Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics & Telecommunication) Sem – V (2014 Course)

e of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	
				End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
	L	P	T		Unit test	Assignment	Attendance				Theory
ssors and llers	4	2	0	60	20	10	10	50	-	150	4
nstruments & nt System	3	2	0	60	20	10	10	-	50	150	3
munication	3	2	0	60	20	10	10	-	50	150	3
ces & Machines	3	2	0	60	20	10	10	-	50	150	3
netic Engineering	3	0	1	60	20	10	10	-	-	100	4
kill Development- V	4	0	0	100	-	-	-		-	100	4
Total	**20**	**8**	**1**	**400**	**100**	**50**	**50**	**50**	**150**	**800**	**21**

Optional Subject

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme					
		L	P	T	ESE	Continuous Assessment			Practical	
						Unit Test	Attendance	Assignment	TW PR	TW OR
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics & Telecommunication) Sem – VI (2014 Course)

e of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	
				End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
	L	P	T		Unit test	Assignment	Attendance				Theory
al Processing	4	2	0	60	20	10	10	-	50	150	4
Systems	3	2	0	60	20	10	10	-	50	150	3
n	3	2	0	60	20	10	10	50	-	150	3
heory and Antennas	3	2	0	60	20	10	10	-	25	125	3
Theory and Coding	3	0	0	60	20	10	10	-	-	100	3
Circuit Design&	0	2	0	-	-	-	-	-	25	25	0
Skill Development-	4	0	0	100	-	-	-		-	100	4
	20	**09**	**0**	**400**	**100**	**50**	**50**	**50**	**150**	**800**	**20**

Credits of Sem- V: 25
Credits of Sem- VI: 25
Total Credits:50

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

B.Tech (E&TC) Sem- V

SUBJECT: - Electronic Instruments and Measurement System

Teaching Scheme
Lecture: 3 Hours/Week
Practical: 2 Hours/ Week

Examination Scheme
End Semester Exam: 60 Marks
Continuous Assessment: 40 Marks
TW & OR: 50 Marks
Credits: 04

Course Prerequisites:

- Fundamentals of instrumentation
- Signal conditioning units such amplifier, attenuator.

Course Objectives:

- Electronic Instruments and measurements include all type of instruments which will help direct measurement of electronic, electrical, and communication parameters.
- It is also useful for virtual implementation of electronic, electrical, and communication parameters using LABVIEW software. So the subject is useful for test and measurement industries to verify quality of product.

Course Outcomes: On successful completion of this course, students will be able to

1. Describe fundamentals of instrumentation and measurements.
2. Classify different electronic instruments according to its usage.
3. Analyze Universal Counter for the measurement of time, frequency, ratio and period with high frequency measurement techniques.
4. Describe various types of Oscilloscope & their functions.
5. Specify and perform communication measurements using various analyzers.

6. Specify functioning, specifications, and applications of different signal analyzing instruments.
7. Describe the operations involved in computer controlled test measurement techniques.

UNIT I

Fundamentals Of Instrumentation And Measurements (6 Hours)

Necessity of Electronic Measurements, Block diagram of Electronic Measurement system, Concept of static and dynamic properties of measurements, Types of errors, Voltage, current, resistance measurement using DMM, Units and Standards, Calibration, Auto zeroing, Auto ranging.

UNIT II

Basic Instruments (6 Hours)

Working principle, types, methods & applications of following Instruments: True RMS Meter, Vector voltmeter, Vector impedance meter, LCR-Q meter with important specifications.

UNIT III

Frequency Generation And Measurements (6 Hours)

Standard frequency generators, Types of frequency generators, Frequency, Ratio, Time interval, Period & Multiple Period Averaging using digital universal frequency counter, High frequency measurements and its techniques.

UNIT IV

Oscilloscope (6 Hours)

Overview of analog CRO, Dual/Multi-trace CRO, Various CRO probes & its applications; Digital Storage Oscilloscope, DSO Design considerations and specifications, DSO functionalities / Measurements such as FFT; Math Functions; Automatic Measurements, Curve Tracer.

UNIT V

Communication Measurements (6 Hours)

Basics of Communication measurements at transmitter – receiver, sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc; Network analyzer- system element, measurement accuracy, Types of network analyzers, S-parameter measurement using network analyzer, EMI measurements and suppression techniques.

UNIT VI

Signal Analyzers And Computer Controlled Test Measurements (6 Hours)

Harmonic and wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, Logic analyzer, Protocol analyzer, Computer controlled test measurements, Virtual measurements and its applications, IEEE 488, PCI/PCI express, buses, Introduction of Lab view software.

List of Experiments: (Any 8 experiments should be conducted from following list.)

1. Voltage /current Measurements using CRO and DMM.
2. Voltage /current measurement of rectifier circuit using True RMS meter.
3. Measurement of resistance, inductance, capacitance and quality factor for any RLC circuit using LCR-Q Meter
4. Frequency, Period and frequency Ratio measurements using Digital Universal Frequency Counter.
5. Measurement and analysis of digital signals using Logic Analyzer.
6. Basic usage of Spectrum Analyzer for RF spectrum generation of sin, square and triangular wave.
7. Measurement of total harmonic distortion using Distortion Factor Meter.
8. Verification of diode and transistor characteristic using Curve Tracer.
9. Digital Storage Oscilloscope Measurements for FFT analysis, capturing transients, storing and retrieving different signals, and various operations like add, subtract and math functions.
10. Measurement of S parameters of transmitter and receiver using Network analyzers.

List of Assignments:

1. Preparation of basic block schematic of any instrument with design considerations and their justification. (Paper design)
2. Select any sensor or transducer. Find its important specifications. Select instrument for the measurement of those important specifications. (Case Study)
3. How quality or standard of any instrument is specified? Which are the important global parameters that can affect quality of measurement? (Presentation)
4. Search and enlist various testing methodologies, instruments and their important aspects. (Case Study)
5. Design any measurement system on Multisim, LABVIEW Software. (Report with design and result)
6. Design a code in C or C++ for any kind of electronic system. (Program with outcome)

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

1. Unit Test	2. Assignments
3. Continuous Assessment	4. End term Examination

Text Books:

1. Cooper Helfric, "Electronic Instrumentation & Measurement Techniques", Prentice Hall Publication
2. H. S. Kalsi, "Digital Instrumentation", Tata McGraw Hill

Reference Books:
1. Oliver Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill
2. Clyde F. Coombs "Electronic Instrumentation Handbook" McGraw Hill

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) Sem.-V

SUBJECT: - Digital Communication

Teaching Scheme	Examination Scheme
Lecture: 3 Hours/week	End Semester Exam: 60 Marks
Practical: 2 Hours/week	Continuous Assessment: 40 Marks
	TW & OR: 50 Marks
	Credits: 04

Course Prerequisites:

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series, fourier transform probability theory

Course Objectives:
- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes: On successful completion of this course, students will be able to
1. Classify analog to digital conversion techniques in communication system.
2. Apply mathematics knowledge to solve problems based on probability theory for Random Signals.

3. Understand bandwidth utilization schemes in digital communication systems.
4. study performance of communication system in presence of noise
5. Understand different multiplexing techniques.
6. understand detection and performance analysis of digital signals

UNIT-I

Analog To Digital Conversion **(6 Hours)**

Pulse Modulation-Sampling process, Quantization, Pulse Code Modulation (PCM), Companding, Noise considerations in PCM Systems-Delta modulation, linear prediction, differential pulse code modulation, Adaptive Delta Modulation, LPC Speech synthesis.

UNIT-II

Random Processes **(6 Hours)**

Introduction to Random Variables, Mathematical definition of a random process, Stationary processes, Mean, Correlation &Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components

UNIT-III

Line Coding And Digital Multiplexing **(6 Hours)**

Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra. Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers, synchronization: Bit Synchronization, Scramblers, Frame Synchronization .Inter-symbol interference, Eye Patterns, Equalization.

UNIT-IV

Digital Carrier Modulation & Demodulation Techniques **(6 Hours)**

Introduction, Amplitude Shift Keying (ASK), ASK Spectrum, ASK Modulator, Coherent ASK Detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), Frequency Spectrum of FSK, FSK Transmitter, Non-coherent FSK Detector, Coherent FSK Detector, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, Coherent PSK Detection, Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, M-Ary PSK, Quadrature Amplitude Modulation (QAM); MQAM transmitters and receivers, Band Width efficiency, Carrier Recovery; Differential PSK, DPSK transmitter and receiver, Minimum Shift Keying (MSK)

UNIT-V

Data Transmission **(6 Hours)**

Base band signal receiver, probability of error, the optimum filter, and white noise-the matched filter, probability of error of the matched filter, coherent reception: correlation, application of coherent reception in PSK and FSK. Correlation receiver for QPSK.

UNIT-VI

Spread Spectrum System **(6 Hours)**

Spread Spectrum Modulation- Pseudo- noise sequences, a notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space Dimensionality and processing gain , Probability of error , Frequency –hop spread spectrum ,Maximum length and Gold codes,TDMA,FDMA,CDMA.

List of experiments (Any 8 experiments should be conducted from following list.)

1. To perform Sampling and reconstruction of signal.
2. To perform Pulse Code Modulation (PCM).
3. To observe Delta modulated signal with staircase approximation.
4. To compare Delta Modulation (DM) System and Adaptive Delta Modulation (ADM) system
5. To perform Differential Pulse Code Modulation (DPCM).
6. To draw and observe practically Different Data Formats
7. To perform Amplitude Shift Keying (ASK) modulation and demodulation.
8. To perform Binary Phase Shift Keying (BPSK) modulation and demodulation.
9. To perform Binary frequency Shift Keying (BFSK) modulation and demodulation
10. To perform Quadrature Phase Shift Keying (QPSK) modulation and demodulation.
11. MATLAB simulation of digital modulation techniques.

List of Assignments

1. To solve problems on statistical parameters of random variables
2. To study Pulse digital modulation techniques
3. To draw different Line coding formats for given data
4. To study Digital carrier modulation
5. Derive Probability of error
6. To study Spread spectrum techniques

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

2. Unit Test	2. Assignments
3. Continuous Assessment	4. End term Examination

Text Books:

1. Simon Haykins, "Communication Systems" John Wiley, 4th Edition, 2001

2. Taub& Schilling, "Principles of Digital Communication "Tata McGraw-Hill" 28th reprint, 2003

Reference books

1. John G. Proakis, "*Digital Communication*", McGraw Hill Inc 2001.

2. Simon Haykin, "Digital Communication Systems", John Wiley & Sons, Fourth Edition.

3. A.B Carlson, P B Crully, J C Rutledge, "Communication Systems", Fourth Edition, McGraw Hill Publication.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

B.Tech (E&TC) Sem- V

SUBJECT: Microprocessors and Microcontrollers

Teaching Scheme	Examination Scheme	
Lecture: 4 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR:	50 Marks
	Credits:	05

Course Prerequisites:

- Students should have basic knowledge of 'Digital Electronics'.

Course Objectives:

- To make students familiar with the basic blocks of microprocessor and microcontroller devices in general.
- To familiarize students with architecture and features of typical Microcontrollers.
- To learn interfacing of real world input and output devices and use assembly and high level languages to interface the microcontrollers to various applications

Course Outcomes: On successful completion of this course, students will be able to

1. Differentiate features of microprocessors and microcontrollers.
2. Use Hardware and software tools for microcontrollers.
3. Develop interfacing of microcontrollers with real world devices.

UNIT 1

Introduction To Microprocessors (8 Hours)

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann architectures. Internal architecture of 8 bit Microprocessor 8085, Overview of instruction set, Addressing modes, instruction cycle, Stack and Subroutines, interrupts.

UNIT 2

8051 Microcontroller (8 Hours)

MCS-51 architecture, family devices & its derivatives. Ports, registers, memory organization, Overview of Instruction set, Addressing modes, Machine cycles and bus timings, timers and its modes, Interrupt structure.

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UNIT 3

Peripheral Interfacing With 8051 (8 Hours)

Serial Communication with RS232, 8051 based system design – Address decoding data memory space Interfacing & Applications –LED, LCD, Stepper motor, DAC/ADC, Sensors, Keyboard. Programming in Embedded C.

UNIT 4

Pic Microcontroller (7 Hours)

Comparison of Features of different PIC series, PIC 18F architecture, registers, memory Organization, oscillator options, BOD, power down modes and configuration bit settings, Overview of instruction set, Addressing modes.

UNIT 5

Peripheral Interfacing With Pic-I **(8 Hour**s)

Port structure, interrupts & timers of PIC18F. Interfacing of PIC18F with LED, Seven segment display, LCD and Keypad. Use of timers with interrupts, PWM generation. All programs in embedded C.

UNIT 6

Peripheral Interfacing With Pic-Ii **(9 Hours)**

MSSP structure, CCP and ECCP, Study of UART, SPI, I2C, ADC. Interfacing serial port, ADC, RTC with I2C and EEPROM with SPI. Motor Control using PIC. All programs in embedded C.

List of experiments: Any 8 of below given list.

1. Find Largest/ Smallest number in an array in 8085.
2. Multiplication/ Division of 8-bit numbers in 8085.
3. Generate BCD up/ down counter in 8051.
4. Square wave generation using timers in 8051.
5. Serial Communication using 8051.
6. LCD interfacing with 8051.
7. Stepper motor interfacing with 8051.
8. Keyboard interfacing with 8051.
9. ADC/DAC interfacing with 8051.
10. Serial Communication using PIC.
11. LCD interfacing with PIC.
12. Stepper motor interfacing with PIC.
13. Keyboard interfacing with PIC.
14. Seven segment display interfacing with PIC.

List of Assignments:

1. Case study of any one of the latest processors.

2. Mini project using 8051/PIC microcontroller on topics such as design of Digital Multimeter, design of DAS system, DC Motor control using PWM, Frequency counter etc.(Simulation only)

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

  3. Unit Test　　　　　　　2. Assignments

  3. Continuous Assessment　　4. End term Examination

Text Books:

1. Mazidi, “8051 microcontroller & embedded system” 3rd Edition ,Pearson
2. Mazidi, “PIC microcontroller & embedded system” 3rd Edition ,Pearson

Reference Books:

1. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
2. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Penram International & Thomson Asia, Second Edition.
3. John B. Peatman, “Design with PIC Micro-controllers”, Pearson Education Asia, Low Price Edition.
4. 18F xxx reference manual

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

SUBJECT: - Electromagnetic Engineering

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Exam: 60 Marks**

Tutorials: 1 Hour/Week **Continuous Assessment: 40 Marks**

Credits: 04

Course Objectives

- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

Course Outcomes

After the successful completion of the course student should be able to:

1. Apply vector calculus to static electric-magnetic fields in different engineering situations.
2. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
3. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.

4. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.
5.

UNIT 1

Vector Analysis (06 Hours)

Introduction and significance of electromagnetic fields, introductory vector analysis and coordinate systems, concepts of gradient, divergence, curl,

UNIT 2

Electrostatic Field (06 Hours)

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 (06 Hours)

Biot-Savart's 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 (06 Hours)

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 (06 Hours)

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 (06 Hours)

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, EMI- EMC.

List of Assignments:

1. Coordinate Systems.
2. Case Study of Electromagnetic fields.

3. Application note on- Electrostatic Discharge
4. Application note on- Electromagnetic interference and Compatibility
5. Analysis of transmission lines using Smith Chart.

List of Tutorials

1. Vectors & coordinate systems
2. Application of Stoke's theorem.
3. Application of Gauss's law.
4. Energy stored in capacitor.
5. Application of Poission's and Laplace's equations.
6. Applications of Ampere's law
7. Boundary conditions for electrostatic fields.
8. Boundary conditions for magnetic fields.
9. Poynting theorem and their applications.
10. Applications of Smith Chart.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

  4. Unit Test　　2. Assignments

  3. Continuous Assessment　　4. End term Examination

Text Books –

1. Matthew N. O. Sadiku, "Principles of Electromagnetics", 4th Edition, Oxford University Press.
2. John D. Kraus "Electromagnetic", McGraw Hill.

Reference Books:

1. William Hyte "Electromagnetic Engineering", McGraw Hill.
2. Edminister J.A, Electromagnetics, Tata McGraw-Hill.
3. R.K Shevgaonkar, Electromagnetic waves,Tata McGraw-Hill.
4. S Salivahanan& S Karthie, "electromagnetic Field Theory" Vikas Publishing House Ltd.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) Sem.-V

SUBJECT: - Power Devices and Machines

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours/week	**End Semester Exam: 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment: 40 Marks**
	TW & OR: 50 Marks
	Credits: 04

Course Prerequisites:

- Basic knowledge of electronic devices, electrical technology.
- Basic mathematical tools like Integration and Derivatives, Partial Derivatives Fourier series.

Course Objectives:

- To introduce to students the theory and applications of power electronics systems for high efficiency, renewable and energy saving conversion systems,
- To prepare students to know the characteristics of different power electronics switches and selection of components for different applications.
- To develop students with an understanding of the switching behavior and design of power electronics circuits such as AC-DC, AC-AC and DC-DC converters.

Course Outcomes:

After successfully completing the course students will be able to:

1. Explain construction, switching characteristics and justify the selection of power devices and thyristors.

2. Explain operating principle and suggest protection circuit for power devices and thyristors.
3. Explain construction and operating principle of DC machines and AC machines (1φ and 3φ).
4. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.
5. Understand, simulate and design single-phase and three-phase thyristors converters.

UNIT I:

Power Diodes And Transistors (**6 Hours**)

Power Diodes: Construction, Switching characteristics, Line frequency diodes.

Power BJT: Construction, Operation, Steady state characteristics, switching characteristics. Switching limits, Break down voltages, Second breakdown, Thermal runaway.

Power MOSFET: Construction, Operation, Static characteristics, Switching characteristics, Forward and reverse bias Safe Operating Area, Parallel operation.

IGBT: Construction, Operation, Steady state characteristics, Switching characteristics, Safe operating area.

Gate drive circuits for Power BJT, MOSFET & IGBT.

UNIT II:

Thyristors (**6 Hours**)

SCR: Construction, Operation, Transistor analogy, Static characteristics, Switching characteristics. SCR ratings, Gate Characteristics, Triggering requirements, Triggering techniques, Isolation techniques.

TRIAC: Construction, Operation, Steady state characteristics, triggering modes.

GTO: Construction, Operation, Turn off mechanism, Applications.

UNIT III:

Power Converters – I (**6 Hours**)

Controlled Rectifiers (AC – DC converters): Concept of line & forced commutation Single phase Semi & Full converters for R & R-L loads, Effect of free-wheeling diode,

Three phase Semi & Full converters for R load.

AC – AC converters: Single phase AC voltage controller for R & R-L loads, three phase AC voltage controller for R load.
(Qualitative analysis only)

UNIT IV:

Power Converters – II (**6 Hours**)

DC - DC converters: DC Chopper: - Working principle of step down chopper, control strategies, step down chopper for R-L load, step up chopper; SMPS.
DC- AC converters: Inverter: - Working principle of single phase, Bridge inverter for R & R-L load, three phase bridge inverter for R load, Harmonic reduction using PWM technique.
(Qualitative analysis only)

UNIT V:

Introduction to Motors (**6 Hours**)

DC motors, AC Motors, Special Purpose Motors,
Induction Motor, Universal Motor, Stepper Motor, Servomotors etc.
(Qualitative analysis only)

UNIT VI:

Industrial Applications (**6 Hours**)

Introduction to drives, sped control techniques, illumination and lighting control protocol, Electric Heating, Electric Welding, High Voltage DC transmission, UPS- On line and off line, LED drives, Solar PV.

List of Experiments: Minimum 6 experiments to be performed from the following List.

1. SCR/TRIAC/ MOSFET/IGBT Characteristics.
2. Triggering circuits and phase control circuits for SCRs/MOSFET Driver Circuits
3. Single phase FW bridge converter feeding DC motor.
4. Three Phase Converter (HW and FW Bridge)
5. Single phase AC Voltage Regulator
6. Chopper (Step up and Step down)
7. Single phase / three phase Inverter with Resistive/Induction Motor load.
8. Simulation of Converter / Chopper using MATLAB/ Lab View/ Multisim.
9. Simulation of PWM Inverter using MATLAB/ Lab View/ Multisim.

List of Assignments:

1. Study of 1- phase AC to DC controlled converter (half controlled and full controlled).
2. Study of 3- phase AC to DC full controlled converter.
3. Study of Thyristor based dc to dc converter (dc chopper).
4. Study of a 3- phase PWM inverter with fixed (50Hz) output frequency and study of a non-PWM type inverter with 120-degree conduction of switches.
5. MOSFET based dc to dc converter (buck, boost and buck-boost types with non-isolated output voltage.)
6. Study of an industrial type fly-back dc to dc converter with isolated and regulated output voltage.
7. Case study of the real time application of electrical systems.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

5. Unit Test 2. Assignments
3. Continuous Assessment 4. End term Examination

Text Books:

1. M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition, 2004 edition, New Delhi.
2. M. D. Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi.

Reference Books:

1. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi.
2. Ned Mohan, T. Undeland& W. Robbins, "Power Electronics Converters applications and design" 2nd edition, John Willey & sons.
3. B. L. Thareja& A. K. Tahreja, "Electrical Technology" Volume 1 & 2, S.Chand Publications.
4. H. Cotton, "Electrical Technology", CBS.
5. Nagrath Kothari, "Electrical Machines", TMH.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) Sem.-VI

SUBJECT: - Digital Signal Processing

Teaching Scheme	**Examination Scheme**
Lecture: 4 Hours/week	**End Semester Exam: 60 Marks**
Practical: 2 Hours/week	**Continuous Assessment: 40 Marks**
	TW & OR: 50 Marks
	Credits: 05

Course Prerequisite:

- Signals and System

Course Objective:

- To introduce the student to a very broad and advanced topic of Digital Signal Processing (DSP) which is one of the core subjects in the curriculum.
- To teach the student the basic concepts and tools in the field of DSP
- To enable the student to apply knowledge of Digital Signal Processing (DSP) in the fields of Signal Processing, Communication, Speech Processing, Instrumentation, Medical Electronics and research

Course Outcomes: After the successful completion of the course the student will be able to

1. To enumerate the advantages of DSP over processing in analog domain.
2. To be able to find Discrete Fourier Transform of a digital signal.
3. To design a Finite Impulse Response (FIR) Filter given the specifications.
4. To design a Infinite Impulse Response (IIR) Filter given the specifications.
5. To quantify the finite word length effects in the field of DSP.
6. To enumerate the features of a DSP Processor.

UNIT 1:

Introduction **(7 Hours)**

Basic elements of DSP and its requirement, Advantages of digital over analog signal processing, z-Transform and its application to the analysis of LTI systems, Discrete

Complex exponentials and their properties, Frequency domain analysis of LTI systems, Frequency response of LTI systems, LTI systems as Frequency selective filters

UNIT 2:

Discrete Fourier Transform (9 Hours)

Overview of Frequency Analysis of signals, Discrete Time Fourier Transform(DTFT), Discrete Fourier Transform as Sampled DTFT, Properties of DFT, Linear filtering methods based on DFT and IDFT, Goertzel Algorithm, Frequency analysis using DFT. FFT algorithms, Saving in computation achieved by FFT algorithm, Decimation in time and decimation in frequency FFT algorithms, Butterfly computation.

UNIT 3:

FIR Filter Design (9 Hours)

Advantages and overview of FIR filters, Symmetric & Anti-symmetric FIR filters, Design of FIR filters using windows, Frequency sampling method, Equiripple optimum Chebyshev FIR filter design, Alternation theorem, Design of some special FIR filters: FIR differentiators, Hilbert Transformers and Raised Cosine Filters. FIR filter structures - Direct form, Cascade form and Frequency-Sampling structures.

UNIT 4:

IIR Filter Design (9 Hours)

Advantages and overview of IIR Filters, IIR Filter design methods - Approximation of derivatives, Impulse invariance, Bilinear transformation. Limitations of the design methods, Designing of Butterworth and Chebyshev Filters, Frequency transformations in analog and digital domain, IIR filter structures - Direct form, Cascade Form, Parallel form structures and Lattice & Lattice-ladder structures

UNIT 5:

Finite Word Length Effects (7 Hours)

Overview of Finite Word Length Effects, Quantization process and errors, Coefficient quantization effects, Arithmetic round-off errors, Dynamic range scaling, Limit cycles in IIR digital filters, Round-off errors in FFT algorithms, Minimizing the Finite Word Length Effects

UNIT 6:

DSP Processors And Applications Of DSP (7 Hours)

Need for special purpose DSP Processors, Features of DSP Processors: Harvard and Modified Harvard Architectures, Bus structure, Addressing Modes, Processing Units, Address Generators, Single Cycle Execution. Case study of TMS320C67x DSP processor. Major applications of DSP: DTMF, Spectral Analysis, Musical Sound Processing, Transmultiplexers, Oversampling A/D and D/A converters

List of Experiments

Assignments to be carried out using software such as MATLAB

1) To plot magnitude and phase Spectra of DFT of a given sequence.

2) To verify properties of DFT

3) To implement filter using overlap add and overlap save method

4) To design FIR Filter for given specifications.

5) To design IIR Filter for given specifications.

6) To observe Finite Word Length Effect in any one application in DSP

7) To do Spectral Analysis of a real signal

8) To implement Dual Tone Multi Frequency signal generation and detection.

9) To implement an FIR Filter on a DSP Processor

List of Assignments

1) Write down what changes were brought due to the transition from analog processing to digital processing in any one field such as telephone system or a audio playback system.
2) Write down the significance of the contribution by Cooley and Tookey to the field of DSP.
3) Justify the need of window function in the design of FIR filter by windowing method.
4) What are the limitations of each of the IIR Filter design method?
5) Compare the structures used to implement digital filters with respect to Finite word length effects.
6) Write down the features of any one commercially available DSP Processor.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

  6. Unit Test 2. Assignments
  3. Continuous Assessment 4. End term Examination

Text Books

1. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing ", PHI
2. S. K. Mitra, "Digital Signal Processing", TMH

Reference Books

1. D. G. Monolakis, V. K. Ingle, 'Applied Digital Signal Processing', Cambridge University Press

2. A. V. Oppenheim, R. W. Schaffer, "Discrete Time Signal Processing ", PHI

3. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors', TMH

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM: VI

SUBJECT: - Embedded Systems

Teaching Scheme	**Examination Scheme**	
Lecture: 3 Hours/week	**End Semester Exam:**	**60 Marks**
Practical: 2 Hours/week	**Continuous Assessment:**	**40 Marks**
	TW & OR:	**50 Marks**
	Credits:	**04**

CoursePrerequisites:

Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

Course Objectives:

- To understand need and application of ARM Microcontroller in embedded system.
- To study the architecture of ARM series microcontroller
- To understand architecture and features of typical ARM7& ARM CORTEX-M3 Microcontroller.
- To learn interfacing of real world input and output devices

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Course Outcomes: On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

UNIT 1

Introduction to Embedded Systems (4 Hours)

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

UNIT 2

Introduction to embedded programming & RTOS (8 Hours)

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

UNIT 3

ARM7 Based Microcontroller **(8 Hours)**

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer.

UNIT 4

Interfacing with ARM7 **(6 Hours)**

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

UNIT 5

ARM CORTEX Processors **(6 Hours)**

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

UNIT 6

Interfacing with ARM CORTEX M3 **(4 Hours)**

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.

List of experiments: Any 8 of below given experiments**.**

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768

9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7

List of Assignments:

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.
3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

7. Unit Test 2. Assignments
3. Continuous Assessment 4. End term Examination

Text Books:

3. Rajkaml, "Embedded system-Architecture, Programming and Design", TMH Publications, Edition 2003
4. Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developer"s Guide – Designing and Optimizing System Software", ELSEVIER
5. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M", Newness, ELSEVIER

Reference Books:

5. LPC 214x User manual (UM10139):- www.nxp.
6. LPC 17xx User manual (UM10360) :- www.nxp.com
7. ARM architecture reference manual : - www.arm.com
8. Trevor Martin,"AnEngineer"s Introduction to the LPC2100 series", Hitex (UK) Ltd.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: VLSI Design

Teaching Scheme	Examination Scheme
Lecture: 3 Hours/Week	End Semester Exam: 60 Marks
Practical: 2 Hours/Week	Continuous Assessment: 40 Marks
	TW& PR: 50 Marks
	Credits: 04

Course Prerequisite
Analog Electronics, Digital Electronics and Semiconductor Physics

Course objectives:
To introduce students to VLSI Design, Fabrication and Testability techniques.

Course Outcomes:
- Ability to design analog and digital VLSI circuits.
- Ability to study fabrication theory and to implement stick diagrams.
- Ability to design and simulate digital circuits using VHDL.
- Ability to learn low power CMOS VLSI design.
- Ability to understand the concepts of Design for Testability.

Unit-I **(06 Hours)**

Introduction to VLSI Design– Introduction to VLSI, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity & Locality.

Fabrication of MOSFETs-Introduction, Fabrication Process flow: Basic steps, C-MOS n-Well Process, Layout Design rules, Stick Diagram of NAND, NOR, Inverter

UNIT-II **(06 Hours)**

MOS Transistor- The Metal Oxide Semiconductor (MOS) structure, The MOS System under external bias, Operation of MOS transistor, MOSFET Current-Voltage characteristics, MOSFET scaling & small-geometry effects, MOSFET capacitances.

MOS Inverters – CMOS Inverter Characteristics, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

UNIT-III

Digital VLSI Design-1 **(06 Hours)**

VHDL Entity-Architecture Concepts, Introduction to various modeling styles of VHDL (Behavioral, Dataflow and Structural), VHDL Basic Elements (Data types, Data objects and Operator),Dataflow Modeling: Example based on dataflow modeling, When-Else and With Select Statement, Structural modeling: Concept of Component .

UNIT-IV

Digital VLSI Design-2 **(06 Hours)**

Behavioral modeling for digital design, If-else, Loop, Case and Wait Statements. Moore and Mealy FSM Design using VHDL, Overview of PLDs, CPLD and FPGA architecture overview, Modes of configuration.

UNIT- V

Low – Power CMOS Logic Circuits **(06 Hours)**

Introduction, Overview of Power Consumption, Low Power Design through Voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits.

UNIT- VI

Design for Testability **(06 Hours)**

Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable design Techniques, Scan Based and BIST Techniques

List of experiments:

1. Introduction to Xilinx tools and design of various Gates.

2. Dataflow Modeling -1
   A) Design Full-adder using dataflow modeling.
   B) Design 3x8 Decoder using dataflow modeling.

3. Dataflow Modeling-2
A)Design 8x3 encoder using when else statement.
   B) Design 4x1Multiplexer using with select statement.
4. Structural Modeling-1
   A)Design a Half adder using Structural modeling.
   B)Design a 4bit adder using Full adder as component.
5. Sturctural Modeling-2
   Design 8-bit odd parity detector using Structural Modeling. Assume 2i/p X-OR as component.
6. Behavioral Modeling-1
   A) Implimentation of Positive edge triggered D-FF.
B) Implimentation of Positive edge triggered T-FF.
7. Behavioral Modeling-2
   A)Design a 4bit buffer register.
   B)Design a 4bit Ring counter using wait statement.
8. FSM Design-1
   Design a BCD counter using Moore FSM
9. FSM Design-2
   Implement sequence detector 1010 using Mealy machine.
10. Layout Design-1
    Introduction to Microwind and design of Inverter.
11. Layout Design-2
    Using Mircrowind, Design NAND and NOR.

List of Assignments:

1. Any one complex Digital VLSI Design Example using VHDL

2. Presentation based on any advanced topics of VLSI Design.

3. Layout design of Ring Oscillator using Microwind

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

8. Unit Test   2. Assignments
3. Continuous Assessment   4. End term Examination

Text Books:

1. Sung-Mo Kang &YosufLeblebici, “CMOS Digital Integrated Circuits: Analysis & Design”, TMH, 3rd Edition.
2. Douglas Perry, “VHDL: Programming by Example”, McGraw Hill, Fourth Edition, 2002.

Reference Books:

1. Neil H.E. Weste, Davir Harris, “CMOS VLSI Design: A Circuits and system perspectives”, Pearson Education 3rd Edition, 2004.
2. Charles Roth, Larry Kinney, “Fundamentals of Logic Design”, Cengage Learning, Seventh edition, 2014.
3. J. Bhaskar “A VHDL Primer”, PHI Learning, Third Edition, 1998.
4. V. Pedroni , “Circuit Design and Simulation with VHDL”, MIT Press, Second Edition, 2010

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: - Microwave Theory and Antennas

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours/Week	**End Semester Exam: 60 Marks**
Practical: 2 Hours/Week	**Continuous Assessment: 40 Marks**
	TW& OR: 25 Marks
	Credits: 04

Course Prerequisites:

Students should have basic knowledge of:

- Electromagnetic engineering

Course objective:

- Todevelop ability to design antenna and understanding of Microwave communication.

Course Outcomes: On successful completion of this course, students will be able

1. To perform wave propagation on a line and Use Smith chart.
2. To understand concepts of Modes and Calculate network parameters.
3. To understand Microwave devices and use them.
4. To calculate antenna parameters.
5. To design different Antenna arrays.
6. To Design Microstrip Antenna.

UNIT 1

Introduction and Transmission Line Theory (6 Hours)

Applications of Microwave Engineering, A Short History of Microwave Engineering, Wave Propagation on a Transmission Line, The Lossless Line, Transmission Line Parameters, Propagation Constant, Group Velocity, Power Flow for the Lossless Coaxial Line, The Combined Impedance–Admittance Smith Chart, The Quarter-Wave Transformer, Load Matched to Line, Conjugate Matching, The Terminated Lossy Line, Single-Stub Tuning, Shunt Stubs Series Stubs, Double-Stub Tuning, Smith Chart Solution

UNIT 2

Waveguides and Network Parameters (6 Hours)

Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses associated with microwave transmission Concept of Impedance in Microwave transmission, Coaxial Line.
Rectangular Waveguide, Circular waveguide, Equivalent Voltages and currents for non-TEM lines. Network parameters for microwave Circuits, Scattering Parameters

UNIT 3

Microwave Devices(6 Hours)

Microwave Passive components: Directional Coupler, Power Divider, Microwave Passive components: Magic Tee, attenuator, resonator, Microwave Active components: Diodes, Transistors, Microwave Active components: oscillators, mixers, Microwave Semiconductor Devices: Gunn Diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron, klystron Amplifier

UNIT 4

Antenna parameters (6 Hours)

Introduction ,Types of Antennas ,Radiation Mechanism ,Radiation Pattern ,Radiation Power Density ,Radiation Intensity ,Beam width , Directivity, Numerical Techniques, Antenna Efficiency ,Gain , Beam Efficiency , Bandwidth, Polarization ,Input Impedance , Antenna Radiation Efficiency ,Antenna Vector Effective Length and Equivalent Areas ,Maximum Directivity and Maximum Effective Area , Friis Transmission Equation and Radar Range Equation , Antenna Temperature , Far-Field Radiation

UNIT 5

Antennas and its array (6 Hours)

Small Dipole, Finite Length Dipole, Half-Wavelength Dipole, Cylindrical Dipole, Folded Dipole ,Loop antennas, Circular Loop of Constant Current, Two-Element Array, N-Element Linear Array: Uniform Amplitude and Spacing, N-Element Linear Array: Uniform Spacing, Non uniform Amplitude, Circular Array , Traveling Wave Antennas, Broadband Antennas, Log-Periodic Antennas, Fractal Antennas

UNIT 6

Microstrip and Other antennas **(6 Hour**s)

Field Equivalence Principle: Huygens' Principle, Babinet's Principle,Microstrip Antennas , Rectangular Patch, Circular Patch, Quality Factor, Bandwidth, and Efficiency, Input Impedance, Coupling, Arrays and Feed Networks, Horn Antennas, Conical Horn, Parabolic Reflector Antennas, Smart-Antenna, Signal Propagation in Smart antennas ,Mobile Ad hoc Networks, Smart-Antenna System Design.

List of Experiments: Any of the 8 below Experiments**.**

1. Frequency & Wavelength measurement of Klystron tube.
2. Determination of VSWR & reflection Coefficient
3. I-V characteristics of Gunn diode.
4. Frequency & Wavelength Measurement
5. Study of Magic tree
6. Design of Microstrip antenna using Ansys HFSS
7. Design of Horn antenna using Ansys HFSS
8. Design of parabolic antenna using Ansys HFSS
9. Design of antenna with array using Ansys HFSS
10. Study of Smart antennas

List of Assignments:

1. Case study of Research paper on Antenna.
2. Design and research Paper publication.
3. Advance applications in Microwave and Antenna.
4. PPT presentation on Subject Topic

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

  9. Unit Test 2. Assignments
  3. Continuous Assessment 4. End term Examination

Text Books:

1. Microwave Engineering by David M Pozzar (John willy& sons).

2. Antenna theory and Design C.A Balanis (John willy& sons.).

Reference Books:

1. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill.,
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005
3. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2^{nd} Ed., John Wiley &
   Sons. 1998.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: - Information Theory & Coding

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/week **End Semester Exam: 60 Marks**

Continuous Assessment: 40 Marks

Credits: 03

Course Prerequisites:

- Digital Communication
- Analog Communication
- Signals and Systems

Course Objectives:

- To introduce the student to the field of Information Theory.
- To introduce the student to the fundamental concepts in information theory
- To enable the students to apply the algorithms of source coding and channel coding.

Course Outcomes: On successful completion of this course, students will be able to

1. To find a source code for a given information source and calculate its efficiency.
2. To find the mutual information for a given source and a channel.
3. To find the channel capacity for a given channel
4. To find the error correcting capacity for a given linear block code
5. To find the encoding and decoding circuit for a given cyclic code.
6. To apply Viterbi decoding algorithm for a given received sequence

UNIT - I

Source Coding **(6 Hours)**

Introduction, Historical Perspective of Information Theory, Information: Definition and physical significance, Properties of Information, Information Source, Discrete Memoryless Source, Binary Source, Entropy, Properties of Entropy, Some Source Coding Algorithms: Huffman Coding, Shannon-Fano Coding. Average Code length, Efficiency, Source Coding Theorem, Lempel-Ziv Coding.

UNIT – II

Mutual Information And Channel Coding Theorem (6 Hours)

Discrete Memoryless Channel, Channel Matrix, Mutual information, Conditional Entropy, Joint Entropy. Physical Significance of Mutual Information, Properties of Mutual Information, Channel Capacity, Channel Coding Theorem, Error Free Communication, Verification of Channel Coding Theorem for Binary Symmetric Channel.

UNIT - III

Channal Capacity Theorem (6 Hours)

Differential entropy and mutual information for continuous ensembles, Differential entropy for Gaussian distribution, Channel Capacity Theorem, Sphere Packing Problem, Implications of Channel Capacity Theorem, Rate Distortion Theory.

UNIT - IV

Linear Block Codes (6 Hours)

Introduction: Need of Error Control Coding, Classification of Error Correcting Codes, Error Detection and Error Correction Techniques, Systematic and nonsystematic Codes, Code rate. Linear Block Codes, Generator and Parity Check Matrices, Hamming Codes, Syndrome: definition and properties, Syndrome decoding, Hamming Bound, Perfect Code.

UNIT -V

Cyclic Codes **(6 Hours)**

Cyclic Codes: Properties and significance, Generator Polynomial and its properties, Parity Check Polynomial, Syndrome Polynomial and its properties, Encoding and Decoding of Cyclic Codes using shift register. Overview of BCH Codes, RS codes, Golay codes, Burst error correcting codes.

UNIT- VI

Convolutional Codes **(6 Hours)**

Introduction, Encoding of Convolutional Codes, Code Tree, State diagram and Trellis Diagram, Transform Domain Approach, Maximum Likelihood Decoding-Viterbi Algorithm, Sequential Decoding, Overview of Turbo Codes.

List of Assignments:

1. To find Huffman code, average code length, coding efficiency for a given source.
2. To find mutual information for a given source and channel.
3. To find the channel capacity of a practical channel such as telephone line.
4. To find minimum distance for a given linear block code.
5. To find generator matrix representation for a given generator polynomial.
6. To decode a given received sequence of bits for a given convolutional code using Viterbi Algorithm

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

10. Unit Test 2. Assignments

3. Continuous Assessment 4. End term Examination

Text Books:

1. Simon Haykin, ' Communication Systems' 4th edition, John Wiley & Sons
2. Ranjan Bose, "Information Theory Coding and Cryptography" Tata McGraw-Hill.

Reference Books:

1 K. Sam Shanmugam, "Digital and analog communication systems", John Wiley.

2 Thomas M. Cover, Joy A. Thomas," Elements of Information Theory, 2nd Edition", Wiley Publication.

3 Roberto Togneri, Christopher J.S deSilva "Fundamentals of Information Theory and Coding Design", CRC Press.

4 Steven Roman," Introduction to Coding and Information Theory", Springer New York.

5 N. T. Markad "Communication System", I K International Publishing House Pvt. Ltd., New Delhi.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Department of Electronics and Telecommunication

Class: B.Tech (E&TC) Sem: - VI

SUBJECT: - Electronic Circuit Design & Practices

Teaching Scheme **Examination Scheme**

Practical: 2 Hours/Week **TW & OR: 25 marks**

Credits: 01

Course prerequisites:

- Knowledge of basic electronics components

Course objective:

The aim is to enable the student to undertake an independent survey into a relevant area.This course is to familiarize the student with the analysis and design of Electronics circuits.

Course Outcomes: On successful completion of this course, students will be able to

- Design and implementation of small electronics systems
- Model and quantitatively analyze circuits with transistors and other nonlinear devices;
- Construct and test electronic circuits in the laboratory;
- Use software tools to simulate the behavior of electronic circuits

Contents:

- Tutorial and 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.

List of Experiments:

- Minimum 8 Experiments based on syllabus using simulation software.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. End term oral performance

Text Books:

- Millman J. and Halkias .C "Integrated Electronics ", 2nd Edition, Tata McGraw-Hill, 2001.

Reference Books:

4. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, 8th Edition. PHI, 2002.
5. S.Salivahanan, et.al, “Electronic Devices and Circuits”, TMH, 2008.
6. Floyd, Electronic Devices, Sixth edition, Pearson Education, 2003.
7. I.J. Nagrath, Electronics – Analog and Digital, PHI, 2009.