Bharati Vidyapeeth (Deemed to be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Electronics & Communication) –CBCS 2021 Course

B. Tech. (Electronics & Communication)) Sem III

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
11		Probability & Statistics	4	0	1	60	40	0	0	0	100	4	0	1	5
12		Switching Theory & LogicDesign	4	2	0	60	40	25	0	25	150	4	1	0	5
13		Analog Circuits & Applications	3	2	0	60	40	25	0	25	150	3	1	0	4
14		Signals & Systems	4	2	0	60	40	25	25	0	150	4	1	0	5
15		Process & Control System*	3	0	0	60	40	0	0	0	100	3	0	0	3
16		Vocational Course-I PCB Design & Assembly	0	2	0	0	0	25	25	0	50	0	1	0	1
17		Data Structures	0	2	0	0	0	25	0	0	25	0	1	0	1
18		Database Management System	0	2	0	0	0	25	0	0	25	0	1	0	1
	Total		**18**	**12**	**1**	**300**	**200**	**150**	**50**	**50**	**750**	**18**	**06**	**1**	**25**
	Social Activity- I **		-	-	-	-	-	-	-		-	-	-	-	2

*Industry Taught Course – I
** Add on course

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B. Tech. (Electronics & Communication Engineering) Sem III **PROBABILITY AND STATISTICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Measures of central tendency, dispersion, skewness and kurtosis.

Course Objectives:	
1	To study probability distributions and testing of hypothesis.

Course Outcomes: After learning this course students will be able to	
1	Understand discrete and continuous probability distributions.
2	Identify standard probability distributions.
3	Apply bivariate distributions.
4	Apply sampling distributions.
5	Understand concept of point estimation and interval estimation.
6	Apply ANOVA for one way and two way distribution.

UNIT – I	**Probability and random variables**	**(08 Hours)**
	Concept of probability, Random Variables, Probability Distributions and Expectation: Concept of a random variable, discrete probability distributions, continuous probability distributions, joint probability distributions, mean, variance, covariance.	
UNIT -II	**Standard distributions**	**(08 Hours)**
	Gaussian, exponential, Rayleigh, uniform, Bernoulli, binominal, Poisson, Normal, hyper geometric, discrete uniform and conditional distributions, . Functions of a random variable.	
UNIT -III	**Joint Distributions**	**(08 Hours)**

	Joint, marginal and conditional distributions, product moments, independent of random variables, bivariate normal distribution.	
UNIT -IV	**Sampling Distributions**	**(08 Hours)**
	The central limit theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, t and F distributions.	
UNIT -V	**Estimation**	**(08Hours)**
	The methods of moments and the of maximum likelihood estimation, confidence intervals for the mean(s) and variance(s) of Normal populations.	
UNIT-VI	**Testing of Hypothesis**	**(08 Hours)**
	Null and Alternative hypotheses, the critical and acceptance regions, types of errors, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample problems for normal populations, ANOVA I & ANOVA II.	

Text Books

1. Rohatgi, V K. and Saleh , A. K. Md. Ehsanes, "An Introduction to Probability and Statistics", (John Wiley and Sons) , (2^{nd} edition)
2. J.S. Milton & J.C. Arnold, “Introduction to Probability and Statistics” Tata McGrawHill Publication

References Books

1. H.J. Larson , “Introduction to Probability Theory and Statistical Inference” Wiley Publication.
2. S.M. Ross , “Introduction to Probability and Statistics for Engineers and Scientists” Academic Press.

Project Based Learning:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.

1) Find the stability of the data using coefficient of variation
2) Use concept of correlation to find coefficient of correlation between different observations
3) Use Rank correlation to find correlation for qualitative data
4) Derive Spearman’s Rank correlation
5) Find the chance of happening particular event using Baye’s theorem
6) Use probability theory to estimate the life of electric equipments
7) Find the height, weight of the population using the example of normal distribution
8) Check the goodness of fit using chi-square distribution
9) Perform ANOVA for single way classification data
10) Perform ANOVA for two way classification data
11) simple regression model

12) Multiple regression model
13) Coefficient of variation
14) Joint and marginal probability distribution
15) Standard probability distributions

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **SWITCHING THEORY AND LOGIC DESIGN**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: 02	Internal Assessment (IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical:25 Marks	Credit : 01
	Total: 150 Marks	Total Credits:05

Course Pre-requisites:

The Students should have knowledge of

1	Fundamentals of Number Systems
2	Knowledge of Boolean algebra laws.

Course Objectives:

1	To familiarize with various number representations and conversion between different representation in digital electronic circuits.
2	To introduce the students to various logic gates, SOP, POS and their minimization techniques
3	To analyze logic processes and implementation of logical operations using combinational logic circuits.
4	To describe, analyze and design sequential circuits.

Course Outcomes: After learning this course students will be able to

1	Represent numerical values in various number systems and perform number conversions between different number systems.
2	Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
3	To differentiate between logic families TTL and CMOS.
4	Identify, formulate and solve a problem based on combinational circuits.
5	Analyze and design a simple sequential logic circuit.
6	Implement Digital circuits using VHDL systems

UNIT – I	**Number system & Codes:**	**(08 Hours)**
	Binary number base conversion decimal, octal, hexadecimal numbers,1's 2's Complement, signed binary numbers binary codes-BCD codes, Gray codes,Excess-3 code, ASCII code & codes for serial data transmission & storage	

	Logic Gates: Positive and Negative Logic, Various Logics Gates with IEEE/ANSI symbols, Boolean equations, truth table and IC Details. Universal Gates & Derived gates	
UNIT – II	**Boolean Algebra and Simplification Techniques:**	**(08 Hours)**
	De-Morgan's theorem – switching functions Introduction, Postulates and Theorems, Various types of Boolean expressions, Simplification Techniques-K-map up to 4 variables, Product of Sum simplification & Sum of product simplification, Don't care conditions, Quine Mc-Cluskey method	
UNIT - III	**Combinational Logic Circuits:**	**(08 Hours)**
	Combinational Circuits and its implementations, Arithmetic Circuits – Adders and Subtractors, BCD Adder, Look-Ahead Carry Generator, ALU, Multiplier, Magnitude comparator. Multiplexer, Encoders, Demultiplexers and Decoders, Parity Generation and Checking.	
UNIT - IV	**Sequential Logic Circuits:**	**(08 Hours)**
	R-S and D Flip-flop, Level Triggered and Edge-Triggered Flip-flops, J-K and T Flip-flop, Synchronous and Asynchronous Input, Flip-flop Timing Parameters, Application of Flip-flop. Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counter, Synchronous Counters, UP/Down Counters, Decade and BCD Counters, Presettable Counters, Decoding Counter, Cascading Counter, Designing Counter with Arbitrary Sequences, Shift Register, Shift Register, Counters	
UNIT -V	**Programmable Logic Devices, Memory & Logic Families:**	**(08**
	Memories: ROM,PROM,EPROM Programmable Logic Devices(PLD):Programmable Logic Array(PLA),Programmable Array Logic(PAL) CPLD-FPGA Logic Families: Significance of families, Characteristic parameters, Types of Logic Families: TTL,ECL Comparison between various logic families Interfacing. between CMOS and TTL logic families	
UNIT - VI	**Introduction to VHDL:**	**(08 Hours)**
	Introduction to VLSI design flow (with reference to an EDA tool),sequential, data flow and structural modeling, functions, procedures, , data objects types, attributes, packages and configurations	
Term Work:		

The term work shall consist of record of minimum eight experiments.
1. Implementation of Boolean functions using logic gates.
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. BCD Adder/Subtractor using IC7483.
7. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallel loading
9. To model 8:1 mux, 1:8 demux using VHDL.
10.Sequence generator using MS-JK flip flop IC's
Text Books:
1. R.P. Jain , "Modern digital electronics" , 3rdedition , 12th reprint TMH Publication, 2007
2**.** Anand Kumar 'Fundamentals of Digital Circuits'--. PHI
3. J. Bhaskar, "VHDL Primer", PHI, Third Edition (2009).
Reference Books:
1. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applications'' –Vith Edition-Tata Mc Graw Hill, Publication
3. Morris Mano 'Digital Design'-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, "Digital Fundamentals" (Eight editions), Pearson
5. Stephen Brown & Zvonko Vranesic, "Fundamentals of Digital Logic Design with VHDL", Second Edition, TMH (2009).
Project based learning:
1. To demonstrate the use of NAND as Universal Gate
2. Electronic Eye using basic gates.
3. Light sensor switch circuit using JK-Flip-Flop
4. Morning sun alarm circuit using IC-4011(quad NAND gate)
5. To demonstrate the use of IC 555 as a Pulse Generator Circuit
6. Automatic switch off battery charger using IC 555
7. Fluid Level Control Using IC 4093
8. A pseudo-random number generator
9. 2-Bit-Parallel-or-Flash-Analog-to-Digital-Converter
10. Digital Bank Token Number Display
11. Digital Object Counter
12. Asynchronous-Modulo-16-Down-Counter
13. Analog-Signals-Multiplier
14. 4-line to 16-line decoder Circuit using 7442
15. Simple Electronic Toggle Switch Flip Flop Circuit Using IC 4017

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **ANALOG CIRCUITS AND APPLICATIONS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical: 25 Marks	Credit: 01
	Total: 150 Marks	Total Credits:04

Course Pre-requisites:	
The Students should have knowledge of	
1	Electronic components and devices.

Course Objectives:	
1	To understand analysis of single stage and multistage transistor amplifier.
2	To give a practical approach of analysis of feedback amplifiers ,power amplifiers and oscillators
3	To understand analysis and design of voltage regulators.

Course Outcomes: After learning this course students will be able to	
1	Describe and demonstrate BJT single stage amplifier, its hybrid equivalent and hybrid models.
2	Analyze multistage amplifiers using BJT.
3	Analyze the importance of negative feedback in amplifiers.
4	Demonstrate and analyze power amplifier circuits in different modes of operation.
5	Design various oscillator circuits using BJT.
6	Design and analyze transistorized series and shunt voltage regulators.

UNIT – I	**Single stage Amplifiers**	**(06 Hours)**
	Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller'sTheorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.	

UNIT – II	**Multi Stage Amplifiers**	**(06 Hours)**
	Need of Multistage amplifiers, Parameter evaluation such as Ri, Ro, Av, Ai & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier	
UNIT - III	**Feedback Amplifiers**	**(06 Hours)**
	Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.	
UNIT -IV	**Power Amplifiers**	**(06 Hours)**
	classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis	
UNIT -V	**Oscillators**	**(06 Hours)**
	Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator	
UNIT -VI	**Regulator**	**(06 Hours)**
	Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's:78XX, 79XX, 723, LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. Analysis of multistage LF amplifier, verification with theoretical values of A_{is}, A_{vs},		

R_i, R_o (overall) with square wave testing.
2. Input impedance improvement techniques for emitter follower.
3. Analysis of LF amplifier with negative feedback in Voltage series and current series topology.
4. Analysis of LF amplifier with negative feedback in Voltage shunt and current shunt topology.
5. Measurement of frequency of oscillations of RC Oscillators - phase shift and wien bridge
6. Measurement of frequency of oscillations of LC oscillators – Hartley, Colpitt
7. Biasing analysis of BJT power amplifier in class A, B, C.
8. Regulation characteristic of series and shunt regulators and calculation of S_v and R_o.
Text Books:
1. S. Salivahanan, Suresh Kumar Vallavaraj, "Electronic devices and circuits", Mc Graw Hill Publication
2. Robert Boylestad, "Electronic Devices and Circuit Theory", Pearson Publication
Reference Books:
1. Allen Mottershed , "Electronic Devices and Circuits", PHI Publication
2. J.B. Gupta , "Electronic Devices and Circuits", Kaison Educational Series
3. Raghbir Singh Khandpur, "Printed circuit boards: Design, fabrication, assembly and testing", 2006, ISBN 10:0071464204,McGraw Hill
Project Based Learning:
Build the following circuits -
1. A single stage common emitter amplifier.
2. RC coupled multistage amplifier.
3. Darlington amplifier.
4. Voltage shunt negative feedback amplifier.
5. Current shunt negative feedback amplifier.
6. Voltage series negative feedback amplifier.
7. Current series negative feedback amplifier.
8. Class A, B, C power amplifier.
9. RC phase shift oscillator using BJT.
10. Colpitt's oscillator using BJT.
11. Hartley oscillator using BJT.
12. Shunt voltage regulator using zener diode.
13. Series voltage regulator.
14. IC 723 as basic high/low voltage regulator with fold back current limiting.
15. Flashing LED using astable multi vibrator.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **SIGNALS AND SYSTEMS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: 02	Internal Assessment(IA): 40 Marks	
	TW:25 Marks & Oral:25 Marks	Credit : 01
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Differential and Integral calculus
2	Vector algebra and algebra of complex numbers

Course Objectives:	
1	To understand the behavior of signals in time and frequency domain
2	To understand the characteristics of LTI systems
3	To analyze continuous and discrete time systems using different transform techniques.

Course Outcomes: After learning this course students will be able to	
1	Classify signals and perform operations on signals.
2	Analyze LTI systems using convolution.
3	Apply Fourier series and Fourier Transform for analysis of signals.
4	Analyze CT signals and systems using Laplace transform.
5	Apply Z-transform for the analysis of DT signals and systems.
6	Sample and reconstruct the signals using sampling technique.

UNIT –I	**Introduction and Classification of signals:**	**(08 Hours)**
	Signals and Systems definition, Types of signals, continuous time and Discrete time signal operations, Amplitude scaling, Time shifting, Time reversal, Time scaling, Mathematical operations additions, subtraction, multiplication of signals, Classification of signals according to their property, Periodic/Aperiodic, Even/Odd, Energy/Power/Causal/Non causal, Deterministic/Random signals	
UNIT –	**Time domain representation of LTI System:**	**(08**

II		**Hours)**
	Introduction to systems, Classification of systems according to their properties, Linear/Nonlinear, Static /Dynamic, Time Invariant/Time-variant, Causal/non causal, Stable/Unstable, Invertible/Non Invertible systems, LTI system: Causality, stability, step response, impulse response, Convolution Integral, convolution sum using graphical method properties and applications.	
UNIT-III	**Fourier Analysis of Signals:** Fourier Series: - Review of Fourier series of CT and DT signals and its properties (No derivation), Exponential and Trigonometric Fourier series of periodic signals, amplitude and phase spectra of periodic signals,Fourier Transform and its properties.	**(08 Hours)**
UNIT-IV	**Application of Laplace Transform in Signal processing:**	**(08 Hours)**
	Review of Bilateral and Unilateral Laplace Transform of signals, ROC and its properties. Laplace transforms of standard signals, Inverse Laplace Transform, Solution to differential equation, System transfer function and Response calculations, Poles and Zeros representation	
UNIT -V	**Z-transform**	**(08 Hours)**
	Z-transform, Region of convergence and its properties, Inverse z-transform, properties of z transform, relation between Z and Laplace Transform, Analysis and characterization of discrete time LTI systems using z-transform.	
UNIT-VI	**Sampling and Correlation:**	**(08 Hours)**
	Sampling theorem, sampling and reconstruction of signal from its samples using interpolation, Effect of under sampling, Correlation, Autocorrelation and cross-correlation of energy and power signals, properties of correlation functions, applications of Correlation, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum,	

Termwork:
1. Introduction to MATLAB and its basic functions.
2. Generate Continuous and discrete time signals.
3. Perform signal operations on Continuous and discrete time signals.
4. Find even and odd part of the signal and sequence and find real and imaginary parts of signal.
5. Compute linear convolution and convolution integral of sequences/signals.
6. Compute Fourier Transform and Inverse Fourier Transform of a given signal

/sequence and plot its Magnitude and Phase Spectra.
7. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform.
8. To compute and plot the impulse response and pole-zero diagram of transfer function using Z-transform.
9. Compute auto correlation and cross correlation between signals and sequences and verify its properties.
10. Verify sampling theorem and reconstruct the signal.
Text Books:
1. Oppenheim, Willsky, S.Hamid Nawab, "Signals and Systems", PHI, 2nd edition, 2002.
2. M.J. Roberts, "Signals and Systems", McGraw-Hill, 1st edition,2003.
3. B.P Lathi, "Principles of linear systems and signals", Oxford, 2nd edition,2009.
Reference Books:
1. Simon Haykin and Bary Van Veen, "Signals and Systems", Wiley- India Publications
2. Michal J. Roberts and Govind Sharma, "Signals and Systems", Tata Mc-Graw Hill Publications
Project Based Learning:
1. Generate basic signals using C / Python programming.
2. Perform multiple operations on signal using C or MATLAB.
3. Visualize signal/data in time and frequency domain using MATLAB.
4. Find the Trigonometric Fourier Series of a given Signal using C/Python/MATLAB.
5. Create Frame-Based Signals using MATLAB Simulink.
6. Create Multichannel Signals by combining single channel signals using Simulink.
7. Create Multichannel Signals by combining multichannel signals using Simulink.
8. Inspect sample and frame rate using Simulink.
9. Perform Linear Convolution of two sequences using SCILAB.
10. Represent, Play and plot audio signals with different sampling frequencies using MATLAB.
11. Study of Signal Processing Sound Effects: Introducing a delay, creating an echo effect by repeating the signal, time scaling, time reversal, volume scaling.
12. Create acoustic environment in Simulink.
13. Develop a Python application to generate digital signals.
14. Perform measurement using spectrum analyzer using MATLAB Simulink.
15. Filter the frames of noisy wave using MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **ITC-I: PROCESS AND CONTROL SYSTEM**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: --		
	Total:100 Marks	Total Credits: 03

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic knowledge of signals.
2	Basic mathematical tools like Laplace Transform.

Course Objectives:	
1	This course provide in depth knowledge of various control system.
2	It introduces the stability of system , transducers, DAS etc.

Course Outcomes: After learning this course students will be able to	
1	Identify various control systems and determine the 'transfer function' of System using block diagram reduction and Signal flow graph.
2	Determine the error in various control systems.
3	Evaluate the stability of a system using Routh's stability criteria, root locus, bode plot etc.
4	Illustrate different specifications of the system in frequency domain.
5	Measure non-electrical quantities such as displacement, temperature, angular speed etc using suitable transducer.
6	Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

UNIT – I	**Control System Classification**	**(06 Hours)**
	Open loop, closed loop, Feedback and Non-feedback Systems, continuous, discrete, linear and non-linear control systems. Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.	
UNIT– II	**Time Domain Analysis**	**(06 Hours)**
	Transient and steady state responses of first and second order	

	systems, steady state errors, control of transient response, Basic control actions and their effects on transient and steady state responses.	
UNIT-III	**Stability**	**(06Hours)**
	Stability concepts, Routh Hurwitz criterion, Root loci, properties and construction of root loci, effects of adding of poles and zeros, root locus of conditionally stable systems.	
UNIT-IV	**Frequency Domain Analysis**	**(06Hours)**
	Bode plot, gain, magnitude and phase shift plots, frequency domain specifications, peak resonance and resonant frequency of a second order system, gain margin and phase margin, conditionally stable system.	
UNIT -V	**Transducers**	**(06Hours)**
	Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge, Electromagnetic flow-meter, Piezoelectric Accelerometer, tacho-generators. Internet Things (IoT) for wireless sensor networks.	
UNIT -VI	**Controllers**	**(06Hours)**
	Control actions – On/Off Controller, Proportional Controller, Integral Controller, Derivative Controller, Proportional- Integral(PI) Controller, Proportional-Derivative(PD) Controller, PID Controller.	

Assignments:

It shall consist of record of minimum six assignments.

1. Transfer function of closed loop system.
2. Transient response specifications of second order system.
3. To draw Root Locus theoretically and verify it.
4. To draw Bode plot theoretically and verify it.
5. To study characteristics of temperature transducer.
6. To Study characteristics of LVDT for displacement measurement.
7. Study of Strain Guage.
8. Internet Things (IoT) for wireless sensor networks.
9. Study of Various Controllers.

Text Books:

1. A. K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, Dhanpt Rai and Co. Ltd

Reference Books:

1. J. Nagrath & M. Gopal, “Modern Control Engineering”, New Age International, New Delhi (Fifth Ediion) 2007

2. H S Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill.
3. Ogata, K., “Modern Control Engineering”, Prentice Hall, second edition, 1991

Project Based Learning:

1. Design of a Lead Compensator.
2. Design of a Lag Compensator.
3. Displacement measurement using “Linear Variable Differential Transformer”.
4. Design of Temperature control system using RTD.
5. Design of Temperature measurement system using thermocouple.
6. Design of Temperature control system Using Thermistor.
7. Design of Load Cell using Strain Guage.
8. Application Internet Things (IoT) using wireless sensor.
9. Transient response analysis for second order system.
10. Design and Simulation of Root Locus for given system.
11. Design and Simulation of Bode plot for given system.
12. Design of on-off controller.
13. Design of Proportional controller.
14. Design of Integral controller.
15. Design of Proportional-Integral controller.
16. Design of Proportional-Integral-Derivative controller.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem III **VOCATIONAL COURSE-I** **PCB DESIGN & ASSEMBLY**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks & Oral: 25 Marks	Credits : 01
	Total:50 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic knowledge of Electronic components.

Course Objectives:	
1	Become familiar with the simulation software.
2	This course provide in depth knowledge of PCB design.
3	It also introduces the PCB manufacturing.

Course Outcomes: After learning this course students will be able to	
1	Design electronic circuits, create a schematic, PCB layout.
2	Become proficient with software skills using EDA tool, for drawing electronic circuit Schematic and PCB Layout.
3	Fabricate a Prototype PCB using EDA tool.
4	Demonstrate the knowledge of selecting proper PCB primitives.
5	Use PCB design software for simple single sided PCB artwork design.
6	Identify and select appropriate soldering tools for the soldering job.

Unit-I	**Component Selection**	
	Principles and Process of Electronic Component Selection: **Electrical parameters, Mechanical parameters** . Performance, Quality**, Availability and price, PCB footprint with Dual -in-Line Package (DIP) and surface mount Packages.(SMP)/ SMD.**	
Unit-II	**Schematic design**	
	Electrical connection between different active and passive electrical components like resistors, capacitors, Integrated circuits IC. Connectivity and functionality between different components. Physical representation of all the electrical connections between active and passive components used in the schematic.	

Unit-III	**Circuit Design**	
	Design specification, Circuit Design theoretically and implementing on Breadboard, verification and testing.	
Unit-IV	**PCB Design**	
	Introduction to PCB Design using EDA tool. Design of single sided PCB, Design of Double sided PCB. Verification and testing. PCB Design Implementation with print-out or Gerber file.	
Unit-V	**PCB fabrication**	
	PCB Manufacturing Process Steps: Design and Output From File to Prototype machine/Film, Printing the Inner layers, Removing the Unwanted Copper, Layer Alignment and Optical Inspection, Layer-up and Bond, Drill, Plating and Copper Deposition, Outer Layer Imaging, Final Etching, Solder Mask Application, Surface Finishing, Electrical Test. PCB fabrication using Prototype machine/Chemical method.	
Unit-VI	**Soldering of Component**	
	Materials and Equipment: soldering iron, Rosin core solder, Sponge, Solder braid etc. PCB Protection Chemicals. Soldering and de-soldering of Components.	
PCB Plant Visit: At the end of course students should visit to PCB manufacturing company.		
Text Books:		
1. R.S. Khandpur **,** "Printed Circuit Boards: Design, Fabrication, and Assembly" ,McGraw-Hill Electronic Engineering		
2. Coombs Clyde, " Printed Circuits Handbook", McGraw-Hill Education		

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B. Tech. (Electronics & Communication Engineering) Sem III **DATA STRUCTURES**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory:--	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks	Credits:01
	Total:25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Knowledge of C programming
Course Objectives:	
1	This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the programming for linked list, stack, queues, graph and tree.
Course Outcomes: After learning this course students will be able to	
1	Write a program using data structure and its types.
2	Define various operations on linked and double linked lists.
3	Implement stacks and queues involving linked list.
4	Perform operations on a tree using linked lists.
5	Create a graph using adjacency list & traverse it using BFS & DPS methods.
6	Find the shortest path in each graph using algorithm.
Term Work:	
The term work shall consist of record of minimum eight experiments.	
1. Program to search for record from a given list of records stored in array using i) Linear search ii) Binary search	
2. Program to sort an array of names using i) Bubble sort ii) Insertion sort iii) Quick sort	
3. Program to implement following operation on singly linked list: i) Create ii) Delete iii) Insert iv) Display v) Search	

4. Program to add two polynomials using linked list.
5. Program to implement stack using: i) Array ii) Linked list
6. Program to convert an infix expression to postfix expression & evaluate the resultant expression.
7. Program to Implement Queue using: (i) Array (ii) linked list
8. Program to create a Binary search tree & Perform following primitive operation on it: i) Search ii) Delete iii) Traversals (inorder, pre-order, post-order -recursive) iv) Non-recursive in order traversal
9. Program to create a graph using adjacency list & traverse it using BFS & DPS methods
Text Books:
1. ISRD group ,"Data structure using C",TMH.
2. Yashwant kanetkar "Data Structure through C" ,BPB Puplication.
Reference Books:
1. AM Tanenbaum, Y Langsam and MJ Augustein "Data structure using C", Prentice Hall India.
2. Weiss, Mark Allen, "Data structure and Algorithm Analysis in C", Addison Wesley.
3. Richard F Gilberg Behrouz A. Forouzan, Thomson ,"Data structure – A Pseudocode Approach with C", Cengage Learning India
4. Yashwant Kanetkar ,"Let us C" ,BPB Publication

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B. Tech. (Electronics & Communication Engineering) Sem III **DATABASE MANAGEMENT SYSTEM**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory:--	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25Marks	Credits:01
	Total:25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Computational C.

Course Objectives:	
1	To explain basic database concepts, applications, data models, schemas and instances.
2	To demonstrate the use of constraints and relational algebra operations.
3	Describe the basics of SQL and construct queries using SQL.
4	To emphasize the importance of normalization in databases.
5	To facilitate students in Database design
6	To familiarize issues of concurrency control and transaction management

Course Outcomes: After learning this course students will be able to	
1	Apply the basic concepts of Database Systems and Applications.
2	Use the basics of SQL and construct queries using SQL in database creation and interaction
3	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system
4	Analyze and Select storage and recovery techniques of database system.
5	Use Algorithms to solve scheduling conflict.
6	Apply Algorithms in distributed database.

Experiment List

1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.
2. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Student is required to submit a document showing the database tables created from ER Model.
3. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form

4. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables
5. Practicing DML commands- Insert, Select, Update, Delete
6. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION,
7. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi)..
8. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
9. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
10. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
11. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.
Text/Reference Books:
1.Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81
3. Pramod J. Sadalage and Martin Fowler, “NoSQL Distilled”, Addison Wesley, ISBN10: 0321826620, ISBN

Bharati Vidyapeeth (Deemed to be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Electronics & Communication) –CBCS 2021 Course

B. Tech. (Electronics & Communication) Sem IV

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
19		Digital Communication	3	2	0	60	40	25	25	0	150	3	1	0	4
20		Microcontroller & Applications	4	2	0	60	40	25	0	25	150	4	1	0	5
21		EM Waves & Propagation	4	0	1	60	40	0	0	0	100	4	0	1	5
22		Integrated Circuits& Amplifier Design	4	2	0	60	40	25	0	25	150	4	1	0	5
23		Essentials of Data Science*	3	0	0	60	40	0	0	0	100	3	0	0	3
24		Vocational Course-II Domestic Appliances &Maintenance	0	2	0	0	0	25	25	0	50	0	1	0	1
25		Java Programming	0	2	0	0	0	0	25	0	25	0	1	0	1
26		Linux Programming	0	2	0	0	0	25	0	0	25	0	1	0	1
		Total	**18**	**12**	**1**	**300**	**200**	**125**	**75**	**50**	**750**	**18**	**6**	**1**	**25**
		MOOC-I**	--	--	--	-	-	--		--	--	-	-	-	2

*Industry Taught Course – II
** Add on course

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B. Tech. (Electronics & Communication Engineering) Sem IV **DIGITAL COMMUNICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: 02	Internal Assessment (IA) :40Marks	
Tutorial: --	TW:25 Marks & Oral: 25 Marks	Credit: 01
	Total:150 Marks	Total Credits: 04

Course Pre-requisites:	
The Students should have knowledge of	
1	Electronic communication
2	Signals & Systems
3	Probability and Statistics

Course Objectives:	
1	To understand the building blocks of digital communication system.
2	To prepare mathematical background for communication signal analysis.
3	To understand the basics of baseband and pass band digital communication systems.
4	To acquire the knowledge of spread spectrum communication systems.

Course Outcomes: After learning this course students will be able to	
1	Apply different sampling techniques to convert analog signal into discrete sequence
2	Describe various CW modulation schemes
3	Learn the generation and detection of band pass modulation techniques
4	Identify the need of Multiplexing and Synchronization in digital communication and design Scrambler and Un-scrambler. Characterize, sketch various Line Codes
5	Evaluate probability of error in various digital modulation techniques
6	Describe the digital communication system with spread spectrum modulation

UNIT – I	**Pulse Modulation**	**(06 Hours)**
	Introduction to Digital Communication System, digital representation of analog signal, advantages of digital communication. Pulse Modulation, Sampling Theorem (time domain analysis) ideal sampling, Natural sampling, Flat top sampling, aliasing effect and aperture effect. Nyquist criteria, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation.	

UNIT – II	**Digital transmission of analog signals**	**(06 Hours)**
	Quantization–Uniform, Non-Uniform, Companding, A-Law, μ Law, Pulse code modulation Delta Modulation, Adaptive Delta Modulation, Differential Pulse Code Modulation.	
UNIT -III	**Band pass Modulation Techniques**	**(06 Hours)**
	ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK), signal space representation and constellation diagram	
UNIT -IV	**Baseband Digital Transmission**	**(06 Hours)**
	Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol Interference, Equalization.	
UNIT -V	**Baseband Receivers**	**(06 Hours)**
	Base band signal receiver, Probability of error, Optimum filter, White noise-Matched filter, probability of error of matched filter, correlation, FSK, PSK, non-coherent detection of FSK, DPSK, QPSK, Calculation of error probability for BPSK &BFSK, Signal space to calculate Pe.	
UNIT -VI	**Spread Spectrum Techniques**	**(06 Hours)**
	Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. To verify the sampling theorem
2. To perform Pulse Code Modulation System (PCM) System
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms
4. To analyze Adaptive Delta modulation system and interpret the modulated and demodulated waveforms
5. To analyze ASK (Amplitude Shift Keying) System with waveforms
6. To analyze PSK (Phase Shift Keying) System with waveforms
7. To analyze FSK (Frequency Shift Keying) System with waveforms

8. To analyze of Quadrature Phase Shift Keying (QPSK) with waveforms

9. To simulate any digital modulation scheme using MATLAB
10. To analyze waveforms of different Data Formats
Text Books :
1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc., 2001.
2. Lathi B P, and Ding Z "Modern Digital and Analog Communication Systems," Fourth Edition, Oxford University Press.
3. Leon W. Couch, "Digital and Analog Communication Systems", Sixth Edition, Pearson Education, 2001.
Reference Books:
1. Haykin Simon, "Digital Communication Systems," Forth Edition, John Wiley and Sons, New Delhi.
2. Taub, D. Schlling, and G. Saha, "Principles of Communication Systems," Third Edition, Tata McGraw Hill.
3. John G. Proakis, "Digital Communication" ,Fifth Edition, Pearson Education.
Project Based Learning:
Implement following systems using matlab and simulink
1. Sampling of the given signal
2. Pulse Width Modulation generator
3. Pulse Position Modulation generator
4. Pulse Amplitude Modulation generator
5. Delta modulation system
6. Quantization of an audio signal
7. Pulse code modulation system
8. Frequency Shift Keying modulator
9. Amplitude Shift Keying modulator
10. Phase Shift Keying modulator
11. Quadrature Phase Shift Keying modulator
12. Unipolar RZ Line coding scheme
13. Bipolar RZ and NRZ line coding scheme
14. Random binary sequence generator
15. Generate the sound

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **MICROCONTROLLER & APPLICATIONS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical:25 Marks	Credit: 01
	Total:150 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Basics of Digital Logic Design.
2	Basics of C programming
3	Basic of Microprocessor architecture.

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Course Objectives:	
1	To introduce the operation of micro-controllers.
2	To familiarize with the fundamentals of embedded system architecture, its basic hardware and software elements.
3	To understand the concept of AVR Controller
4	To introduce the AVR micro-controller with architecture and programming

Course Outcomes: After learning this course students will be able to	
1	Classify the memory devices, microcontrollers and their architecture.
2	Write the programs for 8051 microcontroller using mathematical, logical, data flow instructions.
3	Interface the external devices to 8051 microcontroller
4	Understand the architecture of AVR microcontroller
5	Implement the programs in C using AVR microcontroller
6	Distinguish different types of serial communication protocols

UNIT – I	**Review of Processor and Memory:**	**(08 Hours)**
	General-purpose processors, single-purpose processors, application specific processors, CISC and RISC processor architecture, memory devices, processor and memory selection for an embedded system, interfacing processor, memory and I/O devices, 8/16-bit microcontrollers.	
UNIT – II	**8 Bit Micro Controller 8051:**	**(08 Hours)**

	MCS 51 family architecture: Registers in MCS-51, Parallel I/O ports, Timers & Counters, Memory Organization, Pin Description, Instruction set, Addressing modes, Interrupts in MCS-51, Programming.	
UNIT- III	**8051 Serial Communication &Interfacing of 8051**	**(08 Hours)**
	Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication. Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter	
UNIT- IV	**Introduction to AVR microcontroller**	**(08 Hours)**
	Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR**.**	
UNIT -V	**AVR programming in C**	**(08 Hours)**
	AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming External Interrupt programming, ADC programming, EEPROM programming.	
UNIT- VI	**Serial communication protocols**	**(08 Hours)**
	UART protocol, I2C protocol, SPI protocol, Serial Port programming using polling and interrupt, I2C Programming, SPI Programming	

Term Work:

1.Addition / subtraction / multiplication / division of 8/16 bit data using 8051

2. Largest/smallest from a series using 8051.

3.Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.

4.To write a C program to demonstrate LED using 8051 Micro-controller development kit.

5.To write a C program to demonstrate Seven Segment using 8051 Micro-controller development kit

6.To write a program to demonstrate Stepper Motor using 8051 Micro-controller development kit.

7.To write a program to demonstrate LCD using 8051 Micro-controller development kit.

8.Installation of AVR STUDIO and familiarization of ATMega32 AVR Development Board.

9.Stepper motor interfacing with ATMega32 in C with ATMega32.

10.Timer to generate accurate delay using Interrupt in C with ATMega32

11.Seven Segment Display interfacing with ATMega32 in C.
12.Timer to generate accurate delay using polling in C with ATMega32
13.16x2 LCD interfacing with ATMega32 in C.
15.Interfacing with ATMega32 in C using I2C protocol
16.On-chip ADC for interfacing analog sensors in C with ATMega32.
Textbooks:
1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, "The 8051 Microcontroller and Embedded System" Pearson Education.
2. Dhananjay Gadre, "Programming and Customizing the AVR Microcontroller", McGraw Hill Education
Reference Books:
1. Kenneth J. Ayala, "The 8051 Micro-controller – Architecture, Programming & Applications", Second Edition Penram International & Thomson Asia
2. Rajkamal, "Embedded System-Architecture, Programming and Design", TMH Publications, Edition 2003
3. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, " The AVR Microcontroller and Embedded Systems Using Assembly and C", Pearson Education
Project Based Learning:
Build the following circuits -
1. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
2. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
3. Automatic Railway Gate Controller with High Speed Alerting System using Micro-controller 8051/AVR
4. Bidirectional Visitor Counter using Microcontroller 8051/AVR
5. Celsius Scale Thermometer using Microcontroller 8051/AVR
6. Digital Tachometer using Microcontroller 8051/AVR
7. Density Based Traffic Signal System using Microcontroller 8051/AVR
8. Digital Temperature Sensor using Micro-controller 8051/AVR
9. Digital Voltmeter using Microcontroller 8051/AVR
10. Line Following Robotic Circuit using Microcontroller 8051/AVR
11. Password Based Door Lock System using Microcontroller 8051/AVR
12. RFID based Attendance System using Micro-controller 8051/AVR
13. Remote Control Circuit through RF using Microcontroller 8051/AVR
14. Street Lights that Glow on Detecting Vehicle Movement using Micro-controller 8051/AVR
15. Sun Tracking Solar Panel using Micro-controller 8051/AVR
16. Temperature Controlled DC Fan using Microcontroller 8051/AVR
17. Ultrasonic Rangefinder using Microcontroller 8051/AVR
18. Water Level Controller using Microcontroller 8051/AVR
19. Water Level Indicator using Micro-controller 8051/AVR
20. Temperature based Ceiling Fan Speed Control System (230V AC Motor) using Micro-controller 8051/AVR

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **EM WAVES AND PROPAGATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credits : 01
	Total: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The Students should have knowledge of	
1	Vector calculus and coordinate systems.
2	Curl, Divergence and Gradient.
3	Partial differential equations.

Course Objectives:	
1	Provide fundamentals of Static Electromagnetic Fields.
2	Explain basics of the vector Differential, Integral operators to Electromagnetic theory &
3	Electrostatic & Electromagnetic fields.
4	Define and derive different laws in Electrostatic & Electromagnetic fields.
5	Explain Maxwell's equations and concepts of transmission lines.
6	Analyze techniques for formulating and solving problems in Electrostatic &

Course Outcomes: After learning this course students will be able to	
1	Comprehend the fundamentals of Electrostatic and Electromagnetic fields..
2	Apply Gauss' law, Ampere's Law, Biot-Savart law, Faraday's law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.
3	Develop field equations from understanding of Maxwell's Equations.
4	Extend the knowledge of basic properties of transmission lines to analyze Electromagnetic wave propagation in generic transmission line geometries
5	Demonstrate mathematical skills related with differential, integral and vector calculus.
6	Apply radiation principles and concept of Antennas

UNIT – I	**Static Electric Fields**	**(08 Hours)**
	Review of Co-ordinate systems, Coulomb's law, line, Surface & Volume Charge distribution. Electric Field Intensity, Electric Field	

	due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Poisson's and Laplace Equations, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space	
UNIT –II	**Static Magnetic Fields**	**(08 Hours)**
	Biot – Savart's law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, Stokes Theorem, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions.	
UNIT - III	**Time Varying Fields & Maxwell's Equations**	
	Faradays law of induced Emf, displacement current, Maxwell's Equations in point form & Integral form for various fields.	**(08 Hours)**
UNIT - IV	**Wave Propagation and Uniform Plane waves**	**(08 Hours)**
	Wave equations, wave propagation through different medium, wave propagation through free space , wave propagation through dielectric, wave propagation through conductors- skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric., reflection of plane waves at normal incidence, reflection of plane waves at oblique incidence angles.	
UNIT -V	**Transmission Lines**	**(08 Hours)**
	Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated 2 coefficient VSWR, smith chart (Numerical expected) and applications, transient analysis of transmission lines.	
UNIT -VI	**Waveguides & Antenna Fundamentals**	**(08 Hours)**
	Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.	

List of Tutorials:

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)
   - Point charges
   - Line charges (finite and infinite)
   - Surface charges (finite and infinite)
   - Mixed charges (Point charge, Line charge, Surface charge)
2. Application of Gauss's law
   - Given ρ_v (volume charge density) in a particular region, find $\bar{D}$ (electric flux density) using Law at the given location.
   - Given ρ_S(surface charge density), find $\bar{D}$(electric flux density) using Gauss's Law at the given location.
   - Given $\bar{D}$(electric flux density), find total charge enclosed by the surface (Q), ρ_v (volume charge density) using Gauss's Law.(In all coordinate systems)
3. Find the electrostatic fields (Tangential and Normal) at the boundary between,
   - Free space and dielectric medium
   - Free space and conductor
   - Dielectric medium and conductor
   - Two dielectric media.
4. Find $\bar{H}$(Magnetic field intensity) and $\bar{B}$(Magnetic flux density) at a given point due to,
   - Infinitely long current carrying conductor
   - Finite current carrying conductor
   - Infinite conducting surface
   - Finite conducting surface
   - Different current carrying configurations (i.e. thin conductor, surface all together)
5. For the following current carrying configurations, find the $\bar{H}$(Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
   - Infinitely long current carrying conductor
   - Infinite cylindrical surfaces of different radii all centered at the same axis.
   - Spherical surfaces of different radii all centered at a given point.
6. Given $\bar{H}$ (or $\bar{E}$) and the region properties (like ε, μ, σ etc.), find $\bar{B}$, $\bar{D}$ and $\bar{E}$ (or $\bar{H}$) using Maxwell's equations. (In all coordinate systems).
7. Find attenuation constant, propagation constant, intrinsic impedance, values of E/H for different mediums like free space, conductors, and dielectrics.
8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants (α, β, γ, Z0) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
9. Problems on Impedance matching and design of stub matching using Smith Chart.
10. Find cut-off frequency or waveguide dimensions or phase velocity for rectangular waveguides.

Text Books:

1. A. Murthi," Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

Reference Books:

1. Hayt& Buck, “Engineering Electromagnetics”, 7th Edition, Tata McGraw-Hill
2. Kraus,Fleisch, “Electromagnetics with applications”, 5th Edition, McGraw Hill.
3. Jordan &Balmain, “Electromagnetic waves & radiating systems”, 2nd edition, PHI.
4. Matthew N.O. Sadiku, ”Principles of Electromagnetics”,6th edition, Oxford

Project Based Learning:

1. Plot Magnitude of a Vector & its Unit Vector MATLAB.
2. Simulate Coulomb Law on MATLAB & Scilab.
3. Plot different charge distributions viz. line charge, volume charge, surface charge in MATLAB.
4. Find & simulate Electric filed intensity & flux density for given charge distributions.
5. Verify & plot Divergence theorem with Gauss law in SCILAB & MATLAB.
6. Design a code in SCILAB for relation between E & V, Electric Dipole visualization and verify Poisson’s & Laplace’s Equations.
7. Design & Verify boundary conditions between Free space- conductor-Dielectric in SCILAB.
8. Simulate Biot-Savart’s Law, Magnetic field intensity for different current distributions in SCILAB & MATLAB.
9. Design & Verify Magnetic boundary conditions in SCILAB
10. Visualize & Simulate Maxwell’s Equations for Time varying Fields in MATLAB & SCILAB
11. Visualize EM waves & Uniform Plane waves formation in MATLAB
12. Visualize & Simulate behavior of EM waves in good conductors Lossy-Lossless dielectrics in MATLB & SCILAB.
13. Find out Transmission line parameters for given frequency in SCILAB, Visualize how standing waves generated & reflected on Transmission line in MATLAB
14. Visualize & plot SWR Circle, Impedance Matching, and reflection coefficient input impedance on SMITH CHART in MATLAB.
15. Visualize & plot Stub Matching problem of Transmission lines SMITH CHART in MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **INTEGRATED CIRCUITS AND AMPLIFIER DESIGN**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:25 Marks & Practical :25Marks	Credit: 01
	Total: 150 Marks	Total Credits: 05

Course Pre-requisites:	
The Students should have knowledge of	
1	Knowledge of KCL and KVL Law
2	Basic knowledge of Op-Amp and its configurations

Course Objectives:	
1	Familiar in the operational amplifier principle- analysis- design and application.
2	Gain knowledge on the linear and nonlinear applications of operational amplifiers.
3	Understand the theory and applications of Active filters and PLL.
4	Familiar in the ADC- DAC and its classifications.
5	Understand the few applications of specific ICs.

Course Outcomes: After learning this course students will be able to	
1	Differentiate IC and Discrete components, understand manufacturing process of IC and analyze how monolithic components are being developed.
2	Identify different configurations of op-amp analyze the parameters of op-amp and observe the frequency response of operational-amplifier
3	Understand & demonstrate different applications based on operational-amplifier.
4	Understand analog multiplier and PLL & demonstrate different applications based on it
5	Differentiate A/D and D/A converter, understand their types and analyze their applications
6	Demonstrate the applications of waveform generators, timers and voltage regulators

UNIT – I	**Basics of operational Amplifier**	**(08 Hours)**
	Block diagram representation of a typical op-amp, Differential amplifier, Schematic symbol for op-amp, Definition of integrated	

	circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal &external offset voltage compensation, Frequency Response of an op-amp.	
UNIT –II	**Operational Amplifier – Linear circuits**	**(08 Hours)**
	Inverting amplifier, non-inverting amplifier, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Integrator, Differentiator, peak detector, clipper and clamper, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge.	
UNIT -III	**Operational Amplifier - Non-linear circuits**	**(08 Hours)**
	Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.	
UNIT -IV	**Active filters and waveform generators**	**(08 Hours)**
	First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Saw tooth wave generator and study of function generator IC 8038	
UNIT -V	**Special function ICS**	**(08 Hours)**
	IC 555- as Monostable and Astable Multivibrators and its applications. IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector.	
UNIT -VI	**Interfacing circuits**	**(08 Hours)**
	V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.	

Term Work:

The term work shall consist of record of minimum eight experiments.

1. To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.
2. To demonstrate the use of op-amp as Integrator and Differentiator and draw frequency response.
3. To demonstrate the use of op-amp as precision rectifier.
4. To design and setup a Schmitt trigger, plot the input output waveforms and measure

VUT and VLT.
5. Design and obtain the frequency response of second order Low Pass Filter (LPF) at a high frequency of 1KHz.
6. Design and obtain the frequency response of High Pass Filter (HPF) at a cut off frequency of 1KHz with pass band gain of 2.
7. To design and setup astable multivibrator using Op-amp 555, plot the waveforms and measure the frequency of oscillation
8. To obtain the output of voltage comparator and zero crossing detector.
9. Design instrumentation amplifier the with the help of three Op-amps inverting amplifier and also implement Wheatstone bridge and balance for null condition. (usingVLabs)
10. To design and study the frequency response of Summing Inverting Amplifier circuit.(usingVLabs)
11. Design and simulate triangular/square waveform generator using IC 741.(usingVabs)
12. To construct and study the voltage to current convertor.
13. To construct and study digital to analog converter circuit.
Text Books:
1. Ramakant A. Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4th Edition,2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10th edition, 2010
Reference Books:
1. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford publication,3rdedition,2011
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Ltd., 4th edition, 2010
Project Based Learning:
1. To design and setup a non-inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.
2. To demonstrate the use of op-amp as clipper circuit.
3. Designoperational amplifier 741 tester which test op-amp 741 either is good or fault
4. Design and simulate Temperature to Voltage Converter Circuit.
5. To demonstrate the use of op-amp 741 as an Electronics Thermometer
6. IC 741 based circuit for dark Switch.
7. Hartley and Colpitts oscillator using op-amp
8. Notch filters using op-amp.
9. Water Level based Alarm Circuit (using IC 555- AstableMultivibrator).
10. Digital Stop Watch
11. FM Radio using PLL.
12. ICL7107 (A/D converter) based Digital Voltmeter.
13. Dimmer circuit for LED Lamp (using IC 555)
14. Electronic Letter Box.
15. 4-line to 16-line decoder Circuit using 7442

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **ITC-II:ESSENTIALS OF DATA SCIENCE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: --		
	Total:100 Marks	Total Credits: 03

Course Pre-requisites:	
The Students should have knowledge of	
1	Python programming
2	Probability & Statistics

Course Objectives:	
1	Introduce R as a programming language
2	Introduce the mathematical foundations required for data science
3	Introduce the first level data science algorithms
4	Introduce a data analytics problem solving framework
5	Introduce a practical capstone case study

Course Outcomes: After learning this course students will be able to	
1	Describe a flow process for data science problems (Remembering)
2	Classify data science problems into standard typology (Comprehension)
3	Develop R codes for data science solutions (Application)
4	Correlate results to the solution approach followed (Analysis)
5	Assess the solution approach (Evaluation)
6	Construct use cases to validate approach and identify modifications required (Creating)

UNIT – I	**Introduction to Data Science**	**(06 Hours)**
	Data Science Fundamentals: Data, Data Science Process, Components of Data Science, Data Scientist roles and responsibilities, Introduction to R and R Studio, Variables and Data types in R, Data frames, Recasting and Joining of Data frames, Arithmetic, Logical and Matrix Operations in R, Advanced Programming in R : Functions, Data Visualization in R Basic Graphics.	

UNIT - II	**Linear Algebra & Statistical Modeling for Data Science**	**(06 Hours)**
	Linear Algebra for Data science, Solving Linear Equations, Linear Algebra - Distance, hyperplanes and half spaces, Eigen values, Eigenvectors, Statistical Modeling, Random Variables and Probability Mass/Density Functions, Sample Statistics, descriptive statistics, notion of probability, distributions, mean, variance, covariance, Hypotheses Testing, Type 1 and Type 2 errors. Testing for parameters of a normal distribution and for percentages based on a single sample and based on two samples. Introduction to the chi-squared test. The concept of p-value. Mean-square estimation and Kalman filtering.	
UNIT - III	**Optimization for Data Science**	**(06 Hours)**
	Optimization for Data Science, Unconstrained Multivariate Optimization Gradient (Steepest) Descent (OR) Learning Rule, Multivariate Optimization With Equality Constraints, Solving Data Analysis Problems.	
UNIT - IV	**Regression and Classification**	**(06 Hours)**
	Predictive Modeling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit, Simple Linear Regression Model Building and assessment, Multiple Linear Regression, The least squares error criterion. Relation to maximum likelihood, Analysis of Variance (ANOVA), Logistic Regression, Logistic Regression Implementation in R, Classification , Classification using logistic regression, K - Nearest Neighbors, K-Means Clustering, K - means Implementation in R , Dimension Reduction Techniques.	
UNIT – V	**Data Analysis and Visualization**	**(06 Hours)**
	Pandas and Numpy, Operating on Data in Pandas, Data modeling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn, Data visualization using Power BI.	
UNIT - VI	**Machine Learning**	
	Introduction to Supervised and Unsupervised Learning, Clustering, Decision Trees, Random Forest, Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data, Neural networks, Support vector machine.	**(06 Hours)**
Text Books:		

1. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, O′Reilly Publication.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O′Reilly Publication.
Reference Books:
1. Mohammed J. Zaki , Wagner Meira, "Data Mining and Machine Learning: Fundamental Concepts and Algorithms", Jr,1st Edition. Cambridge University Press
2. Trevor Hastie Robert Tibshirani, " The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Second Edition Springer Series in Statistics
3. Garrett Grolemund and Hadley Wickham, " R for Data Science", O'Reilly Pub.
Project Based Learning:
1. Detecting Fake News with Python Dataset/Package: news.csv
2. Real-time Lane Line Detection in Python
3. Sentiment Analysis Project in Rwith Dataset/Package: janeaustenR
4. Build an application to detect colors with Beginner Data Science Project – Color Detection with OpenCV
5. Build a chatbot using Python– Chatbot with NLTK &Keras
6. Design Gender and Age Detection with Data Sciencewith OpenCV
7. Design & buildMovie Recommendation System Project in R
8. Build an application for Customer Segmentation with Machine Learning(K-means Clustering) using R
9. Create a Spotify Music Analysis visualization using Python pandas
10. Create a Crypto currency Analysis visualization using Python pandas.
11. Build a Song recommendation model using Machine Learning.
12. Build a Book recommendation model using Machine Learning.
13. Uber Dataset Time Series Analysis / Uber Data Analysis in R
14. Implement an Email automation system using SQL & Python
15. Practically implement the Deep Learning Project with Source Code Handwritten Digit Recognition with CNN

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. (Electronics & Communication Engineering) Sem IV **VOCATIONAL COURSE-II** **DOMESTIC APPLIANCES AND MAINTENANCE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks & Oral :25 Marks	Credits: 01
	Total: 50 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Basic Electronics

Course Objectives:	
1	To identify and rectify the faults in domestic appliances like Washing machine,Microwave oven, Mixer,Grinder and Electric kettle.

Course Outcomes: After learning this course students will be able to	
1	Identify and test passive and active electronics components & study of Multimeter
2	Troubleshoot the faults in power supply circuits.
3	Identify and test various mechanical and electrical modules of the washing machine.
4	Identify electronic parts/components/modules of the Microwave oven.
5	Identify and rectify the faults in mixer and grinder.
6	Identify and rectify the faults in electric kettle.

UNIT – I	**Basic Electronic components & Multi meter**	
	Different types of resistors, capacitors and inductors, Measurement of resistor using Color code, Measurement using LCR meter. Identify the power rating of components, Dismantle and identify the different parts of a relay, basics of Transformer, Multimeter.	
UNIT – II	**Power supply**	
	Testing of active components, Practice soldering and de-soldering techniques Assemble and test– half wave, full wave & bridge rectifier circuits with and without filter, different types of fixed positive and negative regulator ICs(78/79 series), Construct a fixed voltage regulator using 78xx/79xx series ICs, Variable voltage regulator using LM 723.	

UNIT - III	**Washing Machine**	
	Installation of front load washing machine Installation of top load washing machine, Identify the internal and external parts of semi-auto washing machine, Identify the internal and external parts of fully automatic washing machine, Operate semi–automatic washing machine, Operate fully–automatic washing machine, Rectify the fault leading to not working of control panel switches. Rectify the fault leading to not working of pulsator / agitator, Rectify the fault leading to spin drier not working, Rectify the fault leading to one side, rotation of motor. Rectify the fault leading to water inlet.	
UNIT - IV	**Microwave oven**	
	Internal and external parts of microwave oven. Identify the different touch pad controls their functions, Testing of high voltage diode. Identify the HV capacitor and discharge it. Rectify the fault leading to fuse blows off when cooking is initiated, Rectify the fault leading to not responding of touch switches(front panel). Rectify the fault leading to dead set. Rectify the fault leading to long cooking time. Precautions – importance of interlocking switch in performing maintenance.	
UNIT -V	**Mixer and Grinder**	
	Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Mixers/grinders, faults in various types of Mixers/grinders & rectification.	
UNIT - VI	**Electric Kettle**	
	Identify various components of Electric kettle, controls and trace the circuit and rectify the simulated faults	

List of Practicals:

Practical based on maintenance of appliances should be conducted

Text Books:

1. Shashi Bhushan Sinha, "Handbook of Repair and Maintenance of Domestic Electronics Appliances",January 2016, BPB Publications.

Reference Books:

1. Michael Jay Geier, "How to Diagnose and Fix Everything Electronic", Second Edition, Mc Graw Hill education.

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B. Tech. (Electronics & Communication Engineering) Sem IV **JAVA PROGRAMMING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	Oral: 25 Marks	Credits: 01
	Total: 25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Fundamentals of computing
Course Objectives:	
1	To introduce object oriented programming concepts.
2	To develop programming ability by learning advanced coding techniques.
Course Outcomes: After learning this course students will be able to	
1	Demonstrate basic knowledge of object oriented programming concepts.
2	Write simple programs in Java.
3	Get the knowledge of interfaces, packages and different file handing operations.
4	Familiarize the concept of exception handling.
5	Conceptualize the technique of multithreading programming.
6	Apply Java for HTML and Applet applications.
Term Work:	
The term work shall consist of record of minimum eight experiments.	
1. Write a Java Program to demonstrate the use of OOP features.	
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.	
3. Write a Java program to differentiate between method overloading and method overriding.	
4. Implementation of different string functions by using switch case.	
5. Write a Java program to understand the use of String buffer class.	
6. Write a Java Program implement multiple inheritances by using Interface.	
7. Write a Java program to implement the concept of package.	
8. Write a Java program to implement concept of Exception Handling.	
9. Write a Java Program to perform different file operations.	

10. Write a program to implement multithreading.
11. Write a program to implement Frame and different graphics objects.
12. Write a program to implement Java Applet.
Text Books:
1. E Balagurusamy, " Programming with Java: A Primer, 3E", Tata McGraw Hill Publishing Company.
2. Herbert Schildt , "Java Complete Reference" , McGraw Hill Publishing Company
3. Deitel and Deitel , "Java: How to Program" , Deitel pub.
Reference Books:
1. Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI", BPB Publication.

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B. Tech. (Electronics & Communication Engineering) Sem IV **LINUX PROGRAMMING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination(UE): --	
Practical: 02	Internal Assessment(IA): --	
Tutorial: --	TW:25 Marks	Credits:01
	Total: 25 Marks	Total Credits: 01

Course Pre-requisites:	
The Students should have knowledge of	
1	Computational C.

Course Objectives:	
1	Make a Shell script executable. To demonstrate the use of constraints and relational algebra operations.
2	Execute programs written in C under UNIX environment
3	To use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc. To facilitate students in Database design
4	Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments..

Course Outcomes: After learning this course students will be able to	
1	To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment
2	To evaluate the concept of shell scripting programs by using an AWK and SED commands.
3	To create the directory, how to change and remove the directory.
4	To analyze the process of how the parent and child relationships
5	To understand the concept of client-server communication by using sockets.
6	Discuss shell programming in Linux operating system

Experiment List

1.

a) Study of Unix/Linux general purpose utility command listman, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor.
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
d) Study of Unix/Linux file system (tree structure).

e) Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program that makes a copy of a file using standard I/O, and system calls
3. Write a C program to emulate the UNIX ls –l command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe. 5. Ex: - ls –l | sort
6. Write a C program that illustrates two processes communicating using shared memory
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.
9. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: Write a shell script that delete all lines containing a specified word
10. Write a shell script that displays a list of all the files in the current directory ; Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. whenever the argument is a file or directory.
11. Write a java script to find the number of characters, words and lines in a file? linked list respectively. Write a C Program that makes a copy of a file using standard I/O and system calls? Implement in C the following Unix commands using system calls A) cat B)mv
12. Write a C program that illustrates how an orphan is created; Write a program that illustrates how to execute two commands concurrently with a command pipe.? Write C programs that illustrate communication between two unrelated processes using named pipe.
13. Write a client and server programs (using c)for interaction between server and client processes using Internet Domain sockets? Write a program to implement the shared memory . Write a client and server programs (using c)for interaction between server and client processes using Internet Domain sockets? . Write a C program that illustrates two processes.
Text Books:
1. Cristopher Negus, “Red Hat Linux Bibl”e, Wiley Dreamtech India 2005 edition.
2. Yeswant Kanethkar, “UNIX Shell Programming”, First edition, BPB.
Reference Books:
1. Robert Love,” Linux System Programming”, O’Reilly, SPD.
2. W.R.Stevens,” Advanced Programming in the Unix environment”, 2nd Edition, Pearson Education.
3. W.R.Stevens , “Unix Network Programming” ,PHI.
4. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education.

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B. Tech. (Electronics & Communication Engineering) Sem II **INTEGRAL TRANSFORMS AND VECTOR CALCULUS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination(UE): 60 Marks	Credits : 04
Practical:--	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total Marks: 100 Marks	Total Credits: 05

Course Pre-requisites:	
The students should have knowledge of	
1	Integrals.
2	Fourier series.
3	Vector algebra.

Course Objectives:	
1	Methods to solve differential equations
2	Various techniques of integral transform.
3	line, surface and volume integrals.

Course Outcomes: After learning this course students will be able to	
1	Implement the methods for first order first degree differential equation.
2	Understand the modeling of physical systems and find the solutions.
3	Solve the nth order linear differential equation.
4	Compute the integral transform for various functions.
5	Apply the Laplace transform for solving differential equations
6	Understand vector calculus and apply it to evaluate line, surface and volume integrals.

UNIT – I	**Differential Equation**	**(08 Hours)**
	Formation of the ordinary differential equations(ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations,	
UNIT – II	**Applications of Differential Equation**	**(08 Hours)**
	Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under	

	Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat.	
UNIT - III	**Linear Differential Equations**	**(08 Hours)**
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
UNIT - IV	**Z-transform**	**(08 Hours)**
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory **Z-Transform (ZT)**: Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
UNIT -V	**Laplace Transform**	**(08**
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
UNIT - VI	**Vector Calculus**	**(08 Hours)**
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.	

Text Books:

2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I and II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

References Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 42th Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.

4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project based learning:

1. Formation of differential equations
2. Evaluate the electric circuit problem using differential equations
3. Evaluate the heat conduction in 1-D using differential equations
4. Evaluate the rectilinear motion problem using differential equations
5. Evaluate the simple harmonic problem using differential equations
6. Obtain the solution of Simultaneous & Symmetric Simultaneous DE
7. Obtain the solution of Simple Difference Equations using Z-transforms
8. Find the Directional Derivatives
9. Find work done using Green's theorem
10. Find scalar potential using vectors
11. Evaluating integrals using Green's theorem, Gauss's and stoke's theorem
12. Use Laplace transform to solve differential equations
13. Use Laplace transform to solve integrals equations
14. Use Fourier transform to solve integrals
15. Applications of vector integration to solve problems in Electro-Magnetic Fields.
16. Find the conditions for Solenoidal and irrotational vector fields

Students in a group of 3 to 4 shall complete any one project from the above list.