ELECTRONICS AND TELECOMMUNICATION ENGINEERING

T.Y. B. Tech.
Effective from A. Y. 2013-14

INDEX

List of Abbreviations

Sr. No.	Abbreviation	Stands for:
1	DEC	Departmental Elective Course
2	PCC	Program Core Course
3	LC	Laboratory Course
4	HSSC	Humanities and Social Science Course
5	MLC	Mandatory Learning Course
6	LLC	Liberal Learning Course
7	OEC	Open Elective Course
8	SEC	Science Elective Course
9	BSC	Basic Science Course

Program Education Objectives (PEOs):

1. To prepare students to excel in postgraduate programs or to succeed in industry/technical profession through global and comprehensive education.

2. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.

3. To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel products and solutions for real life problems.

4. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and an ability to relate engineering issues to broader social context.

5. To prepare student with an academic environment aware of excellence, leadership, written ethical codes and guidelines and the life-long learning needed for a successful professional career.

Program Outcomes (Pos):

Graduates will demonstrate

a. Knowledge of differential equations, vector calculus, complex variables, matrix theory, probability theory, physics, chemistry and network and EM field analysis of electrical and electronics objects.

b. An ability to identify, formulate and solve electrical engineering problems.

c. An ability to design electrical and electronic circuits and conduct experiments on electrical systems, analyze and interpret data.

d. An ability to design digital and analog systems and component.

e. An ability to visualize and work on laboratory and multidisciplinary tasks.

f. Skills to use modern engineering tools, softwares and equipment to analyze problems.

g. Knowledge of professional and ethical responsibilities.

h. An ability to communicate effectively in both verbal and written form.

i. The understanding of impact of engineering solutions on the society and will also be aware of contemporary issues.

j. Confidence for self education and ability for life-long learning.

k. An ability to participate and succeed in competitive examinations like GATE and/or seek employment in the industry.

CURRICULUM STRUCTURE OF T. Y.B.TECH(Electronics & Telecommunication)

Effective from A. Y. 2013-2014

I-Semester:

Sr. No	Course Type/Code	Subject Title	Contact Hours			Credits
			L	T	P	
01	DE- 09002	*Department Elective	3	-	--	3
02	PCC/ET- 09002	Digital Communication Systems	4	--	--	4
03	PCC/ET- 09003	Computer Organization and Advanced Microprocessors	3	--	--	3
04	PCC/ET- 09004	Electronic Measurements and Instruments	2	--	--	2
05	PCC/ET- 09005	Digital Signal Processing	4	--	--	4
06	LC/ET- 09006	Digital Communication Systems Lab	--	--	2	1
07	LC/ET- 09007	Computer Organization and Advanced Microprocessors Lab	--	--	2	1
08	LC/ET- 09008	Electronic Measurements and Instruments Lab	--	--	2	1
09	LC/ET- 09009	Digital Signal Processing Lab	--	--	2	1
10	MLC/ML-09001	Constitution of India	2	--	--	2
11	HSSC/AS-09002	Humanities Course	2	--	--	2
		Total	**20**	**0**	**8**	**24**

*****Department Elective: Random Signals & Stochastic Processes

II-Semester:

Sr. No	Course Type/Code	Subject Title	Contact Hours			Credits
			L	T	P	
01	OEC/ SEC	**Open Elective/ Science Elective Course Refer to Annexure I	3	--	--	3
02	PCC/ET- 09010	Coding Techniques in Communication Systems	4	--	--	4
03	PCC/ET- 09011	Electromagnetic Waves	3	--	--	3
	PCC/ET- 09012	Power Electronics	4	--	--	4
04	PCC/ET-09013	PLDs and Applications	2	--	--	2
05	LC/ET- 09014	Electronic Design and Mini Project	1	--	3	3
06	LC/ET- 09015	Coding Techniques in Communication Systems Lab	--	--	2	1
07	LC/ET- 09016	Power Electronics Lab	--	--	2	1
08	LC/ET-09017	PLDs and Applications Lab	--	--	3	2
09	LLC /LL-09001	Refer to Annexure II	--	--	--	1
		Total	**17**	**0**	**10**	**24**

DE- 09002 Random Signals & Stochastic Processes

Teaching Scheme
Lectures : 3 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(6 hrs)**

Probability:
Introduction to probability, sets, fields, events, Axiomatic definition of probability, Joint, Conditional and Total Probabilities, Bayes' theorem and applications.

Unit 2 **(6 hrs)**

Random Variables I:
Introduction and Definition of a Random Variables, Probability / Cumulative Distribution Function, Probability Density Functions, Conditional and joint distributions and densities, Functions of Random Variables.

Unit 3 **(6 hrs)**

Random Variables II:
Expectation and introduction to estimation: Conditional Expectations, Moments, Chebyshev and Schwarz Inequalities, Characteristic Functions.

Unit 4 **(6 hrs)**

Random Processes:
Basic Definitions and Important Random Processes, Useful classifications of Random Processes.

Unit 5 **(6 hrs)**

Random sequences:
Random Sequences and Linear systems, Wide Sense Stationary Random Sequences, Markov Random Sequences (ARMA Models, Markov Chains), Convergence of Random Sequences.

Unit 6 **(4 hrs)**

Applications:
Applications to statistical Signal Processing, Introduction of Adaptive Digital Filtering.

Text Books

- Henry Stark, John W. Woods, "Probability and Random Processes with Applications to Signal Processing", Third Edition, Pearson Education

Reference Book

- Athanasios Papoulis, S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", Fourth Edition, Tata Mc. Graw-Hill.

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Develop applications of statistics in information systems.
- Develop basic applications for performance analysis using probabilistic framework: Estimation, Detection, whitening, MGF, Various types of random variables, random processes, and properties.
- Use probabilistic analysis and study its ramifications to communication and signal processing.

ET- 09002 Digital Communication Systems

Teaching Scheme
Lectures : 4 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(7 hrs)**

Digital base band modulation and Waveform coding techniques:
Introduction to principles and block schematic of digital communication system, Sampling theorem, Practical difficulties in signal reconstruction, Aliasing effect, Pulse code modulation (PCM), Bandwidth and output SNR analysis of PCM.

Unit 2 **(6 hrs)**

Derivatives of PCM:
Uniform and non-uniform quantization, Companded PCM, Differential PCM (DPCM), Delta modulation (DM), Adaptive delta modulation (ADM), Performance comparison of the above systems with PCM.

Unit 3 **(7 hrs)**

Digital data transmission systems and transmission media:
Line coding, Pulse shaping, Scrambling, Regenerative repeater, M-ary communication, T-1 digital carrier system, Digital multiplexing hierarchy, Transmission media - wired and wireless, Standard link equation analysis.

Unit 4 **(7 hrs)**

Base band demodulation techniques:
Detection of binary signals in Gaussian Noise, Detection error Probability for polar, on-off and bipolar signals, Inter-symbol interference (ISI), Eye pattern, Channel equalization.

Unit 5 **(7 hrs)**

Bandpass modulation and demodulation techniques:
Digital Band pass Modulation techniques such as ASK, FSK, BPSK, QPSK, QAM etc, Bandpass demodulation in the presence of Gaussian noise, Coherent and non-coherent detection, Error performance for binary system, M-ary signaling and performance, Bit error rate (BER) performance of shift-keying techniques.

Unit 6 **(6 hrs)**

Spread Spectrum techniques:
Spread spectrum principles, Pseudo-noise (PN) sequences, Direct-sequence and frequency hopping spread spectrum (DSSS and FHSS) systems, Jamming considerations, Orthogonality between PN-codes, Multiple access techniques (concepts with mathematical treatment) - FDMA, TDMA, and CDMA, Commercial applications of spread spectrum - Cellular systems and GPS.

Text Books

- Bernard Sklar, "Digital Communications - Fundamentals and Applications", Pearson Education Asia.
- B.P.Lathi and Zhi Ding, "Modern Digital and Analog Communication Systems", (Fourth edition), Oxford University Press.

Reference Book

- Simon Haykin, "An Introduction to Analog and Digital Communications", John Wiley and Sons.
- K. N. Hari Bhat and D. Ganesh Rao, "Digital Communications – Theory and Lab Practice", Third Edition, Pearson.
- V. Chandra Sekar, "Communication Systems", Oxford University Press.

Outcomes:

At the end of the course, the student will be able to:

- Design digital communication systems, given constraints on data rate, bandwidth, power, fidelity, and complexity.
- Analyze the performance of a digital communication link when additive noise is present in terms of the signal-to-noise ratio and bit error rate.

- Compute the power and bandwidth requirements of modern communication systems, including those employing ASK, PSK, FSK, and QAM modulation formats.
- Determine the auto-correlation function of a line code and determine its power spectral density.
- Determine the power spectral density of bandpass digital modulation formats.

ET -09003 Computer Organization and Advanced Microprocessors

Teaching Scheme
Lectures : 3 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(6 hrs)**

Introduction to computer organization:
Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic-Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, Microprogramming, System buses, Multi-bus organization.

Unit 2 **(6 hrs)**

Memory organization:
System memory, Cache memory- types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

Unit 3 **(8 hrs)**

Input–output Organization:
Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits-Parallel and serial port. Features of PCI and PCI Express bus.

Unit 4 **(8 hrs)**

16 and 32 microprocessors:
80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86.

Unit 5 **(8 hrs)**

Protected mode in IA – 32:
Mode switching, System registers, Segmentation, Switching privilege levels, Multitasking, Task

switching, Task state segment, Virtual 8086 mode, IA -64 extensions, Multi-threading.

Unit 6 **(8 hrs)**

Embedded System Development:
Intel atom processor E6XX features, Processor micro-architecture, E6XX series SOC, Platform controller hub, device interconnect & GPIO, Hardware and software platforms, Case study.

Text Books

- V. Carl, Zvonko G., Safwat G.Zaky, "Computer organization", McGraw-Hill, international Edition.
- Barry Brey & C.R. Sarma, "The Intel microprocessors", Pearson Education.

Reference Book

- William Stalling, "Computer organization", PHI, Fourth Edition.
- Peter Barry and Patric Crowley, "Modern Embedded Computing", Morgan Kaufmann.
- N. Mathivanan, "Microprocessors, PC Hardware and Interaction", Prentice Hall.
- Yu-Cheng Lieu & Glenn A. Gibson, "Microcomputer Systems: The 8086/8088 Family", Prentice Hall India.
- John Uffenbeck, "The 8086/8088 Design, Programming, Interfacing", Prentice Hall India.
- B. Govindarajalu, "IBM PC and Clones", Tata McGraw Hill, Second Edition.
- Peter Able, "8086 Assembly Language Programming", Prentice Hall India.

Outcomes:

At the end of this course students will demonstrate the ability to

- Provide a good foundation on microprocessors, their principles and practices.
- Write efficient programs in assembly language of the 8086 family of microprocessors.
- Organize a modern computer system and be able to relate it to real examples.
- Develop the programs in assembly language for 80286, 80386 processors in real and protected modes.
- Implement embedded applications using ATOM processor.

ET - 09004 Electronic Measurements and Instruments

Teaching Scheme
Lectures : 2 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(5 hrs)**

Basics of Electronic Measurement:
Terminology of measurements such as accuracy, precision, sensitivity, resolution etc, Types of errors &its minimization, statistical conditioning of data, regression analysis, Importance of calibration, instrument calibration standards.

Unit 2 **(5 hrs)**

Digital Voltmeter:
Review of Principals of Analog Electronic Volt-Ohm- Milliameters (Multimeter), Digital voltmeter Systems & techniques adopted, Digital Multi-meters & its Measurement Applications, DC/AC Bridge theory.

Unit 3 **(5 hrs)**

Oscilloscopes:
Review of Analog Oscilloscopes. DSO & its specifications, and performance parameters.DSO applications in multi disciplinary areas.

Unit 4 **(5 hrs)**

Signal sources:
Review of Signal sources. Synthesized signal source, arbitrary waveform Generator. Review of Instrumentation for signal analysis,- Digital Frequency Meter, THD meter, Spectrum Analyzer.

Unit 5 **(3 hrs)**

Standards & automation:
IEEE 488 bus and PC based ATE, Virtual instrumentation.

Text Books

- Oliver Cage "Electronic Measurement" , Mc_Graw Hill Inc.
- Albert D. Helfrick, William D. Cooper, "Modern Electronic Instrumentation & Measurement Techniques. Prentice Hall of India. Fifth print & onwards.

Reference Book

- Clyde F. Coombs, Jr. "Electronic Instrument Handbook" Mc_ Graw Hill Inc..
- David A. Bell, "Electronic Instrumentation & Measurements", PHI. 2nd Edition Onwards.
- Different Websites on Electronic Measurements.

Outcomes:

At the end of this course students will

- Become versatile with basic principles of measurement techniques and extend their analytical abilities with exposure to the modern instruments and tools.

ET - 09005 Digital Signal Processing

Teaching Scheme
Lectures : 4 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(7 hrs)**

Basic Elements Of DSP And Its Requirements, Advantages Of Digital Over Analog Signal Processing, Properties Of LTI Systems, Causality, Impulse Response, Sequences, Sampling And Reconstruction Of Signals, Pole Zero Analysis.

Unit 2 **(7 hrs)**

DFT, Properties, IDF, Linear Filtering Methods Based On DFT, FFT Algorithms, Goertzel Algorithm, Linear Convolution, Circular Convolution. Applications Of FFT, Applications Of DSP To Speech And Voice Processing, EEG, ECG, Radar Signal Processing.

Unit 3 **(7 hrs)**

Symmetric And Antisymmetric FIR Filters, Design Of FIR Digital Filters Window Method, Park-Mc Lellan's Method, Frequency Sampling Methods, Alternation Theorem In Equiripple Linear Phase FIR Filters, FIR Differentiators, FIR Filter Structures - Direct Form Structures, Cascade Form Structures, Frequency – Sampling Structures, Digital Sinusoidal Generator.

Unit 4 **(7 hrs)**

Design Of Iir Digital Filter Methods Like, Approximation Of Derivatives, Impulse Invariance, Bilinear Transformation, Characteristics Of Butterworth, Chebyshev, Frequency Transformations, Iir Filter Structures Like Direct Form, Parallel Form, Lattice And Lattice –Ladder Structures, Effect Of Finite Register Length In Fir Filter Design.

Unit 5 **(7 hrs)**

Introduction, Concepts Of Multirate Digital Signal Processing, Design Of Practical Sampling Rate Converters, Polyphase Structures, Multistage Implementation Of Sampling Rate Conversion, Quadrature Mirror Filters, Application Examples.

Text Books

- J.G.Proakis, D.G.Manolikis, "Digital Signal Processing", edition II, PHI.
- Ifeachor, Jervis, "Digital Signal Processing ", edition I, Pearson Education.

Reference Book

- J.G.Proakis, D.G.Manolikis, "Digital Signal Processing", edition II, PHI.
- Ifeachor, Jervis, "Digital Signal Processing ", edition I, Pearson Education.

Outcomes:

At the end of this course students will demonstrate the ability to

- Synthesize discrete time signals from analog signals.
- Use time domain and frequency domain analysis tools.
- Apply forward and reverse transformations.
- Visualize various applications of DSP and explore further possibilities.
- Design IIR and FIR filters.
- Excel in H/W and S/W environment of Digital Signal Processing.

ET - 09006 Digital Communication Systems Laboratory

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Sampling & reconstruction.
2. PCM-TDM system.
3. Differential PCM system.
4. Delta Modulation (DM) system.
5. Adaptive Delta Modulation (ADM) system.
6. Companded PCM (A law & μ law).
7. Data formatting (Line Codes).
8. Shift Keying Techniques - I - ASK & FSK.
9. Shift Keying Techniques – II - BPSK & QPSK.

10. Direct Sequence Spread Spectrum (DS-SS).
11. Simulation assignments using tools such as MATLAB and CommSIM.

Outcomes:

At the end of this course students will demonstrate the ability to

- Perform simple experiments with a purpose-build hardware platform, obtain and analyse results relevant for system performance, and report their findings in a systematic form.
- Develop and use simple software modules (e.g., using CommSIM and Matlab) for implementing basic techniques in modern digital communications to numerically evaluate and analyse small-scale modules of communications systems, and report the simulation results.
- Compare different techniques in digital communications, and judge the applicability of different techniques in different situations.

ET - 09007 Computer Organization and Advanced Microprocessors Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. To find largest/smallest 8/16 bit number from an array of 10 numbers.
2. To find area of triangle using sequential multiplication method.
3. To sort leap years from an array of 5 years (One century).
4. To divide 32 bit dividend by 8/16 bit divisor.
5. To convert invalid BCD numbers to valid BCD numbers and arrange them in ascending order.(Range:00 to 99).
6. To display string using INT 21H.
7. To convert upper case to lower case (String given by programmer).
8. To convert lower case to uppercase(String given by user).
9. To study INT 50 H.
10. To display string using Delay.
11. Case studies on Atom Processor E6XX series.

Outcomes:

At the end of this course students will demonstrate the ability to

- Write efficient programs in assembly language of the 8086 family of microprocessors.
- Develop the programs in assembly language, Real mode, protected mode of processors.

ET- 09008 Electronic Measurements and Instruments Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Regression analysis using MS office.
2. Calibration of multi meter with AC/DC standards.
3. Signal analysis using DSO.
4. Harmonic distortion analysis using THD meter.
5. Measurement techniques with Spectrum analyzer.
6. Frequency measurement using Universal counter.
7. PC based IEEE 488 controlled measurements.
8. PC based virtual instrumentation (using ADI analog discovery kit).
9. Experimentation using LAB View platform.

Outcomes:

At the end of this course students will demonstrate the ability to

- Create appropriate test procedures for analog & digital systems.
- Select suitable test instruments and systems.
- Apply suitable test procedures to electronic systems.
- Appreciate the purpose and relevance of measurement and testing in industrial Application.

ET- 09009 Digital Signal Processing Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Generation of Analog Signals using C and MATLAB.
2. Generation of Discrete sequences in C and MATLAB.
3. Verification of linear convolution in C and MATLAB using two finite sequences.
4. Programming for circular convolution in C and MATLAB.
5. Generation of signal. Generate a noise signal. Mix both the signals. Design a Filter. Recovery of original signal using filter.
6. Design of FIR filter in C and MATLAB.
7. Design of IIR filter in C and MATLAB.

Outcomes:

At the end of this course students will demonstrate the ability to

- Apply concept of DSP to varied problems of different domains like medical, astronomical, and military and so on.
- Program Digital filter for specific application.
- Interfacing of DSP processors with PC.
- Get aquatint with different DSP processors for basic application.

ML - 09001 Constitution Of India

Teaching Scheme
Lectures : 2 hrs/week

Examination Scheme
20 marks: Continuous evaluation- Assignments /Quiz
End - Sem Exam – 30 Marks

Unit 1 **(5 hrs)**

Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.

Unit 2 **(5 hrs)**

Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance.

Unit 3 **(4 hrs)**

Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

Unit 4 **(4 hrs)**

State executive – Governors, Chief Minister, State Legislator and High Courts.

Unit 5 **(4 hrs)**

Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

Unit 6 **(4 hrs)**

Electoral process, Amendment procedure, 42^{nd}, 44^{th}, 74^{th}, 76^{th}, 86^{th} and 91^{st} Constitutional amendments.

Text Books:

1. Durga Das Basu: "Introduction to the Constitution of India" (Students Edn.) Prentice – Hall EEE, 19th/20th Edn., 2001.
2. "Engineering Ethics" by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins

Thompson Asia, 2003-08-05.

Reference Books:

1. "An Introduction to Constitution of India" by M.V.Pylee, Vikas Publishing, 2002.

Outcomes:

At the end of this course students will be aware about the Constitution:

- Appreciate the complexity of implementation of any law.
- Appreciate the roles and functions of various high officials.
- Know about Fundamental rights of citizens of India.
- Understand the Electoral process.
- Understand the provisions made for special groups and categories in the constitution

AS - 09002 Humanities course/Applied Psychology

Teaching Scheme
Lectures : 4 hrs/week
Practical : 2hrs/week

Examination Scheme
100 marks:
Assignments /Practical(T1 and T2)- 40 Marks,
End - Sem Exam – 60 Marks

Unit 1 **(4 hrs)**

Introduction to Psychology:
Definition, Nature and Aims, Counseling, Industrial and Social Psychology, Creativity and its application.
Mind Mapping and Problem Solving, Self Awareness, Johari window.

Unit 2 **(6 hrs)**

Personality:
Carl Jung's type theory, Bandura's Social learning, Big Five model Indian Perspective on Personality- Panchakosh Model, SWOT analysis, life planning, emotional intelligence.

Unit 3 **(8 hrs)**

Organizational Behaviour:
Behaviour at workplace (personality, attitude and perceptions), Motivation, Job satisfaction, Leadership and Group dynamics, Engineering Psychology (Ergonomics), Man-machine relation, Group dynamics, Transactional analysis

Unit 4 **(4 hrs)**

Stress Management:
Nature, types and causes of stress, General Adaptation Syndrome (GAS), Coping with Stress-Cognitive, Emotional, and Behavioural techniques, Type A and B theory.

Text Books

1. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J. (2001). *Introduction to Psychology*. 7th Edition. New Delhi: Tata McGraw Hill
2. Schultz, D. & Schultz, S. E. (2002). *Psychology and Work Today*. 8th Edition. Pearson Education

Reference Book

1. Hilgard, E. R., Atkinson, R. C., Atkinson, R.L. (1975). *Introduction to Psychology*. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Golman, Daniel. (1998). *Working with Emotional Intelligence*. Bloomsbury Publishing Plc.
3. Matthewman, L., Rose, A., & Hetherington, A. (2009). *Work Psychology*. Indian Edition. Oxford University Press.

Practical Work

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1: Self Awareness (20 Marks) **(4 hrs)**

Aims/Objectives for the Year- Newspaper Activity, SWOT analysis, Personal Effectiveness Scale, Johari Window.

2: **Level of Adjustment (10 Marks)** **(6 hrs)**

Adjustment Inventory By M.L. Saxena, Interpretation and Explanation

3: Stress and Personality (15 Mark) **(8 hrs)**

Student's Stress Scale by Dr. Manju Agrawal, Type A- B theory and test, Interpretation and Explanation

4:Emotional Quotient (5 Mark) **(4 hrs)**

Concept of EQ, EQ test by N.K.Chadha, Interpretation and Explanation

Outcomes:

After successful completion of the course students will be able-

1. To understand different aspects of their personality and to learn various life skills
2. To strengthen the skills required in industrial/workplace settings
3. To overcome stressful situations effectively with the help of psychological approach
4. To improve their social interactions.

ET - 09010 Coding Techniques in Communication Systems

Teaching Scheme
Lectures : 4 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(8 hrs)**

Information and Source Coding for discrete sources:
Mathematical models for Information, A Logarithmic Measure of Information: Average and Mutual Information, Entropy, Coding for Discrete Sources-Coding for Discrete Memory-less Sources, Discrete Stationary Sources, Shanon-Fano & Huffman algorithms, LZ/LZW coding.

Unit 2 **(6 hrs)**

Coding for analog sources:
Information Measures for continuous Random Variables, Coding for Analog Source: Rate distortion function, Distortion rate function, Scalar quantization, Vector quantization, Coding techniques taxonomy.

Unit 3 **(8 hrs)**

Channel coding:
Channel models, Channel capacity, Introduction to channel coding, Linear block codes, Error correction and detection capability, Usefulness of the standard array, Cyclic codes, Block codes examples such as Hamming codes, Golay codes.

Unit 4 **(8 hrs)**

Convolutional codes:
Convolutional encoding, , Trellis coded Modulation, Formulation of the convolution decoding problem, Properties of Convolutional codes, Convolutional-decoding algorithms such as Viterbi, Sequential.

Unit 5 **(6 hrs)**

Advanced Channel coding:
Galois Field, Reed-Solomon codes, Interleaving and Concatenated codes, Coding and interleaving applied to the compact Disc, Bose-Choudury-Hocquenghem Codes (BCH).

Unit 6 **(6 hrs)**

Turbo Codes:
Bayes theorem, Decision theory, Signal decision example, Turbo codes fundamentals, Introduction to fading multi path channels.

Text Books

- Bernard Sklar, "Digital Communication: Fundamentals and Applications", Pearson Education Asia.
- John G. Proakis, "Digital Communication", Tata McGraw Hill.

Reference Book

- Salvatore Gravano, "Introduction to Error Control Codes", Oxford University Press.
- Simon Haykins, "Digital Communication", Edition II, Wiley.
- B.P.Lathi, "Modern Digital and Analog Communication Systems", International Fourth Edition, Oxford University Press.

Outcomes:

This course enables students to appreciate the role of various source and channel coding techniques in

- Estimating complexity of implementation at transmitter and receiver sites.
- Quality/ Correctness of received information in terms of parameters such as error detection and correction capacity.
- Deciding various schemes for encoders and decoders deployability either in software or in hardware forms and its consequences.
- This course/laboratory also helps in improving the analytical skills.

ET - 09011 Electromagnetic Waves

Teaching Scheme
Lectures : 3 hrs./week

Examination Scheme
100 marks: Continuous evaluation- Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(10 hrs)**

Transmission Lines:
Introduction, Concept of distributed elements, Equations of voltage and current, Standing

waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.

Unit 2 **(5 hrs)**

Maxwell's Equations:
Basic quantities of Electromagnetics, Basic laws of Electromagnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.

Unit 3 **(7 hrs)**

Uniform Plane Wave:
Homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.

Unit 4 **(6 hrs)**

Plane Waves at Media Interface:
Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection, Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, Lossy media interface, Reflection from conducting boundary.

Unit 5 **(6 hrs)**

Waveguides:
Parallel plane waveguide: Transverse Electric (TE) mode, transverse Magnetic (TM) mode, Cut-off frequency, Phase velocity and dispersion.Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides.

Unit 6 **(6 hrs)**

Antennas:
Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz dipole: Near field, Far field, Total power radiated by Hertz dipole, Radiation resistance and radiation pattern of Hertz dipole, Hertz dipole in receiving mode.

Text Books

- R. K. Shevgaonkar, " Electromagnetic Waves", Tata McGraw Hill.
- William Hayt Jr, John Buck, "Engineering Electromagnetics", 6th Edition, TMH.

- Nathan Ida, "Engineering Electromagnetics", 2nd Edition, Springer.

Reference Book

- Ramo, S., Whinnery J.R., and van Duzer. T, "Fields and Waves in Communication Electronics", 3rd Edition, Wiley.
- Narayana Rao, "Engineering Electromagnetics", 3rd Edition, Prentice Hall.
- R.E. Collin, "Foundations for Microwave Engineering", 2nd Edition, McGraw-Hill.

Outcomes:

At the end of this course students will demonstrate the ability to

- Analyze the transmission lines and estimate voltage and current at any point on transmission line for various load conditions.
- Provide solution to real life plane wave problems for various boundary conditions using concepts of electromagnetic wave propagation.
- Analyze the field equations for the wave propagation in special cases such as lossy and low loss dielectrics medium.
- Visualize TE and TM mode patterns of field distributions in rectangular waveguide.
- Analyze the basics of Hertz dipole antenna.

ET - 09012 Power Electronics

Teaching Scheme
Lectures : 4 hrs./week

Examination Scheme
100 marks: Continuous evaluation-
Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(8 hrs)**

Characteristics of Semiconductor Power Devices:
Thyristor, power MOSFET and IGBT. Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, DIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), TOP Switch. Series and parallel operation of power devices, Tiggering/Driver, commutation and snubber circuits for thyritor, power MOSFETs and IGBTs (discrete and IC based). Commutation circuits for SCRs namely complementary voltage (class C), auxiliary current(class D) and auxiliary voltage(class D). Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

Unit 2 **(8 hrs)**

Controlled Rectifiers
Single phase: study of semi and full bridge converters for R, RL ,RLE and level loads. Analysis of load voltage and input current. Derivations of load form factor and ripple factor, Input current Fourier analysis of input current to derive input supply power factor, displacement factor and harmonic factor. Other power factor improvement methods. Effect of source impedance.

Unit 3 **(5 hrs)**

Choppers:
Quadrant operations of Type A , Type B, Type C , Type D and type E choppers. Control techniques for choppers – TRC and CLC Detailed analysis of Type A chopper. Step up chopper.

Unit 4 **(8 hrs)**

Single-phase inverters:
Principle of operation of full bridge, square wave quasi-square wave PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series), voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters. Single phase current source inverters.

Unit 5 **(6 hrs)**

Switching Power Supplies:
Analysis of fly back, forward and full bridge converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, advantages of ZVS and ZCS. Load resonant converter - series loaded half bridge DC-DC converter.

Unit 6 **(7 hrs)**

Applications:
Power line disturbances, EMI/EMC, power conditioners, Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS, separately excited DC motor drives ,PM Stepper motor Drives, Switched reluctance Motor or variable reluctance stepper motor drive, Electronic ballast for fluorescent lighting. Active power filters.

Text Books

- V.R.Moorthi, "Power Electronics", Oxford University Press.
- Ned Mohan, Robbins, "Power electronics", edition III, John Wiley and sons.
- P.C. Sen., "Modern Power Electronics", edition II, S.Chand & Co.

Reference Book

- Cyril W., Lander," Power Electronics", edition III,McGraw Hill.

- SCR manual from GE, USA.
- Muhammad H. Rashid, "Power electronics" Prentice Hall of India.

Outcomes:

At the end of this course students will demonstrate the ability to

- Build and test circuits using power devices such as SCR, IGBT and MOSFET.
- Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters, how to analyze these inverters and some basic application examples.
- Design regulated power supplies and SMPS.

ET - 09013 PLDs and applications

Teaching Scheme
Lectures : 2 hrs./week

Examination Scheme
100 marks: Continuous evaluation- Assignments /Quiz- 40 Marks.
End-Sem Exam - 60

Unit 1 **(8 hrs)**

Revision of basic Digital systems:
Combinational Circuits, Sequential Circuits, Logic families.

Unit 2 **(6 hrs)**

Digital system Design:
Top down Approach to Design, FSM: Mealy & Moore Machines, FSM issues (Starting state, Power on Reset, State diagram optimization, State Assignment, Asynchronous Inputs, Output ,fault Tolerance) Design with synchronous FSM using any FF, Static Timing of sequential circuits, metastability, clock issues.

Unit 3 **(6 hrs)**

Verilog:
HDL fundamentals, simulation, and test-bench design, Examples of Verilog codes for combinational and sequential logic.

Unit 4 **(6 hrs)**

Programmable Logic Devices:
Introduction, Evolution: PROM, PLA, PAL, Architecture of PAL's, Applications, Programming PLD's, Design Flow, Programmable Interconnections, Complex PLD's (Xilinx 9500, Altera MAX - 7000), Architecture, Applications, FPGA : Logic Blocks, Routing Architecture, Design Flow, Virtex-II.

Unit 5 **(6 hrs)**

Testing:
Fault models, Different faults, Fault simulation, ATPG, DFT, and Boundary scan, BIST, JTAG interface.

Unit 6 **(8 hrs)**

CMOS circuits:
MOS transistors and switches, CMOS logic- inverter, NAND, NOR gates, Operating principle of MOS transistor, CMOS inverter- DC characteristics, transmission gates.

Text Books

- J.F. Wakerly, 'Digital Design: Principles and Practices', Prentice Hall.
- Neil H. Weste and Kamran Eshraghin, "Principles of CMOS VLSI design".
- Samir Palnitkar, "Verilog HDL, a guide to digital design and synthesis", Prentice Hall.
- IEEE standard HDL based on Verilog HDL, published by IEEE.

Reference Book

- Douglas Smith, "HDL Chip Design: A Practical Guide for Designing, Synthesizing & Simulating ASICs & FPGAs Using VHDL or Verilog, Doone publications.

Outcomes:

At the end of the course students will demonstrate the ability to

- Design the FSM.
- Write codes using Verilog HDL.
- Analyze, design and simulate the systems based on synchronous sequential circuits using CPLDs and FPGAs.

ET - 09014 Electronic Design and Mini Project

Teaching Scheme
Lectures : 1 hr./week
Practicals : 3 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

Unit 1 **(4 hrs)**

Power supplies:
Linear power supplies for laboratory use with tracking and continuously variable output voltages, multiple outputs, CV-CC modes, Switched mode power supplies (SMPS), IC based regulated power supplies, Converters used as power supply.

Power supply design should incorporate concepts such as current boosting techniques, over current/short circuit, over voltage, thermal protections, indication of V, I and mode of operation on panel meter or seven segment display, SOA protection, heat sink considerations.
50Hz transformer and Inductor design, high frequency transformer and Inductor design, Input and output filter design, thermal consideration for enclosure design.

Unit 2 **(4 hrs)**

Data acquisition and display system for industrial applications:
Sensing signals, isolation using galvanic, optical techniques, conditioning using techniques like V to F, F to V converter, chopper amplifier etc. Selection of suitable instrumentation amplifier, ADCs, indication of parameter using LED/LCD, alpha numeric DPM, analog meter, RS 485, Fiber optic link. System should include circuits as RMS to DC converters, PLL, Programmable gain amplifier, multiplier.

Unit 3 **(3 hrs)**

State machines:
State machines, Moore and Mealy Models, state diagram, ASM charts implementation of next state decoder, output decoder using MSI, LSI devices like multiplexers decoders, PLDs, fuse map generation, steps in design using PLDs, assignment based on real life problems like traffic light control, elevator, drink vending machine, design using HDL.

Unit 4 **(3 hrs)**

Designing radio frequency amplifier system:
Differences in design consideration from LF to RF system with stress on PCB design, front-end RF preamplifier, mixer, impedance matching and insertion loss concepts, neutralization and stability, detail design of IF amplifier and detector stage, monolithic IC's on mixer, IF amplifier ,detector with AGC.

Mini-project:
Topic identification and title finalization. Project should cater to a small system required in laboratory or real life ,should encompass components, devices, IC's analog or digital, micro controllers with which functional familiarity is introduced. Project to be designed, tested on breadboard fabricated using CAD based PCB software, with due considerations to mechanical aspects, for enclosure and control panel design. A complete documentation in the form of project report is to be submitted.

- **Electronic design and mini project work will be covered equally in 3 Practical hours/week in addition to 14 theory hours in semester.**

Reference Book

- Motorola, "Linear / Switch mode power supplies".
- "National Semiconductor regulator design manual".
- "Philips small signal and power transistor manual".
- Motorola, "Power Transistors & Thyristors data hand book".

- Texas instruments, "Linear interface and applications circuit design".
- www.Alldatasheets.com
- www.national.com (this tool.)
- www.farnell.com
- Franklin P. Prosser, David E. Winkel, "The art of digital design", PHI.
- Hill and Peterson, "Digital design".
- Fletcher, "Introduction to digital design".
- Stephen Brown, "Digital design using VHDL".
- Tubay Grame & Huelsmann (student Edition-Burr Brown), "Operational amplifiers".
- Sergio Franco, "Design with Operational amplifiers and analog integrated circuits", IIIrd edition-TMH.
- "PIC 16XX data book".
- "ATMEL micro controller data book".
- Peatman, "Micro controller system design".

Outcomes:

At the end of this course students will demonstrate the ability to

- Design, build and test electronic circuits for the suitable applications in the area of regulated power supplies, data acquisition systems, state machines, digital system design, high frequency designs in communication and to provide solutions to real life problems.
- Use software programming and debugging for various micro controller based, DSP based and embedded system based applications.
- Design, develop, build, test and demonstrate project work and to write and submit a comprehensive report on project work.

ET - 09015 Coding Techniques in Communication Systems Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Entropy computation (Joint entropy, conditional entropy, self information and mutual information).
2. Huffman and Shanon-fano source coding techniques to compress text files.
3. LZW coding technique to compress text files.
4. Linear Block codes: Encoding and Decoding.
5. Cyclic Codes: Encoding and Decoding (Hardware using dividing circuits).
6. Convolution coding scheme: Generation of Trellis Codes.
7. Convolution decoding scheme: Viterbi decoding technique.
8. Study of Reed and Solomon Codes.

*The programming can be done using C, C++ and MATLAB software. The hardware implementations can be done using digital circuitry.

Outcomes:

At the end of this course students will demonstrate the ability to

- Deploy various source and channel coding techniques in software and/or hardware.
- Improve the programming skills on language platforms such as Matlab and 'C' of the students.
- Estimate and improve the time and space complexity of the software implementation of coding techniques.

ET - 09016 Power Electronics Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Study of Power Devices and its characteristics: SCR, Triac, UJT, Power MOSFET and IGBT.
2. Study of R, RC, UJT triggering methods for a SCR.
3. Measurement of Latching and Holding current of SCR.
4. Study of dv/dt limitation circuits for power devices.
5. Commutation methods: class C and class D.
6. SCR converters and reactive loads.
7. Line commutated converters: Inverter operation and measurement of overlap angle.
8. Parallel capacitor commutated (Type A/Class D) chopper.
9. Study of two quadrant Type C/Type D or study of four quadrant Type E chopper.
10. Single phase PWM inverter: measurement of frequency Vs output for resistive and inductive loads.
11. Design of SMPS and regulation characteristics of SMPS.
12. Regulation characteristics of DC Motor, demonstration of ramp up/ ramp down and field failure protection.
13. Three phase diode bridge rectifier.
14. Applications in power electronics.
    Crowbar circuit, lamp dimmer and fan control circuit, stabilizer, UPS.

Mini Project Work:
Design of complete system in power electronics
Viz. – Converters, Inverters, SMPS, Resonant converters, UPS, AC/DC Drives, Chopper, Stepper Motor control etc.

* Any Eight Experiments to be conducted in laboratory for conduction of practical examination. Mini Project work will be done in the batch of 4 students each and will be assessed for term work.

Outcomes:

At the end of this course students will demonstrate the ability to

- Design and implement various triggering and turn off circuits for power devices as, SCR, Power MOSFET, IGBT.
- Interpret the efficiency and switching losses in power converter.
- Understand concepts of active, reactive and ELE loads, regulation characteristics in SMPS and drives.
- Understand and implement various applications in power electronics in terms of mini project work.

ET - 09017 PLDs and Applications Lab

Teaching Scheme
Practical: 2 hrs./week

Examination Scheme
Term-work: 50 Marks
Oral: 50 Marks

List of Experiments:

1. Introduction to HDL based Digital Design Methodology, HDL based Digital Design Flow using Verilog.
2. Introduction to Basic Syntax of Verilog and Gate level modeling through implementation of half adder at gate level and its simulation using Xilinx ISE tools.
3. Basic Concepts of Verilog, Modules and Ports, Gate level coding in Verilog.
4. Write Verilog code, synthesize, simulate and implement the following:
    a. Verilog codes based on combinational logic…ALU, Carry look ahead generator, Encoders, Decoders, Adder/Subtractor, code converters, barrel shifter, Comparators, Seven segment display, Multiplier
    b. Verilog codes based on sequential logic… FFs, Counters, FSM, Memory

   Using Xilinx ISE tool and Development board with Spartan III FPGA

Outcomes:

At the end of this course students will demonstrate the ability to

- Know the basic information about programmable and reprogrammable systems.
- Present means of implementation of basic Boolean functions, of combinative and sequential functions in the programmable and reprogrammable system.
- Know the structure and operation of the programmable CPLD and FPGA.
- Have the clear understanding of all three paradigms of implementation of digital logic circuits

  a. using fixed function ICs
  b. using reconfigurable logic
  c. using ASIC

Annexure I

List of Open Elective/Professional Science courses offered by ALL Departments

Sr. No	Department	Course
1	Civil	Finite Elements in Engineering
2	Mechanical	1. Unconventional Machining Processes 2. Modern Control Systems 3. Power Plant Engineering
3	Electrical	1. Industrial Drives 2. Control System Engineering
4	Electronics and Telecommunication	Electronic Communication Systems
5	Metallurgy and Material Science	Composite Materials
6	Instrumentation and Control	Industrial Automation
7	Production	1. Introduction to ERP 2. Operations Efficiency
8	Computer Engineering	Information Systems
9	Information Technology	Information Systems
10	Applied Science	1. Humanities Course 2. Constitution of India
11	Innovation Centre	Liberal Learning Course

Annexure II

List of Liberal Learning courses offered at Institute Level

- **Agricultural** – Animal Science, Forestry, Horticulture, Floriculture, Sustainable Agriculture, Veterinary
- **Arts** – Graphic Design, Interior Design, Fashion Design
- **Basic Sciences** – Astronomy, Astro- Physics, Biology, Genetics, Kinesiology, Microbiology, Neuro Sciences.
- **Business** – Administration, Communication, Entrepreneurial studies, Hostel Management, Marketing.
- **Defense Studies** - Military Studies, Naval Studies, Air Force Studies, War strategies.
- **Education** - Education policies, Engineering Education, Teacher Training.
- **Environmental Sciences** – Ecology, Meteorology
- **Linguistics** – Word Language
- **Medicine** – Health Studies Nutrition and dietetics
- **Performing Arts**- Music, Dance Theatre, Cinema
- **Philosophy**- Religious Studies
- **Sports and Athletics**