SEMESTER:- III
SYLLABUS

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. III: Electronics & Telecommunication Engineering **SUBJECT: - ADVANCED MATHEMATICS FOR ELECTRONICS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credit:01
		Total Credits: 04

Course Pre-requisites:	
	Class XII Mathematics, Linear Algebra and calculus, Differential equation, and complex analysis

Course Objectives:	
1.	To introduce the concept of Fourier series.
2.	To introduce Transforms like Fourier Transform, Laplace Transform and Z Transform.
3.	To teach vector analysis.
4.	To introduce optimization and graph theory.
5.	To teach probability and statistics.

Course Outcomes: After learning this course students will be able to	
1	Apply Fourier series for solving engineering problems**.**
2	Solve numerical problems involving Fourier Transform**.**
3	Demonstrate the knowledge of Laplace Transform and Z Transforms**.**

4	Apply the concept of optimization and graph theory**.**	
5	Applyvector analysis for engineering problems**.**	
6	Solve numerical problems based on probability and statistics**.**	
UNIT – I	**Fourier Series**	**(06 Hours)**
	Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansions of odd and even periodic functions, Half range series. application to difference equations and Markov chains, Fourier series and KL expansion, Fourier series with an emphasis on the application of solving engineering problems, Develop Fourier series expansion of a function over the given interval.	
UNIT – II	**Fourier Transform**	**(06 Hours)**
	PaFourier transforms, Fourier transform of random process, Fourier sine and cosine transforms, Inverse Fourier, Sine and Cosine Transforms, complex form of Fourier integral, Finite Fourier sine and cosine transforms. Properties of Fourier transform.	
UNIT - III	**Laplace Transform & Z Transform**	**(06 Hours)**
	Laplace Transform:Definition, transforms of elementary functions, properties of Laplace transforms, transforms of derivatives, Properties of Laplace transforms, transforms of integral, periodic functions, Inverse Laplace transforms, Inverse Laplace transforms by using partial	

	fractions, Properties of LT. Z Transform: Definition, properties of z transform, Z Transform of basic sequences, Z transform of some standard discrete function inverse Z transform	
UNIT -IV	**Optimization and graphs**	**(06 Hours)**
	Basics of optimization, Unconstrained optimization: method of steepest descent, linear programming, simplex method, and difficulties. G Graphs and digraphs, shortest path problems, complexities, Bellman's principle, Dijkstra's Algorithm, shortest spanning trees: greedy algorithm, Prim's algorithm, flows in networks, maximum flow: Ford-Fulkerson algorithm	
UNIT -V	**Vector Analysis**	**(06 Hours)**
	Coordinate system, inter-conversion of coordinate systems, Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems.	
UNIT -VI	**Probability and Statistics**	**(06 Hours)**
	Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, exponential distribution, normal distribution, joint and conditional probability, relation of joint and conditional probability, higher order stats	
Topics for projets based learning*		

1. Energy Flow in an Ecosystem: Graphical model
2. Plane Geometry and Vectors
3. Bipartite graph
4. Trellis (graph)
5. Seven Bridges of Königsberg
6. Three-cottage problem
7. Shortest path problem
8. A system of electric charges has a charge density $\rho(x,y,z)$ and produces an electrostatic field $E(x,y,z)$ at points (x,y,z) in space. Gauss' Law states that $\iint \Sigma E \cdot d\sigma = 4\pi \iiint S \rho dV$ for any closed surface Σ which encloses the charges, with S being the solid region enclosed by Σ. Show that $\nabla \cdot E = 4\pi\rho$. This is one of Maxwell's Equations
9. Show that the gradient of a real-valued function $F(\rho,\theta,\varphi)F(\rho,\theta,\varphi)$ in spherical coordinates is:
10. Applications of Vector Fields: in Mechanics
11. Applications of Vector Fields: Electric and Magnetic fields
12. Applications of Vector Fields: Fluids motions
13. Applications of Vector Fields: Heat transfer
14. Routing problems (e.g. Hamiltonian paths, travelling salesman problem)
15. Graph colorings (4-color theorem, chromatic polynomial)
*Students in a group of 3 to 4 shall complete any one project from the above list
Textbooks/Reference Books
1.'Advanced Engineering Mathematics' by Erwin reyszig
2.'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright
3.AppliedMathematics (VolumesIandII)byP.N.Wartikar&J.N.Wartikar
4.HigherEngineeringMathematicsbyB.S. Grewal
5.HigherEngineeringMathematicsbyB.V. Ramana

6.AdvancedEngineeringMathematics

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<tr><td colspan="3">B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - SEMICONDUCTOR DEVICES AND CIRCUITS II</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS ALLOTTED:</u></td></tr>
<tr><td>Theory: 04</td><td>End Semester Examination: 60 Marks</td><td>Credits: 04</td></tr>
<tr><td>Practical: 02</td><td>Internal Assessment: 40 Marks</td><td></td></tr>
<tr><td>Tutorial: 00</td><td>TW & PR: 50 Marks</td><td>Credit: 01</td></tr>
<tr><td colspan="2"></td><td>Total Credit: 5</td></tr>
<tr><td colspan="3">Course Pre-requisites:</td></tr>
<tr><td></td><td colspan="2">Network theory-Current divider rule, Voltage divider rule, KVL, KCL, Network theorems, h-parameters, passive elements and their response (initial final conditions), Semiconductor theory, semiconductor devices like diodes, BJT, FET, MOSFET, Biasing methods, Single stage amplifier-design and analysis</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Course Objectives:</td></tr>
<tr><td></td><td colspan="2">The objective of this course is to cover performance evaluation of various amplifiers by
Introducing a concept of the multistage amplifiers, parameter evaluation and related design aspects of multistage amplifiers with the help of derivations.
Teaching a concept of the feedback in the amplifiers, feedback topologies with the help of derivations and their advantages and disadvantages.
Gauging the efficiencies of various types of power amplifiers with the help of derivations.
Teaching a concept and design of the RC and LC oscillators with the help of derivations.
Introducing a concept and types of the differential amplifiers, current mirrors.
Introducing a concept and types of the tuning amplifiers.</td></tr>
<tr><td colspan="3"></td></tr>
</table>

Course Outcomes: After learning this course students will be able to		
1	Analyze and designdiscrete multistage amplifier.	
2	Analyze and design negative feedback amplifier.	
3	Classify and analyze discrete power amplifiers.	
4	Analyze and design discrete oscillator circuits.	
5	Analyze various types of the differential amplifiers.	
6	Analyze the effect of tuning in the amplifiers, and the applications where the tuning amplifiers are useful.	
UNIT – I	**Multistage Amplifiers**	**(08 Hours)**
	Need of the Multistage amplifiers, Types of Multistage Amplifiers-Cascade and Cascade, Cascade-Coupling methods, Frequency response, Parameter evaluation - Ri, Ro, Av, Ai & Bandwidth for general multistage amplifier, Choice of the transistor configuration in cascade amplifier, Analysis & design of direct coupled, RC coupled (Low frequency, high frequency, and medium frequency analysis), transformer coupled (Low frequency, high frequency and medium frequency analysis) amplifier. Darlington Amplifier, Design of Cascade amplifier	
UNIT – II	**Negative feedback Amplifiers**	**(08 Hours)**
	Types of basic Amplifiers, Concept and types of feedback, Transfer gain with feedback, Negative feedback topologies with their block Schematics, Effect of negative feedback on Input impedance; Output impedance; Gain and Bandwidth with derivation, Analysis of one circuit for each feedback topology for input impedance, output impedance, gain and bandwidth.	

UNIT - III	**Power Amplifiers**	**(08 Hours)**
	Need of Power amplifiers, classification; applications; advantages of power amplifiers - Class A, Class B, Class C, class D and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull; Class AB Complementary symmetry and Quasi – complementary. Efficiency analysis for Class A transformer coupled amplifier, Class B push – pull amplifier. Comparison of efficiencies of other configurations. Distortion in amplifiers; concept of Total Harmonic Distortion (THD).	
UNIT -IV	**Oscillators**	**(08 Hours)**
	Concept of Positive feedback, Condition, and principle of oscillations (Barkhausen criterion), Classification of oscillators, Design analysis of RC and LC oscillators, RC oscillators: Phase shift, Wien bridge Oscillators; LC Oscillators: Hartley, Colpitt's and Clap; Piezo-electric effect in crystals and Crystal Oscillator.	
UNIT -V	**Differential Amplifiers**	**(08 Hours)**
	Limitations of CE amplifier, Split supply biasing, Differential amplifier configurations, Dual Input, balanced output differential amplifier, Dual input, unbalanced output differential amplifier, Single input, balanced output differential amplifier, Single input, unbalanced output differential amplifier, FET differential amplifiers, Constant current bias, Current mirrors (revision), Differential mode gains, common mode gain, CMRR calculation, Derivation for output voltage, input and output impedances	

UNIT -VI	**Tuned Amplifiers**	**(08 Hours)**
	Introduction, Q-factor, small signal tuned amplifiers, Effect of cascading Single tuned amplifiers on Bandwidth, Effect of cascading Double tuned amplifiers on Bandwidth, Stagger tuned Amplifiers, Comparison of Tuned amplifiers, large signal tuned amplifiers, Stability of Tuned amplifiers, Neutralization	

Term Work: Any 8 of below given list
1. To find the gain and bandwidth of a 2-stage CE RC coupled amplifier.
2. To find the gain and bandwidth of a 2-stage transformer coupled amplifier.
3. To find the gain of a direct coupled amplifier.
4. To find the gain and bandwidth of a voltage series negative feedback amplifier.
5. To find the gain and bandwidth of a voltage shunt negative feedback amplifier.
6. To find the gain and bandwidth of a currentseries negative feedback amplifier.
7. To find the gain and bandwidth of a current shunt negative feedback amplifier.
8. To study the response of a Class A direct coupled/ transformer coupled amplifier.
9. To study the response of a Class B power amplifier.
10. To find the oscillations frequency of the RC amplifiers-RC phase shift/ Wien bridge oscillator.
11. To find the oscillations frequency of LC amplifiers-Colpitt's Oscillator/Hartley Oscillator.
12. To plot frequency response of tuned amplifiers.
Topics for projets based learning*
1.Prepare survey report on types of multistage amplifiers.

2. Build and analyze the 2-stage RC coupled amplifier.
3. Build and analyze the 2-stage transformer coupled amplifier.
4. Build and analyze the 2-stage direct coupled amplifier.
5. Prepare survey report on types of negative feedback amplifiers.
6. Build and analyze 2-stage voltage series negative feedback amplifier.
7. Build and analyze single stage current series negative feedback amplifier.
8. Build and analyze single stage voltage shunt negative feedback amplifier.
9. Build and analyze 2-stage current shunt negative feedback amplifier.
10. Prepare survey report on types of power amplifiers.
11. Implement and analyze class A direct coupled power amplifier.
12. Implement and analyze class B push pull power amplifiers.
13. Prepare survey report on types of oscillators.
14. Implement RC phase shift oscillator and verify it for oscillations frequency.
15. Prepare survey report on types of differential amplifier.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. S. Salivahanan and N Suresh Kumar, 'Electronic devices and circuits', Mc Graw Hill Education India Private Limited, Third Edition.
Reference Books:
1. Ramakant A.Gayakwad “Op-amps and Linear Integrated Circuit Technology”Fourth edition
2. Adel S. Sedra, Kenneth C. Smith “Microelectronic Circuits” Oxford series in Electrical and computer engineering

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - SIGNALS AND LINEAR SYSTEMS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 00		Credit: 00
		Total Credit: 04

Course Pre-requisites:	
	Linear algebra,calculus, MATLAB fundamentals,Differential equations, and complex analysis

Course Objectives:	
1.	To teach the basic concepts of signals.
2	To introduce the basic concepts of systems analysis
3	To introduce the tools in the time and frequency domain.
4	To provide knowledge of correlation function and sampling.

Course Outcomes: After learning this course students will be able to	
1	Characterize and analyze the properties of signals.
2	Classify the systems and analyze in time domain using convolution.
3	Apply Fourier transform for analysis of LTI systems.

4	Apply Laplace transform for analysis of LTI systems.	
5	Apply discrete transforms for analysis of LTI systems.	
6	Evaluate the effects of sampling on signal and describe the auto correlation and cross correlation between signals.	
UNIT – I	**Introduction to signals**	**(08 Hours)**
	Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.	
UNIT – II	**Classification of systems**	**(08 Hours)**
	Definition, Classification of System, System Interconnections, state space analysis, Linear & non -linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.	
UNIT - III	**Continuous Time System Analysis**	**(08 Hours)**
	Response of LTI Systems to exponential signals, periodic signals. Derivation Fourier series, Discrete time Fourier series and properties, Fourier Transforms, Duality and Parseval's theorem, Fourier analysis examples: Output of LTI Systems Described by Differential, convolution with FT , unit step response of RC circuit, filtering, FT of Gaussian Pulse, Example of the brain waves.	
UNIT -IV	**Laplace Transform and Application**	**(08 Hours)**
	Review of Laplace transform and properties, Concept of ROC and properties of ROC, pole	

	zero concepts. Transfer function and condition of stability, Application of Laplace transforms to the LTI system analysis, Convolution with LT, Inversion using duality, Laplace Transform of electrical Circuit, example of control system, calculation of harmonic vibration of the beam, Mathematical models of physical system- Electrical & Mechanical System	
UNIT -V	**Discrete Transforms and Applications**	**(08 Hours)**
	Z-Transform: The Region of Convergence for the Z-Transform, Application of Z-Transform to the LTI system analysis. Discrete time Fourier transform, Properties of DTFT, Fast Fourier transform algorithm, Use of FFT in Windows Media Player.	
UNIT -VI	**Correlation and Spectral Density**	**(08 Hours)**
	Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.	
<u>Term Work:</u> Any 8 of below given list		
1. Perform the operations on signals 2. Perform the convolution of signals using formula using MATLAB.		
3. Analyze the synthesis of signals using Fourier Series.		
4. Find the Fourier Transform using MATLAB.		
5. Find the Laplace Transform using MATLAB.		

6. Find the Z-Transform using MATLAB.
7. Find the autocorrelation of sine sequence x[n] with frequency 50Hz and sampling frequency 200Hz, using MATLAB.
8. Find the cross correlation for different signals.
9. Find the Inverse Fourier Transform using MATLAB.
10. Find the Inverse Laplace transform using MATLAB.
11. Find the inverse Z Transform using MATLAB.
12. Find the circular convolution using MATLAB.
Topics for projets based learning*
1. Signals In Natural Domain
2. Signal operations for navigation/obstacle detection
3. Speech production
4. Speech hearing
5. LTI Systems – Eigenfunctions, System Described by differential Equation, Homogenous and Particular Solution
6. LTI Systems-Convolution applications,
7. Periodic Convolution applications,
8. BIBO Stability applications
9. z–Transform Applications– Impulse Response of LTI System Described by Difference Equation
10. Complex Exponential Fourier Series and Trigonometric Fourier Series of Periodic Triangular Wave, Periodic Convolution
11. Real life example on DTFT – Sampling
12. Group/ Phase Delay for LTI systems
13. Implement DFT in Matrix form
14. Implement IDFT in Matrix form
15. FAST FOURIER TRANSFORM ANALYZER
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Roberts M. J., Signals & Systems, TMH.
2. Oppenheim, Wilsely&Nawab, Signals & Systems, MGH.
Reference Books:

1. B.P.Lathi, Signal Processing & Linear Systems, Berkeley Cambridge, 1998 Edition.

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SUBJECT: - NETWORK ANALYSIS AND SYNTHESIS</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS ALLOTTED:</u></td></tr>
<tr><td>Theory: 04</td><td>End Semester Examination: 60 Marks</td><td>Credits: 04</td></tr>
<tr><td>Practical: 02</td><td>Internal Assessment: 40 Marks</td><td></td></tr>
<tr><td>Tutorial: 00</td><td>TW & OR: 50 Marks</td><td>Credit: 01</td></tr>
<tr><td colspan="2"></td><td>Total Credits: 5</td></tr>
<tr><td colspan="3">Course Pre-requisites:</td></tr>
<tr><td></td><td colspan="2">Knowledge of KCL and KVL Laws from ‘Electrical Technology’,Linear Differential Equations, Systems of Linear Equations and complex numbers from ‘Differential Equations and Complex Analysis’</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Course Objectives:</td></tr>
<tr><td></td><td colspan="2">The objective of this course is to cover various methods to find the network parameters as listed below:
• To teach how to find network parameters (voltages, currents, power) in a given passive circuit by the use of methods- MeshAnalysis, Node Analysis and Network Theorems.
• To teach how to find voltages and currents in a given circuit by formulating the network equilibrium equations by the use of graph theory.
• To teach how to find the transient response of the series RLC circuits by the use of homogeneous and non-homogeneous equations.
• To introduce the resonance phenomenon, curves and related parameters in a given series and a parallel resonant circuit with the help of derivations.
• To introduce the two port network parameters, their interrelationships, and interconnections with the help of derivations.</td></tr>
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	• To teach how to design a constant K prototype low pass, high pass, band pass and a band stop passive filters for different bandwidths by using filter topologies.	
Course Outcomes: After learning this course students will be able to		
1	Analyze passive circuits using Mesh Analysis, Node Analysis and Network Theorems.	
2	Apply graph theory by formulating the network equilibrium equations for circuit analysis.	
3	Perform Transient Analysis of the Series Reactive Circuits	
4	Sketch the resonance curves for a given series and parallel resonant circuits.	
5	Compute two port parameters for a given network	
6	Design constant-k prototype low pass, high pass, band pass and band stop passive filters.	
UNIT – I	**DC circuit Analysis and Network Theorems**	**(08 Hours)**
	KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Network Theorems- Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem	
UNIT – II	**Formulation of network equilibrium equations using Graph Theory**	**(08 Hours)**
	Network Graph, tree, co-tree & loop, Incidence Matrix, Tie-set matrix, Cut-set matrix, Formulation of the equilibrium equations in the matrix form, Solution of the resistive and non-resistive networks, Principle of Duality	
UNIT - III	**Transient Analysis of the Series Reactive Circuits**	**(08 Hours)**

	Initial Conditions in the networks, A procedure for evaluating initial conditions, the step response in RC, RL, RLC circuits using classical method and using Laplace Transform for driven and undriven circuits, Time specifications of RLC circuits, Concept of the natural frequency and damping frequency, Zeta.	
UNIT -IV	**Resonance in Series and Parallel RLC Circuits**	**(08 Hours)**
	Resonant condition, Quality factor, Resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. Effect of Generator resistance on bandwidth and Selectivity, Comparison of series and parallel resonant circuits, Applications of resonant circuits	
UNIT -V	**Two Port Networks**	**(08 Hours)**
	Concept of Two port network, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Reciprocity and Symmetry conditions, Interconnections of two-ports, Analysis of some circuits using two port network parameters theory.	
UNIT -VI	**Passive Filter Analysis**	**(08 Hours)**
	Filter Fundamentals, Electrical Properties-Image impedance, Characteristic impedance, Propagation constant, Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters, Applications of passive filters.	

Term Work: Any 8 of below given list
1. To verify Thevenin's and Norton's Theorem for a given circuit.
2. To verify Superposition and Reciprocity Theorem for a given circuit.
3. To find the resonant frequency of a series RLC circuit.
4. To find the resonant frequency of a parallel RLC circuit.
5. To find the Z parameters of a given two port network.
6. To find the Y parameters of a given two port network.
7. To find the H parameters of a given two port network.
8. To find the ABCD parameters of a given two port network.
9. To find the cut-off frequency and to plot the frequency response of a constant-k LPF.
10. To find the cut-off frequency and to plot the response of a constant-k HPF.
11. To find the cut-off frequencies and to plot the frequency response of a constant-k BPF.
12. To find the cut-off frequencies and to plot the frequency response of a constant-k BSF.
Topics for projets based learning*
1.Build and analyze resistive circuit for current usage.
2. Build and analyze resistive circuit for voltage usage.
3. Build and analyze resistive circuit for power usage.
4. Implement the series RL circuit and verify the initial and final conditions of it.
5. Implement the series RC circuit and verify the initial and final conditions of it.
6. Build and verify series resonance circuit.
7. Build and verify parallel resonance circuit.
8. Verify Z parameters for unknown circuit.
9. Verify Y parameters for unknown circuit.

10. Verify H parameters for unknown circuit.
11. Verify ABCD parameters for unknown circuit.
12. Design and implement prototype Low pass filter and verify its bandwidth.
13. Design and implement prototype High pass filter and verify its bandwidth.
14. Design and implement prototype Band pass filter and verify its bandwidth.
15. Design and implement prototype Band stop filter and verify its bandwidth.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
Reference Books:
1. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)
2. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
3. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

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B. Tech. Sem. III: Electronics & Telecommunication Engineering **SUBJECT: - DATABASE MANAGEMENT SYSTEMS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW & OR: 50 Marks	Credit: 01
		Total Credits: 05

Course Pre-requisites:	
	Python Programming

Course Objectives:	
1	To provide a strong formal foundation in database concepts, technology, and practice
2	To give systematic database design approaches covering conceptual design, logical design, and an overview of physical design
3	To have good understanding of different type of databases.
4	To learn a powerful, flexible, and scalable general-purpose database to handle big data

Course Outcomes: After learning this course students will be able to	
1	Design E-R Model for given requirements and convert the same into database tables.
2	Apply BCNF Algorithm for Decomposition

3	Use SQL for query processing.	
4	Use algorithms to solve scheduling conflict	
5	Apply Concurrency algorithm in distributed database	
6	Use NOSQL in database creation.	
UNIT – I	**Introduction to Databases**	**(08 Hours)**
	Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables, Introduction to normalization.	
UNIT – II	**Relational Database Design**	**(08 Hours)**
	Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, Modeling Temporal Data	
UNIT - III	**SQL AND PL/SQL**	
	SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges, Embedded SQL, Dynamic SQL.	**(08 Hours)**

UNIT -IV	**Database Transactions and Query Processing**	**(08 Hours)**
	Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Timestamping Methods, Recovery methods: Shadow-Paging and Log-Based Recovery, Checkpoints, Query Processing, Query Optimization, Performance Tuning	
UNIT -V	**Parallel and Distributed Databases**	**(08 Hours)**
	Introduction to Database Architectures: Multi-user DBMS Architectures, Case study- Oracle Architecture. Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database. Cloud database examples.	
UNIT -VI	NoSQL Database	**(08 Hours)**
	Introduction to NoSQL Database, Types, and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study- unstructured data from social media. Introduction to Big Data, HADOOP: HDFS, MapReduce. JSON	
List of Experiments:		
1. Write a query to display all the columns from salesman table. First create a Salesman table.		
2. Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym		
3. Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, Delete with operators, functions, and set operator.		

4. Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.

5. Unnamed PL/SQL code block: Use of Control structure and Exception handling is mandatory.

Write a PL/SQL block of code for the following requirements: -

1. Schema:

1.Borrower(Rollin, Name, Date of Issue, NameofBook, Status)

2. Fine(Roll.no,Date,Amt)

- Accept roll.no & name of book from user.
- Check the number of days (from date of issue), if days are between 15 to 30 then fine amount will be Rs 5per day.
- If no. of days>30, per day fine will be Rs 50 per day & for days less than 30, Rs. 5 perday.
- After submitting the book, status will change from I to R.
- If condition of fine is true, then details will be stored into fine table.

Frame the problem statement for writing PL/SQL block in line with above statement.

6. Cursors: (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor) Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table Rollcall with the data available in the table Rollcall. If the data in the first table already exist in the second table, then that data should be skipped. **Frame the separate problem statement for writing PL/SQL block to implement all types of Cursors in line with above statement. The problem statement should clearly state the requirements.**

7. PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is <=1500 and marks>=990 then student will be placed in distinction category if marks scored are between 989 and900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud_Marks(name, total_marks) Result (Roll,Name, Class) Frame the separate problem statement for writing PL/SQL Stored Procedure and function, inline with above statement. The problem statement should clearly state the requirements

8. PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is <=1500 and marks>=990 then student will be placed in distinction category if marks scored are between 989 and900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud Marks (name, total marks) Result (Roll, Name, Class) Frame the separate problem

statement for writing PL/SQL Stored Procedure and function, in line with above statement. The problem statement should clearly state the requirements
9. Write a program to implement Mogo DB database connectivity with python Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC.
10. Implement MYSQL/Oracle database connectivity with python Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC
11. **Mini Project:**
Topics for projets based learning*
1.Library Management System An online library management system offers a user-friendly way of issuing books and viewing different books and titles available under a category. This type of Management Information System (MIS) can be easily developed. And SQL queries enable quick retrieval of the required information.
2. Centralized College Database A college has academic departments, such as the Department of English, Department of Mathematics, Department of History, and so on. And each department offers a variety of courses. Now, an instructor can teach more than one course. Let's say a professor takes a class on Statistics and on Calculus.
3. Student Database Management Similarly, you can do a student record-keeping project. The database would contain general student information (such as name, address, contact information, admission year, courses, etc.), attendance file, marks or result file, fee file, scholarship file, etc. An automated student database streamlines the university administration process to a considerable degree.
4. Online Retail Application Database As e-commerce experiences remarkable growth around the world, online retail application databases are among the most popular SQL project ideas.
5.Inventory Control Management Inventory control is the process of ensuring that a business maintains an adequate stock of materials and products to meet customer

demands without delay
6. Hospital Management System It is a web-based system or software that enables you to manage the functioning of a hospital or any other medical setup. It creates a systematic and standardized record of patients, doctors, and rooms, which can be controlled only by the administrator.
7. Railway System Database In this database system, you need to model different train stations, railway tracks between connecting stations, the train details (a unique number for each train), rail routes and schedule of the trains, and passenger booking information.
8. Payroll Management System It is one of the most preferred SQL database project ideas due to its extensive usage across industries. An organization's salary management system calculates the monthly pay, taxes, and social security of its employees.
9. An SMS-based Remote Server Monitoring System Such systems are particularly beneficial for large corporate organizations having massive data centers and multiple servers. Since these servers host many applications, it becomes tricky to monitor their functionality. Usually, when a server is down or has crashed, the clients inform the organization about it.
10. Blood Donation Database This database would store interrelated data on patients, blood donors, and blood banks.
11. Art Gallery Management Database If you are running an art store, you can also organize and manage all your customer information, including names, addresses, the amount spent, liking and interests.
12. Cooking Recipe Portal This is another application of SQL databases in the creative field. You can model a web portal where a stored procedure will display your cooking recipes under different categories.

13. Carbon Emissions Calculator

Lately, environmental conservation has been receiving a lot of attention globally. You can also contribute to the cause by developing a web application that measures the carbon footprint of buildings.

14. A Voice-based Transport Enquiry System

This innovative tool helps you save time while travelling. You would have noticed long queues outside the transport controller's office at public transport terminals. This is where commuters make inquiries about the different types of transport facilities available. In this scenario, technology-enabled transport enquiry systems can result in huge savings of time and effort. You can develop an automated system for bus stands, railway stations, and airports that can receive voice commands and answer in a voice-based format.

15. Pharmacy Management System

Pharmacy Management System is the process of ensuring that a business maintains an adequate stock of medicines and tablets to meet customer demands without delay

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

Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626

Reference Books:

1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719
2. S.K.Singh, "Database Systems : Concepts, Design and Application", Pearson, Education, ISBN 978-81-317-6092-5
3. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide",O'Reilly Publications, ISBN: 978-1-449-34468-9.
4. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-1118905628
5. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749
6. Joy A. Kreibich, "Using SQLite", O'REILLY, ISBN: 13:978-93-5110-934-1
7. Garrett Grolemund, "Hands-on Programming with R", O'REILLY, ISBN : 13:978-93- 5110-728-6

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B. Tech. Sem. III: Electronics & Telecommunication Engineering **SUBJECT: EDA TOOL PRACTICES**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW: 50 Marks	Credit: 01
		Total Credit: 01

Course Pre-requisites:	
	Elementary Electronics, Electrical Technology.
Course Objectives:	
1	To introduce the students to transient analysis of electronic circuits using simulation software (EDA tool)
2	To teach the students to carry out AC analysis of amplifiers using simulation software (EDA tool)
3	To introduce the students to simulation tools for basic analog electronic circuits
4	To introduce the students to simulation tools for basic digital electronic circuits
5	To teach the students to use virtual instruments in an EDA tool
6	To train the students to troubleshoot basic circuits with an EDA tool

Course Outcomes: After learning this course students will be able to	
1	Perform Transient Analysis of simple circuits using EDA tool.
2	Perform AC Analysis of simple circuits using EDA tool.

3	Use an EDA tool for simulating basic analog electronic circuits.
4	Use an EDA tool for simulating basic digital electronic circuits.
5	Use virtual instruments in an EDA tool for analyzing and testing basic electrical and electronic circuits.
6	Use EDA tool for troubleshooting basic circuits.

List of experiments:

1. Study of an EDA tool, concept of simulation, different types of analyses, simulation errors
2. Study and use virtual instruments, signal, and power sources
3. Verify Basic circuit laws and theorems using MULTISIM
4. Construct diode circuits and simulate the same
5. Construct and analyze BJT biasing circuits
6. Construct single stage CE amplifier circuit and carry out transient and AC analysis
7. Implement Boolean equations and implement the same using basic logic gates
8. Implement circuits with multiplexers and decoders
9. Troubleshooting a given circuit using EDA tool

Reference Books:

4. Circuit Analysis with Multisim, David Báez-López Félix E. Guerrero-Castro, Morgan & Claypool Publishers.
5. Advanced Circuit Simulation Using Multisim Workbench, David Báez-López Félix E. Guerrero-Castro, Morgan & Claypool Publishers

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - PCB DESIGN AND SOLDERING

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit:01
		Total Credit: 01

Course Pre-requisites:	
	Elementary Electronics

Course Objectives:	
1	To introduce the basic building blocks for PCB artwork design
2	To train the student to create simple PCB artwork design using an PCB design tool
3	To expose the students to soldering process and tools
4	To train the students to make reliable solder joints
5	To train the students to de-solder the solder joints
6	To teach the art of inspecting solder joints

Course Outcomes: After learning this course students will be able to	
1	Demonstrate the knowledge of selecting proper PCB primitives (track width, pad size, hole size, clearance between pads and tracks,

	footprints)
2	Use PCB design software for simple single sided PCB artwork design
3	Identify and select appropriate soldering tools for the soldering job
4	Use solder iron for soldering through hole components
5	Use solder iron and de-solder pump /wick for de-soldering through hole components
6	Perform electrical (continuity) and visual inspection for solder joints

List of experiments:

1. Design a simple (only discrete components) single sided PCB using PCB design software (PCB artwork design flow)
2. Design a single sided PCB using PCB design software for a circuit with IC components
3. Design a double-sided PCB using PCB design software
4. Study and use of tools like solder iron (types and temperature profile), wire-strippers, cutters
5. Study of solder alloys, flux and rosin
6. Solder basic electronic components like resistors, capacitors, IC bases (through hole)
7. Use de-solder pump/wick for de-soldering components
8. Carry out electrical continuity test and visual inspection for a soldered board

Reference Books:

1. Getting Started with Soldering: A Hands-On Guide to Making Electrical and Mechanical Connections, Marc de Vinck, Maker Media, Inc, 2017
2. Soldering in electronics assembly, MIKE JUDD, Keith Brindley, Newnes,1999

3. Printed Circuits Handbook, Clyde F. Coombs, Jr.,McGraw-Hill, 2008
4. User Manual for the selected PCB Design Software
5. Getting Started with Soldering: A Hands-On Guide to Making Electrical and Mechanical Connections, Marc de Vinck, Maker Media, Inc, 2017

SEMESTER:- IV
SYLLABUS

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - CONTROL SYSTEMS AND APPLICATIONS**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 00		
		Total Credit: 04

Course Pre-requisites:

The Students should have knowledge of

1.	Basic knowledge of signals.
2.	Basic mathematical tools like Laplace transform
3.	Basic knowledge of software like MATLAB

Course Objectives:

- To provide in depth knowledge of the various types of control systems and determination of transfer function using different methods.
- To analyze the first order and second order system in time domain.
- To introduce the concept of different types of controllers and compensators.
- To analyze the control system in frequency domain.
- To analyze the digital control systems in time domain.
- To provide state variable analysis.

Course Outcomes: After learning this course students will be able to	
1	Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2	Determine the time response for different system, the errors in various control systems; evaluate the stability of a system using Routh's Stability Criterion and analysis graphical technique such as root locus.
3	Demonstrate the knowledge of control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID and compensators.
4	Determine frequency response and different graphical methods like Bode plot and polar plot.
5	Calculate the time response for digital control systems and design digital control system.
6	Implement the state variables for state variable model for linear as well as digital control systems.

UNIT – I	**Introduction to Control System**	**(08 Hours)**
	Introduction to analog as well as digital control system, Classification of Control System, control problem, Feedback and Non-feedback Systems, Transfer Function, Block diagram and signal flow graph analysis, Pulse transfer function, Sampled Signal Flow Graph.	
UNIT – II	**Time Domain Analysis**	**(08 Hours)**
	Time response of first order & second order system using standard test signal, steady state errors and error constants, Root locus techniques- Basic concept, rules of root locus, application of root locus techniques for control system, Hurwitz and Routh stability criteria.	
UNIT - III	**Controllers and Compensators**	**(08 Hours)**

	Effect of Poles and Zeros on the System Stability, Types of Compensators, Lead, Lag, Lead-Lag Compensators design, Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram, Examples of ladder diagram.	
UNIT -IV	**Frequency Domain Analysis**	**(08 Hours)**
	Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.	
UNIT -V	**Digital control systems**	**(08 Hours)**
	Time Response of discrete time systems: Time response specifications, Steady state error, error constants, time response for 1st order and 2nd order systems. Design of sampled data control system: Root locus technique, Bode plot, Nyquist stability criteria, lead compensator design using Bode plot, lead compensator design using Bode plot, lead compensator design using Bode plot.	
UNIT -VI	**State variable analysis**	**(08 Hours)**
	State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer functionand state variable representations-State variable analysis of digital control system-Digitalcontroldesign using state feedback.	

Term Work: Any 8 of below given list
1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. Transient response of second order system using MATLAB
3. To draw Root Locus theoretically (analog and digital) and verify it using MATLAB.
4. To draw Bode plot theoretically (analog and digital) and verify it using MATLAB.
5. Magnitude and phase plot of Lead network (analog and digital).
6. Magnitude and phase plot of Lag network (analog and digital).
7. To study architecture of PLC.
8. Ladder diagram example using Virtual Lab
9. Implementation of DOL Starter Virtual Lab
10. Implementation of On-Delay Timer Virtual Lab
11. Implementation of Off-Delay Timer Virtual Lab
12. Implementation of Up-Down Counter Virtual Lab
13. Implementation of PLC Arithmetic Instructions Virtual Lab
14. Implementation of PID Controller Virtual Lab
Topics for projets based learning*
1. Maintaining constant speed (cruise control) and constant temperature (climate control) and maintaining pressure
2. Engine control, steering control, suspension control
3. Control skidding (antiskid system)
4. Automatic warehousing

5. Inventory control
6. Automation of farming
7. Commercial rail transportation
8. Biomedical CS
9. Design and Experimentation of Cable-Driven Platform Stabilization and Control Systems
10. Minimization of Energy Consumption in Underfloor Heating Systems
11. Automatic Water Pump Controller
12. Design, Analysis and Testing of a Flapping Wing Miniature Air Vehicle
13. Design Cognitive mobile robot model
14. PLC Based Performance Analysis Of Range Sensors For A Real-Time Power Plant Coal Level Sensing System.
15. Mine Water Level Fuzzy Control System Design Based On PLC.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. I.J. Nagrath, M.Gopal “Control Systems Engineering”, 5th Edition, New Age International Publication
2. Schaum’s Series book “Feedback Control Systems”.
3. Les Fenical “Control Systems”, 1st Edition, Cengage Learning India.
4. R. Anandanatarajan, P. Ramesh Babu, “Control Systems Engineering”, Scitech Publications
Reference Books:
1. Norman S. Nise “Control Systems Engineering”, 4th edition, Wiley edition.
2. Samarjeet Ghosh, “Control Systems Theory & Applications”, 1st edition, Pearsoneducation.
3. S.K. Bhattacharya, “Control Systems Engineering”, 1st edition, Pearson education.
4. Hackworth, “Programmable Logic Controller”, 1st edition, Pearson education.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - INTEGRATED CIRCUITS AND APPLICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial:00	TW & PR: 50 Marks	Credit: 01
		Total Credit: 5

Course Pre-requisites:	
	SDC-I, SDC-2, Electronics Network Theory

Course Objectives:	
1.	To introduce the OPAMP and its internal building blocks
2.	To provide the basics of analysis and design of linear and nonlinear applications of Op-Amp
3.	To introduce the students to design of active filters
4.	To introduce the students to analysis and design of OPAMP based waveform generators
5.	To introduce the Timer IC 555 and its applications
6.	To introduce PLL, Three terminal voltage regulators and ADC/DAC and their applications

Course Outcomes: After learning this course students will be able to	
1	Visualize the internal blocks of a typical OPAMP IC and interpret the OPAMP parameters
2	Analyze and design linear and nonlinear applications of OP-AMP.

3	Analyze and design first and second order active filters using OP-AMP..
4	Analyze and design Waveform Generators using OP-AMP.
5	Design of multivibrators using Timer IC 555
6	Demonstrate knowledge of Phase Locked Loop IC 565 and its application and design linear power supply using three terminal voltage regulators, classify ADC and DAC devices

UNIT – I	**OPAMP Internals**	**(08 Hours)**
	Amplifier types (voltage, current, transconductance, trans resistance), Limitations of CE amplifiers, Block diagram of OPAMP, Differential amplifier with and without constant current tail (review), Level Shifter, Complementary Symmetry Output power amplifier, Frequency compensation, Ideal and practical characteristics of OPAMP, Parameters of practical OPAMP, Offset voltage balancing.	
UNIT – II	**Linear Applications of OPAMP-I**	**(08 Hours)**
	DC and AC inverting amplifier, DC and AC Non-Inverting Amplifier, DC and AC Voltage Follower circuit, Summing Amplifier, Difference Amplifier, Instrumentation Amplifier, I-V and V-I converters	
UNIT - III	**Linear Applications of OPAMP-II**	**(08 Hours)**
	Integrator, Differentiator, Active Filters, Log, and anti-log amplifiers	
UNIT -IV	**Non-Linear Applications of OPAMP**	**(08 Hours)**
	Comparator and Schmitt Trigger circuit, Window detector, Precision rectifiers, Peak detector,	

	Sample and Hold circuit	
UNIT -V	**Waveform Generators**	**(08 Hours)**
	Positive Feedback and Barkhausen criteria, Wein bridge oscillator, RC Phase shift oscillator, Colpitts oscillator, Hartley oscillator, square wave generator, Triangular wave generator, IC 555 astable and monostable circuits	
UNIT -VI	**Voltage Regulators, PLL and Mixed Signal Circuits**	**(08 Hours)**
	Three terminal IC voltage regulators, Voltage Controlled Oscillator and Phase Locked Loop, Parameters of DAC, Digital-to-Analog Converters (Binary weighted, R-2R ladder network type), Analog to Digital Converters (Flash, Successive Approximation, Integrating) Parameters of ADC, Introduction to sigma-delta ADC.	

List of experiments:

1. Design, build and test DC inverting, non-inverting, and voltage follower circuits
2. Design, build and test AC inverting, non-inverting and voltage follower circuits, plot frequency response
3. Design, build and test inverting, non-inverting summing amplifier circuits
4. Design, build and test integrator circuit and plot frequency response
5. Design, build and test differentiator circuit and plot frequency response
6. Design, build and test 1st order active LPF and HPF and plot frequency responses
7. Design, build and test Wein bridge oscillator
8. Design, build and test RC phase shift oscillator
9. Design, build and test astable multivibrator using IC555

10. Measure line and load regulation of three terminal regulator
Topics for projets based learning*
1.Audio Mixer
2. Stereo Pre-amplifier
3. Graphic Equalizer
4. Burglar alarm
5. Tachometer
6. Universal Battery charger
7. Function Generator
8. Fixed voltage regulated power supply
9. Variable output voltage regulated power supply
10. Dual polarity regulated power supply
11. Electronic stethoscope
12. Digitally selectable precision attenuator
13. Bridge amplifier for stereo
14. Bar graph battery voltage indicator
15. Touch sensitive switch
*Students in a group of 3 to 4 shall complete any one project from the above list
Textbooks:
1. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition,2008, ISBN:0195696131, 9780195696131, Oxford University Press
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, 4th Edition, McGraw-Hill

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - ELECTROMAGNETICS AND TRANSMISSION LINE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credits:01
		Total Credit: 04

Course Pre-requisites:	
	Fundamentals of Vector Analysis and Mathematical Calculus
Course Objectives:	
	• To analyze basic Electrostatic laws such as Coulomb's law and Gauss law • To compute boundary conditions with electrostatic parameters • To analyze basic Magnetostatic laws such as Biot-Savart's Law and Ampere's Law • To evaluate Maxwell's equation • To demonstrate wave propagation through different media • To examine transmission Line and impedance matching techniques
Course Outcomes: After learning this course students will be able to	
1	Analyze electric field in different field distributions

2	Identify the Electrostatic parameters	
3	Analyze magnetostatic field in different field distributions	
4	Evaluate time varying Electric and Magnetic Fields	
5	Characterize wave equation	
6	Compute Transmission Line and its applications	
UNIT – I	**Electrostatic-I**	**(06 Hours)**
	Coulomb's law, Electrostatic Field Intensity, Calculation of Electric field for: infinite line, surface, volume charge distribution, Electric flux density, Concept of Divergence, Gauss Law, Application of Gauss's law for: point, infinite line, infinite sheet, uniformly charged sphere.	
UNIT – II	**Electrostatic-II**	**(06 Hours)**
	Electric Potential, Relation between Electric Field and Potential, Energy Density, Resistance, Capacitance, Boundary Condition	
UNIT - III	**Magnetostatics**	**(06 Hours)**
	Biot-Savart's Law, Application of Biot-Savart's Law, Stoke's Theorem, Ampere's Law, Application of Ampere's Law, Forces due to Magnetic Field, Boundary Conditions, Inductor, and Inductance. Standard inductance configurations: Toroid, Solenoid. Materials in magnetic fields.	

UNIT -IV	**Time Varying Fields and Maxwell's Equation**	**(06 Hours)**
	Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current, Maxwell's Equation in both differential form and integral form.	
UNIT -V	**Wave Propagation/ Uniform Plane Wave**	**(06 Hours)**
	Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Waves in Free Space, Plane Waves in Good Conductors, Power and Poynting Vector, Reflection of a Plane Wave at Normal Incidence.	
UNIT -VI	**Transmission Lines and Impedance Matching Techniques**	**(06 Hours)**
	Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Stub Matching Technique, QWT, Single Stub Matching, Double Stub Matching, EMC-EMI, Types of EMC.	

List of Tutorials:

1. Application of Stoke's theorem.
2. Application of Gauss's law
3. Energy stored in capacitor.
4. Application of Poission's and Laplace's equations.
5. Boundary conditions for magnetic fields.
6. Poynting theorem and their applications.

7. Applications of Smith Chart.
8. Simulation on Electromagnetic Interference and Compatibility
Topics for projets based learning*
1.Design Electrostatic Speakers using the concept of Electrostatic Forces and Energy
2. Study the Faraday Cage
3. Build Lightning Rod
4. Study and survey on Xerography – Electrostatic Imaging
5. Design any Electrostatic Filters
6. Design a gauge that is sensitive to the fluid level in the capacitive gauge.
7. Calculate characteristic impedance and propagation speed of a coaxial cable based on measured dimensions
8. Design a metal detecting device based on mutual inductance
9. Design a non-contact probe that can detect the presence and polarity of a static (or slowly varying) electric field in air
10. Design a non-contact AC current meter
11. Study and survey on Heart Defibrillators
12. Study and survey on Hard Disk Reading and writing process
13. Design Metal detectors
14. Study and survey on Magnetic Resonance Imaging (MRI)
15. Design Magnetic Brakes
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1.Matthew N. O. Sadiku, “Principles of Electromagnetics”, 4th Edition, Oxford University Press.
Reference Books:
1. John D. Kraus “Electromagnetic”, McGraw Hill.
2. William Hyte “Electromagnetic Engineering”, McGraw Hill
3. Edminister J.A, Electromagnetics, Tata McGraw-Hill.

4. R.K Shevgaonkar, Electromagnetic waves,Tata McGraw-Hill.
5. S Salivahanan& S Karthie, “electromagnetic Field Theory” Vikas Publishing House Ltd.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - ANALOG COMMUNICATION**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial:00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 5

Course Pre-requisites:	
	Signals and Linear Systems.

Course Objectives:	
1.	To introduce essential components of communication system.
2.	To teach the students DSB-FC modulation and demodulation and its mathematical background
3.	To teach the students DSB-SC & SSB modulation and demodulation and its mathematical background
4.	To teach the students frequency modulation and demodulation and its mathematical background
5.	To introduce the students working of radio receivers.
6.	To introduce the studentsanalog to digital conversion technique in communication system

Course Outcomes: After learning this course students will be able to	
1	Identify the basic components and effect of noise on communication system
2	Demonstrate the knowledge of DSB-FC modulation and demodulation and its mathematical background

3	Demonstrate the knowledge of DSB-SC & SSB modulation and demodulation and its mathematical background	
4	Demonstrate the knowledge of frequency modulation and demodulation and its mathematical background	
5	Identify components of communication receiver system.	
6	Demonstrate the knowledge of Pulse Modulation technique	
UNIT – I	**Principles of Communication Systems**	**(08 Hours)**
	Review of signals and systems, Frequency domain of signals, Block schematic of communication system, base band signals, RF bands, Necessity of modulation, Types ofchannels, Noise types - Internal & External, Noise Calculations, Signal to Noise ratio, Noise figure, Noise Temperature	
UNIT – II	**Amplitude Modulation-I**	**(08 Hours)**
	Amplitude Modulation principles, Representation of AM, Frequency spectrum & BW, Modulation index, % modulation, Power relations in AM, Trapezoidal patterns-, high- and low-level AM transmitters, DSB-FC Generation-linear and non-linear modulator, Linear modulators-low- and high-level linear modulators, Non-linear modulators- square law modulator and switching modulator, DSB-FC Demodulation- square law detector and envelope/diode detector.	
UNIT - III	**Amplitude Modulation-II**	**(08 Hours)**
	DSB-SC Principles, DSB-SC Generation Methods: Multiplier modulator, linear modulator, non-linear modulator and switching modulator, DSB-SC Demodulation-synchronous and coherent detection, SSB Principles, SSB Generation Methods: Filter method, phase shift method &the	

	third method,SSB Demodulation, Comparison of AM,DSB-SC and SSB, Independent sideband system (ISB), Vestigial sideband (VSB).	
UNIT -IV	**Frequency Modulation**	**(08 Hours)**
	Angle Modulation, Principles, mathematical analysis of FM, frequency deviation and percentage modulation, modulation index, deviation ratio, Bessel function,BW requirements, Narrow band & wide band FM, Pre-emphasis and de-emphasis, FM modulators - Direct & Indirect modulator, Direct modulator- varactor diode modulator, reactance modulator-frequency stabilized reactance modulator, Indirect modulator- Armstrong method, FM demodulators - Direct & Indirect detector, Types of direct detectors, Indirect detector-phase locked loop.	
UNIT -V	**Radio Receivers**	**(08 Hours)**
	Block diagram of AM receiver- TRF and Super heterodyne receiver,FM receiver, receiverperformance and measurement parameters: Sensitivity, Selectivity, fidelity, Image Frequency Rejection, Automatic Gain Control (AGC)- simple and delayed AGC, IF Amplifiers, Tracking- Two point and three-point tracking, Mixers-separately excited mixers and self-excited mixers.	
UNIT -VI	**Pulse Modulation**	**(08 Hours)**
	Sampling process, Sampling Theorem,Nyquist criteria, Sampling types: Natural & flat top sampling, aliasing error and aperture effect, Pulse Modulation-PAM modulator & demodulator, PWM modulator& demodulator, PPM modulator& demodulator, Comparison of PAM,PWM and	

	PPM, Multiplexing, TDM- transmitter and receiver, FDM- transmitter and receiver.	
List of experiments:		
1. Write a MATLAB program for generation of AM signal		
2. Write a MATLAB program for generation of DSB-SC signal		
3. Write a MATLAB program for generation of FM signal		
4. To perform Amplitude Modulation and Demodulation.		
5. To performDSB-SC Modulation & Demodulation.		
6. To performFrequency Modulation and Demodulation		
7. To perform sampling and Reconstruction of a signal.		
8. To performPulse Amplitude Modulation (PAM.)		
9. To performPulse Width Modulation (PWM)		
10. To performPulse Position Modulation (PPM)		
Topics for projets based learning*		
1. Survey report on types of noise and its impact on communication system		
2. Survey report on types of AM modulators and demodulators		
3. Build simple AM transmitter system using linear modulator		
4. Build simple AM transmitter system using non-linear modulator		
5. Build simple AM receiver system		
6. Survey report on types of FM modulators and demodulators		

7. Build simple FM transmitter system using direct modulator
8. Build simple FM transmitter system using indirect modulator
9. Build simple FM receiver system using direct demodulator
10. Build simple FM receiver system using indirect demodulator
11. Build a circuit for sampling and seconstruction of a signal.
12. Build the Pulse Amplitude Modulation circuit
13. Build the Pulse Width Modulation circuit
14. Build the Pulse Position Modulation circuit
15. Build the Pulse Position demodulation circuit
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Electronics Communication System, George Kennedy, 4th Edition, Tata McGraw HillPublication.
2. Modern Digital and analog Communication System, B.P.Lathi, Oxford University press.
Reference Books:
1. Principles of Communication Systems,Taub&Schilling,Tata McGraw-Hill Publication.
2. Communication Systems, Simon Haykin, 4th Edition, John Wiley & Sons.
3. Electronics Communications, Dennis Roddy, John Coolen, 4th Edition- PearsonEducation.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - DATA SCIENCE**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW: 50 Marks	Credits: 01
		Total Credits: 05

Course Pre-requisites:	
	Python Programming and DBMS.

Course Objectives:	
	• To acquire in-depth understanding of the fundamental concepts in data modeling, data analysis, statistics, machine learning techniques. • To strengthen the analytical and problem-solving skill through developing real time Use cases. • To gain practical experience in programming tools for data sciences, database systems, machine learning and Visualization tools. • To empower students with tools and techniques for handling, managing, analyzing and interpreting data.

Course Outcomes: After learning this course students will be able to	
1	Develop a schema design, perform ETL operations with normalized techniques.
2	Visualize the data and detect anomalies with the help of statistical methods.
3	Implement ANOVA test, Regression & Dimensionality Reduction Techniques.

4	Model different machine learning algorithms and draw predictive outcomes.	
5	Develop an interactive and functional Dashboard using Power BI.	
6	Visualize the data using Power BI	
UNIT – I	**Fundamentals of Data Analysis using MySQL**	**(08 Hours)**
	Introduction to Data Science, DBMS approach to analytics, ER Diagram and Schema design, Normalization techniques, data cleaning and transforming – Extract, Transform & Load.	
UNIT – II	**Data Analysis and Visualization with Excel, Python**	**(08 Hours)**
	with Excel: Descriptive statistics, Outlier detection, Visualization: Box plot, Line chart, Pie chart, Bar charts, Histogram. **With Python:** Pandas and Numpy, Data modelling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn.	
UNIT - III	**Advanced Statistics**	**(08 Hours)**
	Analysis of Variance (ANOVA), Regression Analysis: linear regression, multiple linear, and non-linear regression, Dimension Reduction Techniques.	
UNIT -IV	**Machine Learning-I**	**(08 Hours)**
	Introduction to Supervised and Unsupervised Learning, Clustering, Decision Trees, Random Forest, Multiple Linear Regression, Logistic Regression, Linear Discriminant Analysis	

UNIT -V	**Machine Learning-II**	**(08 Hours)**
	Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data.	
UNIT -VI	**Data visualization using Power BI**	**(08 Hours)**
	Introduction to Power BI, Basic charts and dashboard, Descriptive Statistics, Dimensions and Measures, Visual analytics: Storytelling through data, Dashboard design & principles.	

Term Work: Any 8 of below given list

1. SQL - Northwind Trader Database: Schema Design, Normalization & Cleaning.
2. Northwind Trader Database: Querying.
3. Statistics & Visualization with Excel.
4. Handling data using Python Pandas – Load (Multiple sources such as – Excel, SQL, CSV, URL), Transform.
5. Exploratory Data Analysis & Visualization using Python.
6. Machine Learning [Supervised] – Regression (Linear, Logistic & Multi-Linear.
7. Machine Learning [Supervised] – Classification (Logistic Regression, Decision Tree & Random Forest, KNN, K Mean Clustering, SVM).
8. Machine Learning [Time series] – ECG Analysis.
9. Machine Learning – Titanic Dataset Analysis (EDA)-1 .
10. Machine Learning – Titanic Dataset Analysis (Visualization & Prediction)-2.

11. Power BI – Input & Transforming Data.
12. Power BI – Creating Visuals & Reports.
13. Power BI – Dashboard.
Topics for projets based learning*
1. Design/Model a database without normalizing from scratch and create an E-R diagram as schema. Apply normalization techniques to previous created tables and perform Data Wrangling & Data Cleaning.
2. Implement an Email automation system using SQL & Python.
3. Create a Spotify Music Analysis visualization using Python pandas.
4. Create a Crypto currency Analysis visualization using Python pandas.
5. Build a Netflix like Movie recommendation model using Machine Learning.
6. Build a Song recommendation model using Machine Learning.
7. Build a Book recommendation model using Machine Learning.
8. Create a Credit Card Fraud Detection system using Machine Learning Algorithms.
9. Create a cheque clearance model using Machine Learning Algorithm.
10. Twitter Sentiment Analysis.
11. Uber Dataset Time Series Analysis.
12. Build a dynamic functional ChatBot using reddit conversations as dataset.
13. Build a Machine Learning Model with Health Care Data.
14. Create an interactive Super Store Dataset using PowerBI.
15. Create a Dashboard on Covid Vaccine Tracker using PowerBI.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O′Reilly Publication.

2. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, O′Reilly Publication.
3. Microsoft Power BI Quick Start Guide: Build dashboards and visualizations to make your data come to life, by Devin Knight , Brian Knight, Packt Publishing.

Reference Books:

1. Python Machine Learning By Example: The easiest way to get into machine learning, by Yuxi (Hayden) Liu, Packt Publishing.
2.Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence, by Brett Powell, Packt Publishing.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering **SUBJECT: - ADVANCED COMPUTER PROGRAMMING**		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 01

Course Pre-requisites:

1.	C programming.

Course Objectives:

1. To introduce the basic building blocks for JAVA programming
2. To teach the concept of multithreading and exception handling.
3. To teach the lambda functions.
4. To train the student to use java script.
5. To train the student to use HTML.

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

1	Demonstrate the knowledge of basic programming in JAVA.
2	Implement the concept of multithreading and exception handling.
3	Use the lambda functions.

4	Implement the concept of JavaScript.
5	Implement the concept ofHTML.
6	Design webpage using JavaScript and HTML.

Term Work: Any 16 of below given list

1. Introduction to basics of JAVA and JAVA installation.
2. WAP to implement static and non-static members and their execution control flow.
3. WAP to implement wrapper class.
4. WAP to implement flow control statements, looping statements and arrays.
5. WAP to implement:
    a. Inheritance
    b. Abstraction
6. WAP to implement:
    a. Polymorphism
    b. Encapsulation
7. WAP to implement exception handling and assertions.
8. WAP to implement multithreading.
9. WAP to implement callable and future.
10. WAP to implement string handling.
11. WAP to implement IO streams.

12. WAP to implement collection Array List.
13. WAP to implement collection LinkedList.
14. WAP to implement lambda functions with predicates.
15. WAP to implement lambda functions with streams.
16. WAP to implement annotations.
17. WAP to implement the basics of HTML
18. WAP to implement the basics of java script
19. WAP to implement handling of events and errors, debugging with java scripts.
20. A mini-project to create Web Pages using HTML and JavaScript.
Text Books:
1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
Reference Books:
1. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company
2. Java: How to Program by Deitel and Deitel
3. Ivan Bayross, "Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI", BPB Publication.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - SENSOR MODELLING AND SIMULATION LABORATORY

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 1

Course Pre-requisites:

	signals and systems and control systems.

Course Objectives:

1.	To introduce the transducers and sensors which will help direct measurement of electronic, electrical, and communication parameters.

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

1	Characterize the temperature sensors.
2	Simulate the performance of a bio-sensor.
3	Measurement of level in a tank using capacitive type level probe.
4	Characterize the LVDT
5	Design an orifice plate for a typical application.

6	Simulate the performance of a chemical sensor.
7	Characterize the strain gauge sensor.

List of Practicals to be performed in the laboratory

1. To learn the various static and dynamic characteristics of measurement systems.
2. Characterize the temperature sensor (RTD) on virtual lab
3. Measurement of level in a tank using capacitive type level probe on virtual lab
4. Characterize and analyze the working of the LVDT.
5. Characterize the strain gauge sensor.
6. To measure and study of Pressure indicator With Pressure Output in percentage
7. To measure and study of Flow Indicator with Flow rate, Totalizer
8. To measure and study of Level Indicator with MM, CM and percentage
9. To study Inductive rotor position sensor with four inductive coils using MATLAB
10. To study Electrothermal converter using MATLAB.
11. To study Rotary transformer for measurement of angle of rotation using MATLAB
12. To study Exponential light-emitting diode with optical power output port using MATLAB

Text Books&Reference Books:

1. H. S. Kalsi, “Digital Instrumentation”, Tata McGraw Hill
2. Clyde F. Coombs “Electronic Instrumentation Handbook” McGraw Hill
3. Cooper Helfric, “Electronic Instrumentation & Measurement Techniques”, Prentice Hall Publication