARM processor
7. message queue implementation using µCOS-II RTOS on ARM processor
8. implement mail box using µCOS-II RTOS on ARM processor
9. demonstrate shared data problem using µCOS-II RTOS on ARM processor
10. demonstrate priority inversion problem using µCOS-II RTOS on ARM processor

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU707 ELECTIVE-I Lab
(C) SYSTEM SOFTWARE LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of ETU703 (C). The List given below is just a guideline.

List

Write a program to

1. generate machine op-code table, symbol table and pseudo op-code table during first pass assembler
2. generate machine op- code table using two pass assembler
3. generate macro name table, macro definition table and argument list array during pass one of two pass macro
4. generate expanded source in pass two of two pass macro
5. process binary files of various types: structure and processing.

6. maintain data structures in files (e.g. b-tree, Linux directories), Object and executable files (demonstrated through ELF files), linking and loading, dynamic loading. Issues in program development
7. verify on run time linking
8. generate expanded source using one pass assembler
9. implement ascending and descending sorting

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU707 ELECTIVE-I Lab
(D) ARTIFICIAL INTELLIGENCE LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of ETU703 (D). The List given below is just a guideline.

List

Write a program to

1. generate activation functions used in neural networks
2. illustrate different generalized bell functions
3. illustrate different membership functions
4. realize t-norm operators
5. realize t-conorm operators
6. illustrate various training algorithms
7. create neural network models of different logic gates
8. create neural network models for illustration of different operations like union, intersection and difference

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU707 ELECTIVE-I Lab
(E) BIOMEDICAL ENGINEERING LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE duration: 3 Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of ETU703 (E). The List given below is just a guideline.

List

Implement

1. ECG pre-amplifier
2. EEG pre-amplifier
3. EMG pre-amplifier
4. filters for EEG signal
5. low energy charging and discharging circuit (related to defibrillator)
6. pure tone sine wave (audiometer)

Verify

7. Verify blood pressure parameters
8. Verify various parameters using ECG machine
9. Verify various parameters using EEG machine

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU708 PROJECT PHASE I

Teaching Scheme: 04P **Total: 04** **Credits: 02**
Evaluation Scheme: 50 ICA **Total Marks: 50**

1 In general, a group of 3-6 students should be allowed to complete the project on Approved topic.

2 Preferably more than 25 % projects shall be Industry / Research based / oriented.
3 Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students.
4 Students should finalize the topic for the project after literature survey in consultation with the Guide.
5 The **Synopsis/Abstract** on the selected topic should be submitted to the Program Head for approval.
6 On approval of the topic, students should initiate the topic based work.
7 Approximately more than 30% work(of the total quantum) should be completed by the end of VII semester.
8 At the end of semester, each batch should submit the progress report in following format:
Title
Introduction
Concept
Work completed
Work to be completed
References
9 For uniform and continuous evaluation, the Evaluation Committee comprising of the Guide, Project Course Coordinator and Expert appointed by the Program Head will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Note:
ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Oral examination shall be conducted by the panel of examiners.

ETU709 SEMINAR

Teaching Scheme: 02P **Total: 02** **Credits: 02**
Evaluation Scheme: 50 ICA **Total Marks: 50**

1. Student shall select a topic for seminar which is **not covered in curriculum**.
2. Topics shall be registered within a month after beginning of VII Semester and shall be approved by the concerned guide and Program Head.
3. Students should know the functional and technical details of selected topic after carrying out the conceptual study.
4. Before the end of semester, student shall deliver a seminar and submit the seminar report in following format:
Introduction
Literature Survey
Concept
Functional and Technical Details
Future scope
Applications

Comparison with similar topics / methods

References

5. Student shall deliver a seminar based on submitted report. The presentation and oral examination on selected seminar topic shall be assessed by panel of examiners

Note:

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Seminar Topic and the knowledge acquired. The seminar shall be assessed by the examiner panel consisting of Project Guide, Course Coordinator Seminar and Expert appointed by Program Head.

ETU710 INDUSTRIAL TRAINING/VISIT

Teaching Scheme: 00 **Total: 00** **Credit: 01**

Evaluation Scheme: 50 ICA **Total Marks: 50**

Industrial Training shall have an option of Industrial Visit.

Industrial Training: List of renowned industries shall be prepared by the Departmental Coordinator of T & P Cell for the course. After approval from the Principal and with the consultation of Industry personnel, 02 weeks trainings shall be arranged during the vacations (after the VI semester). The students may be permitted to undergo the trainings of 02 weeks as per their choices for which all the official formalities will be completed by the students under the guidance of course coordinator. The students shall submit the report based on the Industrial training to the course coordinator which will be evaluated during the VII semester

Industrial Visit: An Industry Visits to minimum three industries shall be arranged for the students unable to complete the Industrial Training. The visit shall be arranged preferably during the vacation period. However in non-availability of permission for the visit during vacation period, same may be arranged during the regular VII semester. The students will be required to submit the report based on the Industrial Visit which will be evaluated by the course coordinator

Note:

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training/visits and knowledge / skill acquired. The technical report submitted by the students shall be assessed, by the panel of examiners consisting of Project Guide, Course Coordinator and Expert appointed by the Program Head.

ETU711 INDUSTRIAL LECTURE-II

Teaching Scheme: 01 **Total: 01** **Credit: 01**

Evaluation Scheme: 25 ICA **Total Marks: 25**

List of renowned persons from industry shall be prepared by the Departmental Coordinator of T & P Cell for the course. After approval from the Principal, Minimum twelve Industrial lectures

shall be arranged, preferably once a week, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors covering the various aspects.
The assignments based on the Industry Lecture-I and Industry Lecture-II will be evaluated during VII semester

Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.

Students shall submit the report based on lectures.

Note:

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the lectures and knowledge acquired. The technical report submitted by the students shall be assessed, by the panel of examiners consisting of Project Guide, Course Coordinator and Expert appointed by the Program Head.

ETU712 Self Study- III

Teaching Scheme: 00 **Total: 00** **Credits: 02**
Evaluation Scheme: 25 TA **Total Marks: 25**

ETU712 Self Study - III is based on one class test each, on the basis of 20 % curriculum of the courses ETU701, ETU702 and ETU703(A-E), ETU704(A-E) as applicable, shall be declared by respective course coordinator at the beginning of semester. After CT-II test, a test shall be conducted separately for each course and marks of all such tests shall be converted to out of 25. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week.

ETU801 COMPUTER NETWORKS AND COMMUNICATIONS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction: Communication network, data communication and its components, data representation and data flow, types of communication: local area network (LAN), metropolitan area network (MAN), wide area network (WAN) and LAN topologies: bus, ring, star; OSI model, various layers in details; circuit switching, packet switching, message switching.

Data Link Control and Protocols: Piggybacking, multiple access protocol: channel allocation, random access methods: ALOHA, slotted ALOHA, carrier sense multiple access (CSMA), CSMA with collision detection (CSMA/CD), controlled access methods: polling, token bus and token ring

TCP/IP Protocols: Overview of transfer control protocol (TCP) / internet protocol (IP), user datagram protocol (UDP), IP addressing and related issues, IP address resolution techniques, IP datagram and forwarding.

Networking Devices and Routing Techniques: Hubs, repeaters, bridges, routers, gateways, switches, routing algorithms: fixed, random, flooding and adaptive.

Applications: Integrated services digital network (ISDN), broadband integrated services digital network (BISDN), synchronous optical network (SONET), synchronous digital hierarchy (SDH), electronic mail, asynchronous transfer mode (ATM) technology.

Text Books

1. Data communication and Networking, B. A. Forouzan, 4th edition, Tata McGraw-Hill, 2006
2. Computer Networks, A. S. Tannenbaum, Pearson Education, 4th edition, 2003

Reference Books

1. Computer Networking: A Topdown Approach Featuring, J. F. Kurose and W. Rouse, 3rd edition, Pearson Education, 2007
2. Computer Networks: A Systems Approach, L. L. Peterson and B. S. Davie, 5th edition, ELSEVIER Publication, 2012
3. Adhoc Wireless Networks – Architecture and Protocols, C.S. Murthy, B. S. Manoj, 1st edition, Pearson Education, 2008
4. Guide to Networking Essentials G. Tomshon, E. Tittel, D. Johnson, 5th edition, Thomson India Learning, 2007
5. Data and Computer Communication, W. Stallings, 8th edition, Pearson Education, 2007

ETU802 MICROWAVE ENGINEERING

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Microwave Communication: Introduction, microwave spectrum and bands, applications of microwaves.

Waveguides: Rectangular and circular: solutions of wave equations in rectangular coordinates, transverse electric (TE) and transverse magnetic (TM) modes, power transmission and losses, excitations of modes.

Microstrip Lines: Introduction, characteristics impedance, losses, quality factor.

Microwave Linear Beam Tubes: Limitations of conventional tubes at microwave frequencies, microwave tubes – O type and M type classifications, O-type tubes, two cavity klystrons: Velocity modulation process, bunching process, output power and efficiency, multi-cavity klystron

amplifier: Beam current density, output current and output power of two cavity klystron, reflex klystrons: Velocity modulation, power output and efficiency, electronic admittance, helix travelling wave tubes: Slow wave structures, amplification process, convection current, axial electric field, wave modes, gain consideration.

Microwave Crossed Field Tubes: Introduction, cross-field effects, magnetrons – different types, eight cavity cylindrical travelling wave magnetron, Hull cut-off conditions, π mode operation; linear magnetron: Hull cut-off conditions, Hartree conditions.

Microwave Active Components: Transferred Electron Devices: Introduction, Gunn effect diodes-GaAs diode, RWH theory, modes of operation, LSA diodes, avalanche transit time devices: introduction, Read diode, impact ionization avalanche transit time (IMPATT) and trapped plasma avalanche triggered transit time (TRAPATT) diodes, parametric devices, microwave tunnel diodes: principle of operation, microwave characteristics.

Microwave Passive Components: Terminator, attenuator, phase changer, directional coupler, hybrid junction, microwave propagation in ferrites, devices employing Faraday rotation, scattering matrix, formulation for N port junction.

Microwave Resonators and Filters: Basic resonant circuits RLC, transmission line resonators, rectangular and circular cavities and their quality factor (Q), transmission line filter, quarter wave and direct coupled cavity filter.

Text Books

1. Microwave Devices and Circuits, S. Y. Liao, 3rd edition, PHI, 2003
2. Microwave Engineering, D. M. Pozar, 3rd Edition, John Willey and Sons, 2007

Reference Books

1. Microwave Engineering Passive Circuits, P. A. Rizzi, 1st edition, PHI, reprint 2009
2. Foundations for Microwave Engineering, R.E. Collin, 2nd edition, John Wiley, 2007

ETU803 ELECTIVE-II
(A) WIRELESS COMMUNICATIONS

Teaching Scheme: 03L+00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Cellular Communications: Introduction, frequency reuse, multiple access technologies, cellular processes - call setup, handover, etc., teletraffic theory, cellular traffic modeling and blocking probability, power control operation of cellular systems, example of cellular calls.

Cellular System Design Fundamentals: Frequency assignments, channel assignment strategies, co-channel and non-co-channel interference, cellular system capacity, performance criteria, trucking and grade of service, improving coverage and capacity in cellular system.

Multiple Access Technique: Frequency division multiple access (FDMA), time division multiple access (TDMA), frequency hop multiple access (FHMA), space division multiple access (SDMA), packet radio, mobile radio propagation and antennas, radio propagation mechanism, path loss modeling and signal coverage, fading in mobile systems, antennas at cell site, mobile antenna, diversity.

Wireless Systems and Standards: Global system for mobile **(**GSM), system architecture, radio subsystem, channel types, frame structure, signal processing in GSM, code division multiple access CDMA (IS-95), frequency and channel specifications, forward and reverse CDMA channel.

Cordless Systems and WLL: Introduction to cordless systems, cordless telephony standard (CT2) and digital enhanced cordless telecommunication (DECT): standards, architecture, frame format and radio link, operation; IEEE802.16, role of wireless local loop (WLL), propagation considerations for WLL, local multipoint distribution services (LMDS) and multichannel multipoint distribution services (MMDS).

Wireless LAN: Overview, technologies; types: infrared, spread-spectrum, narrow band microwave LAN, mobile data networks, cellular digital packet data (CDPD), global packet for radio service (GPRS), wireless application protocol (WAP).

Text Books

1. Mobile Cellular Telecommunications, W. C.Y. Lee, 2nd edition, MGH, 2006
2. Wireless Communications Principles and Practice, T. S. Rappaport, 2nd edition, Pearson Education, 2010

Reference Books

1. Wireless Communications and Networks, W. Stallings, 2nd edition, Pearson Education, 2009
2. Principles of Wireless Networks, K. Pahlavan and P. Krishnamurthy, 1st edition, Pearson Education, 2009
3. Mobile Communications, J. Schiller, 2nd edition, Pearson Education, 2008
4. The Essential Guide to Wireless Communication Applications, A. Dornan, 2nd edition, Prentice Hall Education, 2002

ETU803 ELECTIVE-II
(B) VERY LARGE SCALE INTEGRATION DESIGN

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction: Metal oxide semiconductor (MOS) transistor switch, complementary metal oxide semiconductor (CMOS) circuits and logic design; realization of universal gates, compound gates, tristates, multiplexers, latches using MOS transistors; VLSI design flow.

Design Flow: Design methodology: top-down, bottom-up, Verilog test bench, counter, non-retriggerable monoshot, right shift register, parallel to serial converter; finite state machine model.

MOS Transistor Theory and Modeling: Ideal I-V characteristics, C-V characteristics, MOS capacitance models, non-ideal I-V effects, DC transfer characteristics.

CMOS Processing Technology: CMOS fabrication and layout**,** CMOS inverter, fabrication process, layout design rules, wafer formation, well and channel formation, contacts and metallization, design rules, interconnects, circuit elements, design rule checking (DRC), manufacturing issues.

Circuit Characterization and Performance Estimation: Resistance, capacitance and inductance estimation, delay estimation and models, transistor sizing, static and dynamic power dissipation, low power design, reliability issues.

CMOS Logic Design: Basic physical design of simple logic gates, design of CMOS NAND gate, adder cell, comparator circuit, RS latch, clock divider, shift registers, analog cells using CMOS layout design tool.

VLSI Testing Process: Role, testing: digital and analog, effect of technology trends, chip level, types, functional and structural defects; automatic test equipment (ATE), errors, faults and fault modeling.

Text Books

1. CMOS VLSI Design: A circuits and Systems Perspective, N. Weste, D. Harris, A. Banerjee, 3rd edition, Pearson Education, 2006
2. Basics of CMOS Cell Design, E. Sicard, S. Bendhia, 1st edition, TMH Publications, 2005

Reference Books

1. CMOS Analog Circuit Design, P. E. Allen and R. Douglas, 3rd edition, Holberg Oxford University Press Publication, USA, 2011
2. VLSI Digital Signal Processing Systems Design and Implementation, K. K. Parhi, 1st edition, John Wiley and Sons, 2007
3. Verilog HDL: A Guide to Digital Design and Synthesis, S. Palnitkar, 2nd edition, Prentice Hall, 2003
4. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal Circuits, M. L. Bushnell and V. D. Agrawal, 3rd reprint, Kluwer Academic Publishers Group, 2004

ETU803 ELECTIVE-II
(C) OPEN SOURCE OPERATING SYSTEMS

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Operating System: History, architecture, objectives and functions, interaction, hardware architecture and evolution, batch, multiprogramming, multitasking, multiuser, parallel, distributed and real-time operating system (OS), system calls, OS shell, Linux shell commands, shell programming.

Processes, Scheduling and Deadlocks : Process states, description, control, threads, mutual exclusion and synchronization, principle of concurrency, hardware/software approaches, semaphores, monitors, principle of deadlock, prevention, avoidance, detection, scheduling: types, algorithms, multiprocessor and real time.

Memory Management: Requirements, memory partitioning, memory allocation: contiguous and non-contiguous, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing and segmentation.

Input Output and Files Management: Overview, input output (I/O) devices, organization of the I/O function, operating system design issues, Linux I/O system, file organization, file directories, file sharing, security, Linux file system.

Text Books

1. Operating System Concepts and Principles, A. Silberschatz and P.B. Galvin, 8th edition, Wiley India, 2009
2. Modern Operating System, A. S. Tanenbaum, 3rd edition, Prentice Hall India, 2009

Reference Books

1. Operating Systems: Internals and design Principles, W. Stallings, 6th edition, Pearson Education, 2009
2. Design of Linux Operating system, M.J. Bach, 1st edition, PHI, 2012

ETU803 ELECTIVE-II
(D) FUZZY LOGIC AND NEURAL NETWORKS

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Fuzzy Sets: Introduction, uncertainty, imprecision, partial truth and fuzziness; fuzzy sets: basic concepts, operations, properties; fuzzy relations: basic concepts, operations, properties; value assignment approaches.

Membership functions: Features, fuzzification: membership value assignments, fuzzy rule based systems, graphical technique of inference, defuzzification: lambda-cuts and other defuzzification methods; fuzzy relations.

Introduction of Neurons: Biological neurons and their artificial models, introduction to neural computing, components of artificial neuron, input and output weights, thresholds, weight factors, transfer functions.

Learning Methods: Supervised: single layer network, perceptron, training algorithm and limitations; multilayer network: architecture of feed forward network, learning rule, generalized delta rule, back propagation algorithm; unsupervised: counter propagation networks, Kohonen's self organizing maps, Hopfield networks.

Applications: Fuzzy logic: fuzzy classification, pattern recognition: single sample identification, multi feature recognition, simple fuzzy logic control system design; neural networks: pattern recognition, characters recognition, associative memories, control applications, robot kinematics, anti-lock breaking system (ABS).

Text Books

1. Fuzzy Logic with Engineering Applications, T. Ross, 3rd edition, Wiley, 2011
2. Introduction to Artificial Neural Systems, J. M. Zurada, 1st edition, Jaico Publishing House, 2004

Reference Books

1. Neuro-Fuzzy and Soft Computing, J.S.R. Jang, T. Sun, E. Mizutani, 1st edition, Pearson Education, 2004
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications, S. Rajasekaran, G. A. Vijayalakshmi Pai, 1st edition, PHI, 2009
3. Neural Networks in Computer Intelligence, Limin Fu, 1st edition, Tata McGraw Hill, 2003
4. Neural Networks and Fuzzy systems, B. Kosko,1st edition, PHI, reprint 2009

ETU803 ELECTIVE-II
(E) BIOINFORMATICS

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction to Cell Biology and Genetics: Cell concept, cell cycle, genetic code, structure and properties of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), DNA replication signal transduction, prokaryotic and eukaryotic genomes, gene structure, genetic code (GC) content, gene density, open reading frames, gene expression, repetitive elements.

Introduction to Bioinformatics: Definition and history, internet and bioinformatics, introduction to data mining, applications of data mining and applications of bioinformatics.

Data Searches, Pairwise Alignments and Substitution Patterns: Dotplots, simple alignments, gaps, scoring matrices, Needleman and Wunsch algorithm, global and local alignments, database

searches, pattern of substitution with genes, estimating substitution numbers, variations in evolutionary rates between genes, molecular clocks, organelles.

Distance Based and Character Based Methods of Phylogenetics: Advantages, phylogenetic trees, distance matrix methods, maximum likelihood approaches, multiple sequence alignments, parsimony and strategies for faster searches, tree confidence and molecular phylogenies.

Markov Chains and Applications: Machine learning methods, hidden Markov models (HMM), applications of HMM in gene identification and profiles HMMS, neural networks and support vector machines.

Analysis Tools: Bioinformatics programming tool kit, proteome analysis through Liquid chromatography–mass spectrometry (LC-MS), nuclear magnetic resonance (NMR), microscopic image analysis, x-ray crystallographic analysis, and automated gel analysis, network pathway analysis and metabolomics software, facilities in bioconductor.

Text Books

1. Bioinformatics: Concepts, Skills and Applications, S.C. Rastogi, N. P. Mendiratta, P. Rastogi, 2nd edition, CBS Publishers and Distributors, New Delhi, 2011
2. Introduction to Bioinformatics, A. M. Lesk, 3rd edition, Oxford University Press, 2009

Reference Books

1. Fundamental Concepts in Bioinformatics, D. E. Krane, M. L. Raymer, 1st edition, Pearson Education, 2003
2. Introduction to Bioinformatics, Pearson Education, K Attwood, D. J. parry-Smith, 1st edition, 11th Reprint, 2005
3. Cell and Molecular Biology, G. Karp, 1st edition, John Wiley, 2010
4. Bioinformatics: The Machine Learning Approach, P. Baldi, S. Brunak, 2nd edition, MIT Press, 2001

ETU804 ELECTIVE-III
(A) SATELLITE COMMUNICATION SYSTEM

Teaching Scheme: 03L + 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2Hrs. 30 Min.

Overview of Satellite Systems: Introduction to frequency bands, types: lower earth orbit (LEO), medium earth orbit (MEO), geosynchronous earth orbit (GEO) and highly elliptical orbit (HEO); communication system, orbits, modulation, transmission and multiplexing, national progress - a brief history.

Orbits and Launching Methods: Kepler's law, orbital aspects of satellite communication, orbital period and velocity; effects of orbital inclination, azimuth and elevation, coverage angle and slant range, orbit determination, orbit perturbations, orbital effects in communication system

performance; launching and positioning, satellite drift and station keeping; launch vehicles and propulsion.

Satellite Channel and Links: Radio wave propagation, polarization, depolarization, frequency reuse, antennas, atmospheric losses, effects of rain, receiver noise, carrier to noise ratio; satellite link analysis: general link design equation, system noise temperature, uplink, downlink and complete link design.

Satellite Construction and Transponder: Introduction, attitude and orbit control system; telemetry, tracking and command, power systems, communication and antenna subsystems, equipment reliability and space qualification, the transponder model, satellite front end, RF filtering of digital carriers, satellite signal processing, transponder limiting, nonlinear satellite amplifier.

The Space Segment Access and Utilization: Introduction, space segment access methods, time division multiple access (TDMA), frequency division multiple access (FDMA), code division multiple access (CDMA), space division multiple access (SDMA), assignment methods.

Application of Satellite Communication: Earth station: subsystem, types, design, technology and satellite services, domestic satellite systems using small earth stations, very small aperture terminal (VSAT), global positioning system (GPS), satellite navigation, direct broadcast satellite television and radio, satellite services and the internet, satellite based mobile communication.

Text Books

1. Satellite Communication, D. Roddy, 4th edition, Tata McGraw Hill, 2008
2. Satellite Communication, P. Timothy, B. W. Charles and J. Allnutt, 2nd edition, Willey International Publication, 2006

Reference Books

1. Satellite Communication, R. M. Gagliardi, 1st edition, CBS publications and Distributors, 2004
2. Satellite Communication systems engineering, W. L. Pritchard, H. G. Suyderhoud, R. A. Nelson, 2nd edition, Pearson Education, 2003
3. www.isro.org

ETU804 ELECTIVE-III
(B) ELECTRONIC DESIGN TECHNIQUES

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Design of Sequential Systems: Asynchronous state machine (ASM) charts, hardware description language and control sequence method, reduction of state tables, state assignments; design of logic circuits using read only memory (ROM), programming logic arrays (PLA), complex programmable logic device (CPLD), field programmable gate array (FPGA).

HDL Modeling of Combinational Circuits: Introduction, levels of abstraction, realization of combinational circuits, behavioral, data flow and structural realization of multiplexers, demultiplexers, adders, magnitude comparator.

Fault Modeling: Fault classes and models: stuck at faults, bridging faults, transition and intermittent faults, test generation: fault diagnosis of combinational circuits by conventional methods – path sensitization technique, Boolean difference method, Kohavi algorithm, fault diagnosis in sequential circuits**:** State identification and fault detection experiment, machine identification, design of fault detection experiment.

Programming Logic Arrays: Design using PLA's, minimization and folding, PLA testing: fault models, test generation and testable PLA design.

Asynchronous Sequential Machine: Fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

Text Books

1. Switching and finite Automata Theory, Z. Kohavi, N. K. Jha, 3rd edition, TMH, 2011
2. Logic Design Theory, N. N. Biswas, 1st edition, PHI, 2010

Reference Books

1. Digital Logic Design Principles, N. Balabanian, B. Calson, 1st edition, Wiley Student edition 2011
2. Digital System Testing and Testable Design, M. Abramovici, M. A. Breuer, A. D. Friedman, IEEE Computer Society Press, 1994
3. Fundamental of Logic Design, C. H. Roth Jr., 4th edition, Jaico Publication, 2003
4. Computer Aided Logic Design, F. J. Hill and G. R. Peterson, John Wiley and Sons, 4th edition, 1993

ETU804 ELECTIVE-III
(C) ANTENNA AND RADAR

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Antenna: Introduction, parameters: radiation patterns, beam area, radiation intensity, beam efficiency, directivity, gain, resolution, antenna aperture, effective height.

Point Sources and arrays: definition, patterns: power, field, phase; arrays of two isotropic sources: Same amplitude and phase, same amplitude and opposite phase; continuous array, array of two driven $\lambda/2$ elements: broad side and end fire.

Microstrip Antennas: Basic characteristics, feeding methods, analysis methods, design of rectangular and circular patch antennas, concept and benefits of smart antennas.

Radar: Basic principles: Fundamentals, radio detection and ranging (RaDAR) performance factors, continuous wave and frequency modulated radar Doppler effect, frequency modulated continuous wave (FMCW) RaDAR, moving target indicator (MTI) and Doppler radar-delay lines canceller and characteristic, blind speed, douplet cancellation; MTI radar with power amplifier and oscillator.

Tracking Techniques: Target detection, scanning, tracking technique-sequential lobing, conical scan monopulse, tracking in range, acquisition; tracking performance, radar receivers, mixer amplifiers, receiver noise, duplexers, displays.

Text books

1. Antennas for All Applications, J. D. Kraus, R. J. Marhefka, A. S. Khan, Tata McGraw Hill, 3rd edition, 2003
2. Introduction to RaDAR Systems, M. I. Skolnik, 3rd edition, 2005

Reference books

1 Antenna Theory and Design W. L. Stutzman, G. A. Thiele, 2nd edition, John Wiley and Sons, 1998
2. Antenna Theory and Design, C. A. Balanis, 3rd edition, John Wiley and Sons, 2005

ETU804 ELECTIVE-III
(D) DIGITAL IMAGE PROCESSING

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Introduction: Image fundamentals, components of image processing system, image model, sampling and quantization, basic relationships between pixels, imaging geometry, gray scale image representation.

Image Transforms: Introduction to the Fourier transform, discrete Fourier transform (DFT), properties of two dimensional Fourier transform, fast Fourier transform (FFT), Hadamard, Haar, discrete cosine transform (DCT), Slant transform, image enhancement: point processing, spatial filtering; enhancement in frequency domain, histogram based processing, homomorphic filtering.

Image Restoration: Degradation model, diagonalisation concept, algebraic approach to restoration, inverse filtering, Weiner filtering, restoration in spatial domain, basic morphological concept, morphological principles, binary morphology, basic concepts of erosion and dilation.

Image Compression: Fundamentals, models, elements of information theory, lossy and predictive methods, vector quantization, and lossless compression, Huffman coding, run length encoding (RLE), Limpel-Ziv-Welch (LZW) encoding, image compression standards.

Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation.

Text Books

1. Digital Image Processing, R. C. Gonzalez and R.E. Woods, 2nd edition, Prentice Hall, 2005
2. Digital Image Processing, A. K. Jain, 2nd edition, PHI, 2004

Reference Books

1. Digital Image Processing, W. K. Pratt, 3rd edition, John Wiley, 2005
2. Digital Image Processing and Computer Vision, R. J. Schalkoff, John Wiley and Son, 1988

ETU804 ELECTIVE-III
(E) INDUSTRIAL AUTOMATIONS

Teaching Scheme: 03L+ 00T **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE duration: 2 hrs 30 min.

Programmable Logic Controllers: Introduction**,** architecture, operation; definition of discrete process control, ladder diagrams: elements, programming and features, programming examples of typical processes.

Hierarchical control: Hierarchical control, overall tasks of the system, task listing, lower and higher level computer tasks, centralized control and its features, personal computers in process control, direct digital control, distributed process control.

Supervisory Control and Data Acquisition: Introduction, objectives and features, building blocks for mimic diagrams, data transfers to programmable logic controllers (PLC), selection criteria and applications to process control systems.

DCS Configurations: Functional block diagram of distributed control systems (DCS), supervisory computer displays, software configurations, control technique, communication between components, algorithms, attributes, study of Tata Honeywell's TDC-3000.

Data Highways: Introduction**,** field buses, multiplexers and remote sensing terminal units.

System Integration: PLC and computer (Hybrid control system), input output (I/O) hardware, set point stations, network protocols, manufacturing automation protocol/technical office protocol (MAP/TOP).

Computer Integrating Process: Communication hierarchy, international organization for standardization / open system interconnection (ISO/OSI) reference model, MAP/TOP application; study of Yokogawa and Rosemount distributed control systems.

Text Books

1. Process Control Instrument Engineers Handbook, B. G. Liptak, 3rd edition, Butterworth Heinemann Company, 1999
2. Introduction to Programmable Logic Controllers, G. Dunning, 2nd edition, Thomson Delmar Learning, 2002

Reference Books

1. Process Control Instrumentation Technology, C. D. Johnson, 7th edition, Pearson Education, New Delhi, 2003
2. Instrument Engineers Handbook, Process Measurement And Analysis**,** B. G. Liptak, 3rd edition, Elsevier India, 2012
3. Programmable Controllers: Principles and Applications, J. W. Webb, Mergy publishing co. 1988
4. Computer Based Industrial Control, Krishankant, 7th edition, PHI, 2005

ETU805 COMPUTER NETWORKS AND COMMUNICATIONS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU801. The list given below is just a guideline.

List

1. Build a local area network (LAN) using any one topology
2. Build wireless LAN and troubleshoot the connectivity and file sharing
3. Socket programming for client/server application
4. Set up a dial up connection (wired phones and mobile) for internet access
5. Set up a broad band connection using wired / wireless fidelity (Wi-Fi) modem
6. Build LAN and configure TCP/IP protocol suite
7. Build LAN using sub netted IP address
8. Build LAN using classless inter domain routine (CIDR) and CIDR IP addresses
9. Install dynamic host configuration protocol (DHCP) server in an active directory domain of windows operating system (configure DHCP service and troubleshooting)
10. Write a program for frame sorting technique used in buffer
11. Write a program for implementation of Shortest Path algorithm

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU806 MICROWAVE ENGINEERING LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU802. The list given below is just a guideline.

List

1. Verify the characteristics of the reflex klystron
2. Measure frequency and wavelength for TE10 mode
3. Determine standing wave ratio and reflection coefficient
4. Analyze the working of magic tee
5. Analyze the working of directional coupler
6. Analyze the working of isolator
7. Analyze the working of circulator and attenuator
8. Verify I–V characteristics of Gunn diode
9. Verify characteristics of microstrip ring resonator
10. Verify characteristics of microstrip LPF, HPF, Band Pass and Band Stop Filter

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU807 ELECTIVE-II Lab
(A) WIRELESS COMMUNICATIONS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU803(A). The list given below is just a guideline.

List

1. Analyze concept of cordless system
2. Design the adaptive linear equalizer and its implementation
3. a. Design the multipath code division multiple access (CDMA)
   b. Design the multiuser code division multiple access (CDMA)
4. Analyze global system for mobile communication (GSM)
5. Verify direct signal spread spectrum – DSSS modulation and demodulation
6. Simulate free space propagation – path loss model
7. Simulate link budget equation for satellite communication
8. Simulate carrier to noise ratio in satellite communication
9. Compute wireless path loss in indoor and outdoor the handover system
10. Analyze Bluetooth technology and its parameters

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU807 ELECTIVE-II Lab
(B) VERY LARGE SCALE INTEGRATION DESIGN LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU803(B). The list given below is just a guideline.

List

Write a HDL code and its test bench for

1. AND, Ex-OR, NOR and NAND gate
2. 4:1 and 8:1 multiplexer
3. arithmetic and logic unit (ALU)

4. Full adder
5. D-Flip Flow

Use Microwind to design and verify

6. 4:1 and 8:1 multiplexer
7. arithmetic and logic unit (ALU)
8. Full adder
9. D-Flip Flop

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU807 ELECTIVE-II Lab
(C) OPEN SOURCE OPERATING SYSTEMS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU803(C). The list given below is just a guideline.

List

Write a program to

1. verify parent process – child process relationship
2. implement the process scheduling algorithms: first come first serve, shortest remaining job first, round robin, preemptive priority scheduling
3. verify variable sharing using semaphore
4. implement producer consumer problem
5. implement Banker's algorithm for a multiple resources
6. simulate Dinning Philosopher's problem
7. simulate all page replacement algorithms
8. implement file management system calls: Creating a file, copying one file to another, linking a file, deleting a file
9. verify inter-process communication

10. simulate bounded buffer problem

Case studies

11. Linux operating system
12. Android operating system

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU807 ELECTIVE-II Lab
(D) FUZZY LOGIC AND NEURAL NETWORKS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU803(D). The list given below is just a guideline.

List

Write program to

1. generate activation functions used in Neural Networks
2. verify different generalized bell functions
3. verify different membership functions
4. realize t-norm operators
5. realize t-conorm operators
6. verify linguistic variables and their values
7. create neural network models of different logic gates
8. verify different fuzzy operations like AND, OR and NOR
9. verify different operations like union, intersection and difference on fuzzy variables
10. verify lambda cuts of the fuzzy variables

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU807 ELECTIVE-II Lab
(E) BIOINFORMATICS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU803(E). The list given below is just a guideline.

List

Write a program to

1. calculate and visualizing Sequence Statistics
2. aligning pairs of sequences
3. working with whole genome data
4. comparing whole genomes
5. assessing the significance of an alignment
6. using scoring matrices to measure evolutionary distance
7. using HMMs for profile analysis of a protein family
8. building a phylogenetic tree for the hominidae species
9. investigating the bird flu virus
10. bootstrapping phylogenetic trees

Note

- **ICA** – The Internal Continues Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A and B

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions

ETU808 PROJECT PHASE- II

Teaching Scheme: 06P **Total: 06** **Credits: 06**

Evaluation Scheme: 75 ICA + 100 ESE **Total Marks: 175**

1. Project work decided in VII semester shall be continued.
2. Students should complete implementation of ideas given in synopsis, so that project work should be completed before end of semester.
3. Students shall submit the final project report in proper format as per guidelines given on the college website which shall include the work of both semesters.
4. For uniform and continuous evaluation, evaluation committee for each group shall be formed by Program Head in which guide must be a member. Internal marks should be awarded by committee at the end of semester based on continuous evaluation.
5. Final examination of project shall include demonstration, presentation of complete work and oral examination based on the project work.

Note:

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Oral examination shall be conducted on the Project report, by the panel of examiners consisting of Project Guide, Course Coordinator and Expert appointed by Program Head.

ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report.

ETU809 SELF STUDY- IV

Teaching Scheme: 00 **Total: 00** **Credits: 02**

Evaluation Scheme: 25 TA **Total Marks: 25**

ETU809 Self Study - III is based on one class test each, on the basis of 20 % curriculum of the courses ETU801, ETU802 and ETU803(A-E), ETU804(A-E) as applicable, shall be declared by respective course coordinator at the beginning of semester. After CT-II test, a test shall be conducted separately for each course and marks of all such tests shall be converted to out of 25. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week.