Shivaji University, Kolhapur
Department of Technology
THIRD YEAR B.TECH
ELECTRONICS AND COMMUNICATION TECHNOLOGY
Curriculum Structure
Semester – V

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	ETC311	Linear Integrated Circuits	3	-	-	3
2	ETC312	Electromagnetic Fields	3	1	-	4
3	ETC 313	Microcontrollers	3	-	-	3
4	ETC 314	Signals & Systems	3	-	-	3
5	ETC 315	Computer Network & Data Communication	3	-	-	3
6	ETC316	Laboratory-I Linear Integrated Circuits	-	-	2	1
7	ETC317	Laboratory-II Microcontrollers	-	-	2	1
8	ETC318	Laboratory-III Signals & Systems	-	-	2	1
9	ETC319	Laboratory-IV Computer Network & Data Communication	-	-	2	1
10	ECT 3110	Electronic System Design	-	-	2	1
11	AC 312	Audit Course II Research Methodology	2	-	-	-
		Total	17	1	10	21
Total Contact hours per week = 28						

Semester –VI

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	ECT321	Digital Signal Processing	3	-	-	3
2	ECT322	Digital Communication Technology	3	-	-	3
3	ECT323	Optical Fiber Communication	3	-	-	3
4	ECT324	VLSI Design	3	-	-	3
5	ECT325	Control Systems	3	1	-	4
6	ECT326	Laboratory-I Digital Signal Processing	-	-	2	1
7	ECT327	Laboratory-II Digital Communication Technology	-	-	2	1
8	ECT328	Laboratory-III Optical Fiber Communication	-	-	2	1
9	ECT329	Laboratory-IV VLSI Design	-	-	2	1
10	ECT3210	Laboratory-V Mini Project and Seminar	-	-	2	1
11	AC 323	Audit Course III Presentation and Communication Technique	2	-	-	-
		Total	17	1	10	21
Total Contact hours per week = 28						

Note : Tutorials and Practical shall be conducted in batches with batch strength not exceeding 18 students.

Shivaji University, Kolhapur
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Third Year B. Tech (Electronics and Communication Technology)

(Semester V)

LINEAR INTEGRATED CIRCUITS (ECT 311)

Teaching scheme
Lectures: 3 hrs/week   **Credits: 03**

UNIT.1 Op-Amp basics and Characteristics   (7 Hrs.)
Differential amplifier: common mode, differential mode, configurations, DC and AC analysis, constsnt current bias, current mirror circuit, cascade diff-amp stages, level shifter. Block Diagram of Op-Amp, Study of µA 741: Ideal & Practical Op-amp specifications, Transfer characteristics of Opamp, offset voltages and offset currents with compensation techniques, Input Bias current, slew rate, CMRR and methods to improve CMRR, PSRR, Thermal drift, open loop gain, closed loop gain, Comparative study of OP 07, LM 741, LM 311.

UNIT.2 Op-Amp Configurations   (5 Hrs.)
Open Loop & Closed Loop Inverting, Non inverting and Differential amplifier with analysis of parameters like Av, Ri, Ro, Bandwidth and output offset voltage. AC & DC amplifiers with all configurations.

UNIT.3 Op-Amp frequency response   (5 Hrs.)
Open loop and closed loop frequency response, unity gain BW, need for compensation, Internal and external compensated op amps and frequency response, effect of slew rate, slew rate analysis, selection of op amp for different applications.

UNIT.4 Op-Amp Applications   (7 Hrs.)
Summing amplifier, Subtractor, Integrator, Differentiator, Instrumentation Amplifier, I to V and V to I converters. Comparators, Zero Crossing Detector, Window detector, Schmitt trigger, peak detector, log and antilog amplifier, precision rectifier, sample and hold circuit, clippers and clampers.

UNIT.5 Op-Amp Active Filters and signal generators   (7 Hrs)
First & Second Order Butterworth Low Pass, High Pass, Band Pass, Band Reject, & All Pass Filters, KS filter. *Signal generators:* RC phase Shift, Wein Bridge, Hartely, Colpitts oscillators, opamp as multivibrators and triangular wave generators, Case study of IC 8038 Waveform generator.

UNIT.6 PLL and Timer   (5 Hrs.)
Introduction, Operating principle, Study of Block Diagram of PLL with detail explanation, transfer characteristics of IC 565 PLL, lock range and capture range with applications like Frequency modulator, demodulator, frequency synthesizer. *Timer IC:* IC555 block diagram, IC 555 as astable, monostable, bistable multivibrators, VCO.

TEXT BOOKS:
1. Ramakant. A.Gayakwad " Op-Amps & Linear Integrated Circuits" , 3rd Edition, PHI.
2. Sergio Franco "Design with op-amp & Analog Integrated Circuits" , 3rd Edition, Tata McGraw Hill.
3. S.Salivahanan & Bhaaskaran "Linear Integrated Circuits" , 1st Edition, Tata McGraw Hill.

REFERENCE BOOKS:
1. National Analog & Interface products Data book—National Semiconductors
2. T.R Ganesh Babu, "Linear Integrated Circuits" 3rd Edition, Scitech Publication.
3. David. A. John & Ken Martin "Analog Integrated Circuit Design", Student Edition, Wiley.
4. , Rashid "Microelectronics Circuits Analysis & Design" 1st Edition, Cengage Learning.
5. J. Michael. Jacob "Application & Design with Analog Integrated Circuits" 2nd Edition, PHI.
6. Roy Choudhury & Shail. B. Jain "Linear Integrated Circuits," 2nd Edition, New Age Publishers.

Note for question paper setter:
- Question paper of subject, 'Linear Integrated Circuit' shall consist of 40% design based problems and/or numerical treatment.

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(Semester V)

ELECTROMAGNETIC FIELDS (ECT 312)

Teaching scheme
Lecture: 3 hrs./week
Tutorial: 1hr/week   **Credits: 04**

UNIT.1 Introduction   (6hrs)
Introduction and significance of electromagnetic fields, Introductory vector analysis and coordinate systems, concepts of gradient, divergence , curl,

UNIT.2 Electrostatic Field   (6hrs)
coulomb's law & electric field, field due to distributed charges, flux density, gauss's law , divergence theorem, electrostatic potential, potential gradient, electric dipole, electrostatic energy density, boundary conditions for electrostatic field.

UNIT.3 Steady Magnetic Field   (6 hrs)
Biot savarts law, Ampere's circuital law, Stroke's Theorem, Magnetic flux density & Vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magneto static field.

UNIT.4 Time Varying Fields and Maxwell's Equations   (6 hrs)
Continuity equations for static conditions, displacement current, Faraday's law, Inconsistency of Ampere's law, Maxwell's equations, Comparison of field & circuit theory. Energy stored in Electric and magnetic field time varying fields.

UNIT.5 Propagation of Electromagnetic Waves   (6 hrs)
Wave propagation in dielectric & conducting media, wave equations for sinusoidal time variations, Characteristics of plane wave in pure dielectric media and conducting media. Reflection of electromagnetic wave for normal incidence, Polarization, Pointing theorem,
Skin depth, phase velocity and group velocity, Boundary conditions

UNIT.6 Transmission Lines and waves theory   (6 hrs)
Types of Transmission lines,Transmission line equation,Transmission line parameters, The terminated uniform transmission line, Reflection coefficient, VSWR, group velocity, phase velocity. Smith chart and impedance matching Technique , attenuation of waves.

TEXT AND REFERENCE BOOKS –
1. John D. Kraus " Electromagnetic", Mc Graw Hill.
2. Jordan & Balmain "Electromagnetic Fields & Radiation Systems", PHI.
3. David K Cheng "Field & Wave Electromagnetic",Pearson Education.
4. William Hyte "Electromagnetic Engineering", Mc Graw Hill.

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(Semester V)

MICROCONTROLLERS (ECT 313)

Teaching scheme
Lectures: 3 hrs/week   **Credits: 03**

UNIT.1 MCS-51 Microcontroller family   **(8 hrs)**
Introdution to MCS-51, architecture,8051 microcontroller hardware, Input /output pins, external memory, register files, counters and timers, interrupts, serial communication, development tools IDE .

UNIT.2Programming MCS-51 microcontrollers   **(7 hrs)**
Addressing modes, instruction set, assembly language programming, programming by using embedded c language, timing subroutines. Lookup table

UNIT.3 MCS-51 Microcontroller interfacing and programming   **(7 hrs)**
Interfacing of switches, matrix keyboards, seven segment displays, LCD displays, ADC, DAC, relays, thumbwheel , interfacing I^2C,SPI bus devices,RS232.

UNIT.4 Microchip PIC microcontroller family   **(8 hrs)**
Introduction to RISC & CISC architectures, Microchip PIC 16CXXX microcontroller family and various development tools, CPU architecture, register file structure, I/O ports and TRIS registers, interrupts, timers, oscillator configurations, reset alternatives, WDT, sleep mode , on chip resources, interrupt structure,

UNIT.5 Programming PIC microcontrollers   **(4 hrs)**
Instruction set, assembly language programming, embedded c programming

UNIT.6 PIC families and MPLAB development tools   **(2 hrs)**
Overview of PIC microcontroller derivatives with comparison. MPLAB development environment, programming, debugging, simulation tools.

TEXT AND REFERENCE BOOKS:
1. Kenneth Ayala, "The 8051 Microcontroller Architecture, programming and Applications" Penram Intrnational
2. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded systems"Pearson Education Asia LPE
3.Intel or Atmel MCS 51 Family Microcontrollers Data Sheets.
4. Mike Predcko "8051 Microcontrollers programming and practice"
5. John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE
6. Microchip Midrange Embedded Microcontrollers Handbook
7. Microchip PIC 16X family Microcontrollers Data sheets.

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(Semester V)

SIGNALS AND SYSTEMS (ECT 314)

Teaching scheme
Lecture: 3 hrs./week   **Credits: 03**

UNIT.1 Introduction to Signals (4 Hrs)

Signals, Continuous and discrete time signals, Classification of Signals , Periodic aperiodic, even & odd energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals , periodicity properties of discrete time signals, complex exponential, unit impulse, unit step, impulse functions, transformation of independent variable.

UNIT.2 Systems (6 Hrs)

Properties of systems: Linearity, Causality, time invariance, stability, computation of impulse response of LTI system (continuous and discrete), magnitude and Phase representations of frequency response of LTI systems.

UNIT.3 Analysis of signals and systems (12 Hrs)

Fourier series representation of continuous time and discrete time periodic signals , properties of continuous time and discrete time Fourier series. Continuous time and discrete time Fourier Transform, properties of the CT and DT Fourier Transform, Characterization using differential and difference equation, Parseval's relation, convolution in time and frequency domains.

UNIT.4 Sampling Theorem (2 Hrs)

Representation of continuous time signals by its sample, Sampling theorem, reconstruction of a Signal from its samples, aliasing effect, antialiasing, discrete time processing of continuous time signals, sampling of band pass signals.

UNIT.5 Laplace Transform (6 Hrs)

Introduction, ROC, Properties of Laplace Transform, examples, Inverse Laplace transform using partial fraction method, transfer function of LTI-CT system, impulse response and transfer function, convolution and de-convolution using LT, stability in S domain, structure realization of LTI system in S domain, direct form-I, direct form-II, cascade structure, parallel structure.

UNIT.6 Z-Transform (6 Hrs)

Basic principles of z-transform, z-transform definition, region of convergence, properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using residue Theorem, power Series expansion and partial fraction expansion, Computation of Impulse response & Transfer function using Z Transform, stability of LTI Systems, structure realization of LTI system in Z domain

TEXT BOOK

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, "Signals & Systems", 2nd edn., Pearson Education, 1997.
2. Michael J. Roberts "Fundamentals of signals & systems",Tata McGraw Hill, 2007.

REFERENCES
1. John G.Proakis and Dimitris G.Manolakis , "Digital Signal Processing, Principles, Algorithms and Applications" , 3rd editionn., PHI.
2. M.J.Roberts ,"Signals and Systems Analysis using Transform method and MATLAB" , TMH 2003.
3. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
4. Ashok Amhardar "Analog and Digital Signal Processing ," 2 nd Edition Thomson 2002.

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(Semester V)

COMPUTER NETWORK AND DATA COMMUNICATION(ECT 315)

Teaching scheme
Lectures: 3hrs/week   **Credits: 03**

UNIT.1 Introduction to Computer Networking   **(6 Hrs)**
Network topology,Network hardware :LAN, MAN,WAN, wireless network, home network,, network software, OSI and TCP-IP reference model, internet, Ethernet, wireless LAN 802.11,connection oriented networks, applications of computer network.

UNIT.2 Physical Layer   **(6 Hrs)**
Theoretical basis of data communication, guided transmission media, wireless transmission, communication satellite, mobile telephone systems,cable television.

UNIT.3 Data Link Layer   **(6 Hrs)**
DLL design issues, error detection and correction, DLL protocols, sliding window protocols, HDLC, DLL in internet.

UNIT.4 Medium Access Control Sublayer   **(6Hrs)**
Channel allocation, multiple access protocols, Ethernet, wireless LAN, Broadband wireless, Blue tooth

UNIT.5 Network Layer   **(6Hrs)**
Network layer design issues, routing algorithms, congestion control algorithms, QoS,
Internetworking, Multimedia.

UNIT.6 Data Communication   **(6 Hrs)**
Communication, Signal and Data Transmission, Bit rate, Baud Rate, Digital Data, Analog Data, Simplex, Half Duplex and Full Duplex Modes of Transmission, Synchronous and Asynchronous Transmission, Modulation: Amplitude Modulation, Frequency Modulation, Phase Modulation. Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing. Transmission Media: Twisted Pair Cable, Coaxial Cable, FOC(Fiber Optics Cable), Applications of Internet: email, Telnet, FTP, Remote Login, WWW, Switching Techniques, Circuit Switching, Packet Switching, Datagram, Hub, Bridges, Routers, Switches, Gateways, VAST, Modems, E-Commerce, EDI-Electronic Data Interchange, ISDN:-Elements, Uses of ISDN, Broadband ISDN

TEXT BOOKS
1. Andrew S. Tanenbaum, "Computer Networks",Fourth Edition, PHI Publications
2. Behrouz Forouzan, "Data Communications and Networking", Fourth Edition, TMH
3. W. Stallings, "Data and Computer Communications", Sixth Edition, PHI Publications

REFERENCE BOOKS
1.Leon Couch, "Digital & Analog Communication Systems", MacMillan,

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Laboratory-I
LINEAR INTEGRATED CIRCUITS (ETC316)

Teaching scheme
Practical: 2 hrs/week
Credits: 01

Note: Perform at least 10 experiments out of the following list:

1. Study of Inverting amplifier for DC & AC inputs using opamp
2. Study of Non-Inverting amplifier for DC & AC inputs using opamp
3. Frequency Response of Inverting & Non-Inverting amplifier using opamp
4. Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting modes
5. Study of Instrumentation Amplifier using LM 324
6. Study of V-I & I-V Converter
7. Study of Schmitt Trigger using opamp & Window detector using opamp
8 Study of Comparator & Zero Crossing Detector using opamp
9. Study of Precision Rectifier using opamp
10. Study of Butterworth Filter using opamp
11. Study of Triangular & square wave generator using opamp
12. Design of IC 555 Timer as Astable & Monostable Multivibrator
13. Study of IC NE 565 PLL
14. Study of Weins Bridge Oscillator using opamp
15. Study of Function Generator using IC 8038.

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(Semester V)

Laboratory-II
MICROCONTROLLERS (ETC317)

Teaching scheme	**Examination scheme**
Practical: 2 hrs/week	**EPE: 50 marks**
Credits: 01	**Minimum passing:20**

PRACTICALS :

Minimum 10 experiments should be carried out based on syllabus.
5 experiments on MCS 51 family Microcontroller and 5 experiments on Microchip
PIC Microcontroller should be performed.
Out of performed experiments at least six experiments should be performed by using Hardware.

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(Semester V)

Laboratory-III
SIGNALS AND SYSTEMS (ETC318)

Teaching scheme
Practical: 2 hrs/week
Credits: 01

PRACTICALS :
Minimum 8 experiments should be carried out based on
1. Construction of continuous time signals
2. Construction of Discrete time signals
3. Convolution of CT
4. Convolution of DT signals
5. Fourier series of signal
6. Pole zero plot
7. Sampling
8. Introduction to SIMULINK

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(Semester V)

Laboratory-IV
COMPUTER NETWORK AND DATA COMMUNICATION (ECT 319)

Teaching scheme
Practical: 2 hrs/week
Credits: 01

LIST OF EXPERIMENTS
1. Half duplex and full duplex communication by using RS – 232 for character transfer.
2. Half duplex, Full duplex file transfer between two PC by using RS – 232.
3. LAN implementation.
4. Finite state machine design (Tutorial type)
5. Implementation of BIT stuffing.
6. Implementation of Stop and wait protocol.
7. Implementation of Go Back N protocol.
8. Implementation of Selective repeat protocol.
9. Sliding window protocols using RS 232c.
10. Implementation error detection method.
a. Hamming code.
b. CRC method.
11. Shortest path routing algorithm (By simulation)

Minimum 8 experiments based on above syllabus.

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(Semester V)

ELECTRONIC SYSTEM DESIGN (ECT 3110)

Teaching scheme
Practical: 2 hrs/week   **Credits: 01**

Laboratory work should consists of design and implementation of small electronics systems based on OP-AMP, Timer 555 IC, encoders, decoders, multiplexers, demultiplexers, switching regulators, PLL etc. A group consists of two students, who will work on one system for entire semester. The work includes design, implementation, validation and report writing of the system.
Note: Microcontroller based systems are strictly not allowed.

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(Semester V)

Audit Course-II
RESEARCH METHODOLOGY (AC 312)

Teaching Scheme	**NoCredits,UniversityGrade**

Examination scheme
Lecture 2Hr/Week

UNIT 1 Introduction to Research Methodology   **4 hrs**

Objective of Research, Types of Research, Research Methods and Methodology, Scientific method of Research, Research Process

UNIT 2 Research Problem   **4 hrs**

Research Problem and Selection of Research Problem, Need for defining the Problem, Techniques for defining a Problem, Development of hypothesis

UNIT 3 Research Design   **4 hrs**

Meaning and Need of Research Design , Features of a good Research Design, Types of Research Design-Exploratory, Descriptive and Experimental Research

UNIT 4 Referencing Information Sources   **4 hrs**

Using secondary sources of information: using an Encyclopedia, bibliography card, Translation card catalogue information, periodic indexes and usage, compiling a preliminary bibliography; Referencing documentation sources: styles of footnotes, endnotes etc., model bibliography entries

UNIT 5 Sampling Design   **4 hrs**

Census and Sample survey, Implication of Sample design, Steps in Sampling Characteristics of a good Sample design, Types of Sample design

UNIT 6 Scaling Techniques & Data Collection   **3 hrs**

Attitude Measurement and Measurement in Research, Measurement Scales, Scaling, Scale Classification Bases, Concept of important Scaling Techniques;
Data Collection: Primary and Secondary data, Observation Method, Survey Method, Collection of data through Questionnaire and Schedule distinction, Selection of appropriate method of Data Collection

UNIT 7 Processing Operations and Report Writing   **3 hrs**

Processing Operations, Problem in Processing, Types of Analysis, Application of some Multivariate tools of data analysis
Report Writing: Writing and Formulating of Reports, Steps in Report Writing, Types of Report

References Books:
1. C.R.Kothari "Research Methodology" New Age International (P) Ltd.
2. D.K.Bhattachary "Research Methodology";; Excel Books
3. Goodday &Hack "Research Methodology"

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Third Year B. Tech (Electronics and Communication Technology)

(Semester VI)

DIGITAL SIGNAL PROCESSING (ECT 321)

Teaching scheme
Lectures: 3hrs/ week   **Credits: 03**

UNIT.1 DFT and FFT   (6 Hrs.)
Introduction to DSP system, DFT, Relation between DFT and Z Transform, Properties of DFT, Circular convolution ,IDFT. DIT FFT & DIF FFT algorithm implementation, fast convolution signal, overlap save & overlap-add algorithm segmentation, correlation, circular correlation, IFFT, DFT properties of circular correlation.

UNIT.2 FIR Filter Design   (6Hrs.)
Characteristics of FIR filter, properties of FIR filter, digital network for FIR filter, frequency sampling, Fourier series & windowing method, filter design using Kaiser window, Realization of FIR by direct form structures, cascade, parallel form.

UNIT.3 IIR Filter Design   (6Hrs.)
Impulse invariant technique, Bilinear transformation Placement of poles & zeros, frequency band transformation, analog filter approximation ,quantization and rounding problems, Effect of finite word length on stability and frequency response, Realization of IIR by direct form structures, cascade & parallel form.

UNIT.4 Adaptive filter   (4 Hrs.)
Introduction to adaptive signal processing, Adaptive direct form FIR filters, Least Mean Square (LMS) algorithm.

UNIT.5 DCT & Wavelet Transform   (6 Hrs.)
Forward DCT, Inverse DCT, DCT as a orthogonal transformer. Introduction to wavelets, time ,frequency representations, continues time wavelet, Continues wavelet transform (CWT), Inverse CWT, Properties of CWT, Discrete wavelet transform, STFT, Comparison of Fourier transform & wavelet transform ,Application of wavelets transforms .

UNIT.6 Application of Digital Signal Processing   (8 Hrs.)
Mobile communication, Bio-medical Engineering, image processing**,** Acoustic Noise Canceller, Dynamic range compression, LPC analysis and synthesis, SSB modulation, Radar tracking & implementation ,Study of architecture of TMS 320C6XXX processor

TEXT BOOK:
1. John G Prokis , "Digital Signal Processing ,Principles, Algorithms and Application", PHI
2**.** S.K.Mitra, "Digital Signal Processing", TMH
3. E. C. Ifleachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach",   Second Edition, Pearson education.
4.Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP, Microprocessors with examples from TMS 320C6XXX", Thomas Publication.

REFERENCE BOOKS:

1. A.V.Oppenheins and R.W. Schalfer , "Discrete Time Signal Processing", PHI
2. S. Salivahanam, A Vallavaraj, C. Guanapriya, "Digital Signal Processing",TMH
3. Raghuveer M. Rao and Ajit S. Boperdikar , "Wavelet Transforms – Introduction to theory and applications", Pearson Education.
4. Smith, "Scientist and Engg. Guide on Digital Signal Processing"

Note for question paper setter:
Minimum sixty percent marks must be allocated for numerical and derivations.

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DIGITAL COMMUNICATION TECHNOLOGY (ECT 322)

Teaching scheme
Lectures: 3 hrs/week   **Credits: 03**

UNIT.1 Probability and Information Theory   (6 hrs)

Probability, joint & conditional probability, probability mass functions, statistical average, continuous random variables – PDF and statistical averages, random processes- stationary, time average & ergodicity, power spectral density of stationary random processes, *Information Theory:* Unit of information, entropy, rate of information, mutual information, channel capacity, Shannon's theorem, Shannon Hartley theorem, Shannon fano coding, Huffman coding, Trade-off between bandwidth and S/N ratio.

UNIT.2 Waveform Coding   (6hrs)

Sampling theorem and recovery of original signal, Quantization – Uniform & Non uniform , PCM, DPCM, Cumulative error in DPCM, minimization of error in DPCM, need of predictors, implementation of predictors at transmitter,   Bandwidth requirement in each system, Delta Modulation , limitations of DM, ADM, comparison between DM, PCM and ADM.

UNIT.3 Baseband Data Communication   (6 hrs)

Block diagram, Baseband pulse shaping, Shaping of transmitted spectrum , Baseband signal receiver, Integrate and Dump filter, optimum filter, matched filter transfer function, correlate filter transfer function, Inter symbol interference, Equalization , Eye Diagrams , Synchronization: bit, symbol and frame.

UNIT.4 Digital Carrier Modulation and Detection Schemes   (6 hrs)

ASK, PSK, FSK ,DPSK, QPSK, M-ary PSK, QAM, MSK, duo-binary signaling, coherent and non coherent detection, *carrier recovery circuits:* squaring loop and costas loop, Probability of errors and comparison of noise performances in ASK, FSK, PSK.

UNIT.5 Error Control Coding   (10 hrs)

Types of error & codes, Error control coding, Linear Block codes: encoder, decoder, implementation of Linear Block codes. Cyclic codes: encoder, syndrome calculator, decoder. Convolutional codes: encoding and sequential decoding and viterbi decoding.

UNIT.6 Spread spectrum techniques   (2 hrs)

Direct sequence spread spectrum, frequency hopping, use of spread spectrum with code
division multiple access, Ranging using spread spectrum, frequency hopping spread spectrum, generation and characteristics of PN sequence.

TEXT BOOKS:

1. Singh & Sapre , "Communication System Analog & Digital ", TMH.
2.B.P. Lathi, " Modern Digital & Analog Communication System" Oxford
3.K.Sam Shanmugam, " Digital & analog Communications " John Wiley
4.Siman Haykin, "Digital Communication ", Wiley
5. Bernard Scalar, "Digital Communication Fundamentals & Applications"

REFERENCES:-
1. Taub & Schling, "Principles of communication system"
2. M.S. Roden, "Digital Communication System Design"
3. Simon Hykin , "Digital Communication by"
4. Proakis, "Digital Communication
5. K. Sam Shanmugan, "Digital & Analog Communication systems" Wiley

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(Semester VI)

OPTICAL FIBRE COMMUNICATION (ECT 323)

Teaching scheme
Lecture: 3 hrs./week   **Credits: 03**

UNIT.1 Introduction to optical Fibre communication   (2hrs)
Overview of optical fiber communication ,the general system, advantages of optical fiber communications. Optical wave guides, ray theory transmission, total internal reflection, acceptance angle, numerical aperture, skew rays. cylindrical fibers, modes, V number, mode coupling, step index fibers, graded index fibers.

UNIT.2 Optical fibre material and properties   (6 hrs)
Single mode fibers,cut off wavelength, mode field diameter, effective refractive index. Fiber materials:Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers, Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses.

UNIT.3 Optical fibre dispersion   (6hrs)
Information capacity determination, group delay, types of dispersion , material dispersion, wave guide dispersion, polarization mode dispersion, intermodal dispersion. pulse broadening. optical fiber connectors connector types, single mode fiber connectors, connector return loss.

UNIT.4 Optical fibre components   (6hrs)
Fiber Splicing- Splicing techniques, Splicing single mode fibers. Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints,. Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency,Laser diode rate equations,Resonant frequencies. Reliability of LED&ILD.

UNIT.5 Optical Sources and detectors   (10hrs)
Sources, light emitting diodes (LEDs), laser diodes, light source linearity, modal, partition and Reflection Noise, source to fiber power launching , output patterns, power coupling, power launching, equilibrium numerical aperture, laser diode to fiber coupling.
Optical detectors, physical principles of PIN and APD, detector response time, temperature effect on avalanche gain, comparision of photo detectors, optical receiver operation, fundamental receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers.

UNIT.6 Optical Networks   (6 hrs)
Basic Networks, SONET/SDH, Broadcast-and –Select WDM Networks,Wavelength Routed Networks, Nonlinear Effects on Network Performance,Performance of WDM + EDFA Systems, Solitons, optical CDMA, Ultrahigh Capacity network.

TEXTBOOKS:
1. Gerd Keiser , "Optical Fiber Communications", 3rd Edition Mc Graw-Hill International edition, , 2000.
2. John M. Senior, "Optical Fiber Communications", PHI, 2nd Edition, 2002.

RERFERENCES:
1. D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, "Fiber Optic Communications"Pearson Education, 2005.
2. S.C.Gupta, "Text Book on Optical Fibre Communication and its Applications", PHI, 2005.
3. Govind P. Agarwal , John Wiley, " Fiber Optic Communication Systems",3rd Edition, 2004.
4. Joseph C. Palais , "Fiber Optic Communications", 4th Edition, Pearson Education, 2004

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(Semester VI)

VLSI DESIGN (ECT 324)

Teaching scheme
Lectures: 3 hrs/week   **Credits: 03**

UNIT.1 MOS Devices   (6 hrs)
Introduction to MOS Technology, I – V Characteristics of NMOS and PMOS, Transfer Characteristics Of CMOS Inverter, Detailed analysis of CMOS Inverter with parasitic elements.

UNIT.2 Fabrication and Layout   (6 Hrs)
Basic CMOS Technology: Self aligned CMOS process, N well, P well, Twin tub, Layout of CMOS Inverter, CMOS Layout and Design rules.

UNIT.3 Introduction To VHDL   (6hrs)
Introduction, EDA Tool- VHDL, Design flow, Introduction to VHDL, Elements of VHDL, Modeling styles: Sequential, Structural and data flow modeling, sequential and concurrent statements,Overview of different modeling techniques in VHDL, Data types and data objects in VHDL, Dataflow Modeling, Behavioral Modeling by using VHDL for combinational and sequential Circuits. Comparison of various Hardware Description Languages.

UNIT.4 Circuit Design Using CPLD & FPGA   (6 hrs)
Function, procedures, Attributes, Test benches, synthesizable and Non-synthesizable statements, Packages and configurations, The State diagram, Modeling in VHDL with examples such as counters, Registers and Bidirectional bus. Introduction, study of Architecture of CPLDs and FPGAs. Function block architecture, input/output Block and interconnect, switch matrix, FPGA fabric. Study of architecture of Xilinx 9500 series and Altera MAX 700 series CPLD . Study of architecture of Xilinx Spartan 4000, Virtex XCV (2.5) series FPGA

UNIT.5 Design using VHDL   (6 hrs)
Designing general purpose processor,datapath,ALU,control unit,encoder & decoder for Huffman coding,comparator,adder, substractors.

UNIT.6 Design for Testability   (6 hrs)
Fault model, need of design for testability, path sensitizing, random tests, BIST(built inselwith test), boundary scan test. Introduction to fault coverage, Testability, Design for testability concept, controllability and absorbability, stuck at Fault Model, stuck Open and Stuck short faults, Boundary Scan check, JTAG technology, TAP controller and TAP controller state diagram, Scan path, Full and partial scan

TEXT BOOKS:

1) N. Weste and K. Eshranghian, "Principles of CMOS VLSI Design", Addison Wesley.
2) Douglas Perry, "VHDL", Tata MC-Graw Hill
3) J Bhasker, "A VHDL Synthesis Primer", Addison Wesley
4) Stephen Brown and Zvonko, " Vranesic,Fundamaentals of Digital Logic with VHDL design", Tata McGraw Hill
. 5) BushnellAgrawal , "Essentials of Electronic Testing for digital memory and mixed signal VLSI circuits", Kulwar Academic Publisher

REFERENCE BOOKS AND WEBSITES:

1) The Programmable Logic data Book. Xilinx data manual
2) John F. Wakerly, " Digital Design, Principles and Practices", Pentice Hall Publication.
3) Peter Ashenden, " The Designer's Guide to VHDL", Harcourt Asia PTE LTD
4) www.xilink.com
5) www.altera.com
6) www.actel.com

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Third Year B. Tech (Electronics and Communication Technology)

(Semester VI)

CONTROL SYSTEMS (ECT 325)

Teaching scheme
Lectures: 3 hrs/ week
Tutorial: 1hr/week   **Credits: 04**

UNIT.1 **Introduction to Control System Engineering**   **(6 Hrs)**
Open loop and closed loop systems, Mathematical models of electrical and mechanical systems,regenerative feedback, Transfer function, Block diagrams and reduction techniques,signal flow graphs, deriving transfer function of physical system, mechanical system and field controlled and armature controlled DC servo motors, control system design issues.

UNIT.2TimeDomain Analysis of Control Systems   **(6 Hrs)**
Standard test signals, time domain response of first and second order systems for different input signals, steady state errors and error constants, design specifications of second order system.

UNIT.3 Stability Analysis of control systems   **(6 Hrs)**
Concept of stability, condition of stability, characteristic equation, relative stability, Routh Criterion and applications,Routh-Hurwitz criterion, special cases for determining relative stability, Nyquist stability criterion.

UNIT.4 Design in s-plane   **(6 Hrs)**
Stability of dynamic systems, Routh-Hurwitz stability criteria, Rules of root locus, Root Locus examples, Effect of addition of poles and zeros on Root locus.

UNIT.5 Design in Frequency Domain   **(6 Hrs)**
Time domain analysis limitations and significance of frequency domain analysis,Frequency domain analysis using Bode plots, gain margin, phase margin, effect of addition of poles and zeros on bode plots, compensator design considerations, phase lead, phase lag compensators design,

UNIT.6 State Space Analysis for control system design   **(6 Hrs)**
 State, state variables, state model, state variable representation , state diagram representation, diagonalisation

TEXT BOOKS:
1. I.J. Nagrath,M.Gopal, " Control System Engineering"Willey Eastern
2. Schaum's Series book , "Feedback Control Systems "
3. Dorf,Bishop , "Modern Control System" addison – Wesley Publication

REFERENCE BOOKS
1. Katsuhiko Ogata , "Modern Control Engg", II edition
2. Kuo, "Automatic Control Engg",II edition

Shivaji University, Kolhapur
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Third Year B. Tech (Electronics and Communication Technology)

(Semester VI)

Laboratory-I
DIGITAL SIGNAL PROCESSING (ETC 326)

Teaching scheme
Practical: 2 hrs/week   **Credits: 01**

LIST OF EXPERIMENTS: Minimum 8 experiments
1) Convolution of CT and DT signals on MATLAB.
2) Design of FIR filter using Kaiser Window method.
3) Design of IIR filter using BLT technique.
4) Power Spectrum Estimation using any one non-parametric method.
5) Study of Hardware and Software utilities for DSP starter kits (Texas, ADSP or Motorola).
6) Implementation of any application on DSP starter kit.
7) Implementation of the DSP Algorithms by using MATLAB
8) Implementation of FIR Filter by using MATLAB.
9) Implementation of IIR Filter by using MATLAB.

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(Semester VI)

Laboratory-II
DIGITAL COMMUNICATION TECHNOLOGY (ECT 327)

Teaching scheme
 Practical: 2 hrs/week
                                                                            Credits: 01

LIST OF EXPERIMENTS :
1.   Study of ASK.
2.   Study of FSK
3.   Study of PSK.
4.   Study of DM .
5.   Study of ADM.
6.   Study of QPSK.
7.   Study of ADPCM
8.   Study of TDM-PCM .
9.   Study of DPCM.
10.   Study of Eye pattern using oscilloscope
11.   Study of Hamming Code.

Note: Practical consists of minimum eight experiments from above and minimum two experiment based on MATLAB.

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(Semester VI)

Laboratory-III
OPTICAL FIBRE COMMUNICATION (ECT 328)

Teaching scheme
Practical: 2 hrs/week   **Credits: 01**

LIST OF EXPERIMENT:
Minimum eight experiments should be carried out based on above syllabus.
Experiment List

1) To plot spectral response characteristics of photodiode
2) To plot spectral response characteristics of photo transistor
3) To plot intensity response of photo diode
4) To plot intensity response of phototransistor.
5) Study of Fiber optic communication trainer kit.
6) Numerical aperture measurement of optical fiber.
7) Displace measurement by fiber optic
8) Data communication by fiber optic
9) Characteristics of opto coupler

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Laboratory-IV
VLSI DESIGN (ECT 329)

Teaching scheme
  Practical: 2 hrs/week
                                                                                Credits: 01

PRACTICALS:
Minimum 08 experiments should be carried out on VHDL test bench and kits. Simulation, synthesis and implementation of combinational and sequential logic circuits should be done on Xilink/ Altera devices.

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Third Year B. Tech (Electronics and Communication Technology)

(Semester VI)

MINI PROJECT AND SEMINAR (ECT 3210)

Teaching scheme
Practical: - 2 hrs/week   **Credits: 01**

Group size and activities:

1) Mini project group size should not exceed **three** students per every group.

2) Project idea should be proposed and finalized in consultation with guide.

3) Proposed weekly plan of the project should be finalized with guide.

4) Project work should be carried out in following steps

    a) Selection of project & problem definition.

    b) Paper design (Circuit design and flow chart of software)

    c) Simulation if required.

    d) Hardware implementation

    e) Software implementation (if required)

    f) Testing and calibration

    g) Report writing

5) Compulsory submission of mini project report by each group is a must.

6) Projects of two or more groups should not be same.

7) Seminar must be delivered after completion of project by each group preferably by using power point presentation.

8) Mini-project report must be submitted before/at the time of viva-voce .

Project Contents:

1) It should consists of hardware part and software part is optional.

2) Design of PCB by using suitable CAD tool, simulation if necessary, component mounting, soldering, testing , result analysis should be done by group.

3) Design and development of cabinet should be done for the project.

Guidelines for mini-project selection

Parameter monitoring, parameter / system controlling applications, data acquisition systems, microcontroller based systems, digital design, communication projects, power supply and batteries

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(Semester VI)

Audit Course III

PRESENTATION AND COMMUNICATION TECHNIQUES (AC 323)

Teaching Scheme:

Lectures: 2 Hrs/week

UNIT 1 Communication in a Business Organization **5 hrs**

Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions) External Communication, Strategies for conducting successful business meetings, documentation (notice, agenda minutes) of meetings. Introduction to modern communication techniques (for e.g. e-mail, internet, video conferencing etc), Legal & ethical issues in communication (intellectual property rights, patents)

UNIT 2 Advanced Technical Writing **5 hrs**

a. Report – Writing and presentation: Definition and importance of reports. Qualities of Reports, language and style in reports, type of reports, formats (letter, memo, and project- reports), and methods of compiling data. Computer-aids
b. Technical Paper Writing
c. Writing Proposals

UNIT 3 Interpersonal Skills **5 hrs**

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution Assertiveness, Leadership, Term-building, Decision-making, And Time-management.

UNIT 4 Interview Techniques **5 hrs**

Preparing for job interviews, verbal and non-verbal communication during interview. Observation sessions and role-play techniques may be used to demonstrate interview strategies.

UNIT 5 Group Discussion **5 hrs**

Dynamics of Group Behaviour, Techniques for effective participation.

Assignments:

a) **Written**

1. Assignments on Communication topics
2. Assignments on Report writing
3. Assignments on Interpersonal Skills

b) **One class test**
c) **Oral:** Practical sessions on Group-discussion / Interview Skills /Project Presentation / Power point Presentation.

Break up of IOE Marks

a) Assignments Written: 20 marks

b) Test: 10 marks

c) Performance in Oral: 20 marks

    Total 50 marks

Books Recommended:

A. For classroom teaching

(i)   Fred Luthans, ' Organizational Behavior' McGraw Hill International Edition

(ii)   Lesiker and Petit 'Report writing For Business' McGraw Hill International Edition

(iii)   Huckin and Olsen 'Technical Writing and Professional Communication' – McGra

Hill International Edition

(iv)   Wallace and Masters 'Personal Development for life and Work' (workbook) Thomson Learning

(v)   Herta Murphy 'Effective Business Communication' Hearta Murphy

Herburtwhildebraudt- McGraw Hill

B. For Additional Reading:

(i)   Lewicki, Saunders, Minton 'Essential of Negotiation' McGraw Hill International Edition

(ii)   Hartman Lemay 'Presentation Success' Thomson learning.

(iii)   Kitty O Locker & Kaczmark – 'Business Communication Building Critical Skills' McGraw Hill

(iv)   Vikas Gupta:Comdex Computer Course Kit, IDG Books Pvt, Ltd.

(v)   Heller & Handle: The Essential Manager's Manual – Dorleen Kindercey

(vi)   The Sunday Times 'Creating Success Series'

    1.Develop your Assertiveness

    2.Make every Minute Count

    3.Successful Presentation Skills

    4.How to motivate people

    5.Team building.

Equivalence of T.Y B.Tech (Electronics and communication Technology) Semester V & VI

The above detailed syllabus is a revised version of the T.Y.BTech (Electronics and communication Technology) course being conducted by the Shivaji University at the Department of Technology. This syllabus is to be implemented from June 2013.

The Equivalence for the subjects of Electronics and communication Technology at T.Y (B.Tech) Semester V and VI pre-revised course and revised course (Credit System) is as follows.

T.Y.B Tech Semester V (Electronics and communication Technology)

Sr. No.	T. Y. BTech (Electronics and communication Technology) Semester V Pre-revised syllabus	T.Y. BTech (Electronics and communication Technology) Semester V Revised syllabus (Credit System)	Remark
1.	Linear Integrated Circuits	Linear Integrated Circuits	------------------------
2.	Electromagnetic Fields	Electromagnetic Fields	------------------------
3.	Microcontrollers	Microcontrollers	------------------------
4.	Signals and Systems	Signals and Systems	------------------------
5.	Computer Networks and data communication	Computer Networks and data communication	------------------------
6.	Mini Project and Seminar	---------------------	**Shifted to VIth semester**
7.	------------------------	Electronic System Design	**Newly added**
8.	------------------------	Research Methodology	**Newly added**

T.Y.B Tech Semester VI (Electronics and communication Technology)

Sr. No.	T.Y BTech (Electronics and communication Technology) Semester VI Pre-revised syllabus	T.Y BTech (Electronics and communication Technology) Semester VI Revised syllabus (Credit System)	Remark
1.	Digital Signal Processing	Digital Signal Processing	-----------------------
2.	Digital Communication Technology	Digital Communication Technology	-----------------------
3.	Optical Fibre Communication	Optical Fibre Communication	-----------------------
4.	VLSI Design	VLSI Design	-----------------------
5.	Control System Engineering	Control Systems	**Only name Changed**
6.	------------------------	Mini Project and Seminar Lab	**Shifted from V th semester**
7.	Presentation and Communication Techniques	Presentation and Communication Techniques	-----------------------