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

B. Tech. Sem. III: Electronics & Telecommunication Engineering
COURSE: - Data Structure and Algorithms

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**Credit Allotted**
Lectures : 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 02 Hours / Week	Internal Assessment: 40 Marks Term Work :25 Marks Oral: 25 Marks	Term Work & Oral : 01
Total : 05 Hours/Week	Total Marks :150 Marks	Total Credits : 04

Course Pre-requisites:

Computer Programming 1,Computer Programming 2

Course Outcomes:

	After successfully completing the course the student will be able to:
CO1	Comprehend fundamental principles of data structures and algorithms for effective problem-solving.
CO2	Execute operations on linear sequential data structures.
CO3	Implement linear linked organization data structures for efficient data representation.
CO4	Implement and analyze a variety of searching and sorting algorithms.
CO5	Execute operations on nonlinear data structures and trees.
CO6	Apply concepts for hashing and file organization for efficient data management.

UNIT - I	**Introduction to data structure and algorithm**	**(08 Hours)**
	Introduction to data structures, Classification of Data Structures, Primitive Data Types, Abstract Data Types abstract data types (ADT), Introduction to algorithms, Importance of Algorithm Analysis, characteristics of algorithms, algorithm design tools: pseudo code and flowchart, relationship among data, Complexity of an Algorithm, Asymptotic Analysis and Notations.	
UNIT - II	**Sequential Organization Data Structures**	**(06 Hours)**
	Stacks: primitive operations, stack as an ADT, realization of stacks using array, stack operations, multi-stack, applications of stack, expression evaluation and conversion, simulating recursion using stack. **Queue:** primitive operations, queues as ADT, realization of queue using array, circular queue, double ended queue, priority queue, applications of queue.	
UNIT -III	**Linked Organization Data Structures**	**(06 Hours)**

	Introduction to linked list, comparison of sequential and linked organizations, comparison of static and dynamic memory allocation, realization of linked lists, dynamic memory management, linked list as ADT, types of linked list, Operation on Linked List like Insertion-Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List,, applications of link list.	
UNIT -IV	**Searching and Sorting**	**(06 Hours)**
	Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort.	
UNIT- V	**Non-Linear Data Structure**	**(06 Hours)**
	Trees: Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expression trees and their usage, binary search trees, AVL Trees, Heaps and their implementation. **Graphs**: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	
UNIT -VI	**Hashing and File Organization:**	**(04 Hours)**
	Hashing: Introduction, key terms, hash function, Collision Resolution strategies, hash, Table overflow, skip list, comparison of hashing and skip lists. **File:** concept of file, file organization, sequential file organization, and direct access file Organization, indexed sequential file organization.	
Project Based Learning: Maximum 4 students per group , projects based only on the course		
List of Experiments:		
1.	Write a program to implement functions (insert, delete, display) on stack, queue and Circular queue data structure.	
2.	Write a program to convert and solve expression from	
3.	(a)Infix to Prefix (b) Infix to Postfix , Evaluate Postfix expression	
4.	Write a program to implement Singly Linked List manipulation for storing student Information (PRN, Name, Marks). (a) Display data of top rank student. (b) How many students secure first class and above rank?	
5.	Write a program to implement Doubly Linked List manipulation for storing Employee Information (Name, Salary, Age). (a) Display data of employees having a salary of more than 50,000. (b) Display list of employees having age less than 30 and salary greater than 30,000.	
6.	Write a program to implement Binary Search Tree storing city names and Traversal in	

	BST (In-order, Preorder, Post-order).
7.	Write a program to implement Threaded Binary Tree and its Traversals.
8.	Write a program to implement graph traversals: BFS and DFS.
Reference Books:	
1.	1. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", Prentice Hall of India, , ISBN-81-203-1177-9.
2.	E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, ISBN 16782928
3.	S. Lipschutz, “Data Structures”, McGraw Hill Pub.
4.	Patil V., “Data Structures using C++”, Oxford university press, ISBN 0-19-806623-6
5.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein,“Introduction to Algorithms”.

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
COURSE :SEMICONDUCTOR DEVICES AND CIRCUITS

Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Lectures: 03 Hours / Week	End Semester Examination :60 Marks	Theory : 03
Tutorial : 02 Hours / Week	Internal Assessment :40 Marks TW: 25 Marks PR: 25 Marks	Term Work & Practical : 01
Total : 05 Hours/Week	Total :150 Marks	Total Credits : 04

Pre-requisites: ELEMENTARY ELECTRONICS

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Analyze and design BJT amplifiers
CO2	Analyze and design FET & MOSFET amplifiers
CO3	Analyze multistage BJT amplifiers and select appropriate cascade topology
CO4	Identify feedback topology and design BJT feedback amplifiers
CO5	Identify , analyze and design BJT power amplifiers
CO6	Analyze BJT differential amplifiers and current mirrors

UNIT-I	**Basics of BJT Amplifiers and Models**	**(6 Hours)**
	Concept of AC load line, BJT as two-port networks, BJT Models small signal models (h-parameter, Ebers-Moll, hybrid –pi and T), Analysis of CE, CB, CC Amplifiers (Derivation of Zi, Zo, Av, Ai and Ap), Frequency response of BJT amplifiers, Single stage CE voltage amplifier design, Large signal BJT model, BJT as switch, power BJT	
UNIT-II	**JFET and MOSFET Amplifiers and Models**	**(6 Hours)**
	JFET models, Analysis of CS, CD, CG Amplifiers, Frequency response of JFET amplifiers, Single stage CS amplifier design, FET as switch.MOSFET models, Analysis of MOSFET amplifiers, Single stage CS amplifier design, Frequency response of MOSFET amplifiers, MOSFET as switch, Power MOSFET.	
UNIT-III	**Multistage Amplifiers and Coupling Methods**	**(6 Hours)**
	Need of the Multistage amplifiers, Types of Multistage Amplifiers, 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, analysis of transformer coupled amplifier. Design of Darlington Amplifier, design of Cascode amplifier.	
UNIT-IV	**Feedback in Amplifiers**	**(6 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, Analysis of one circuit for each feedback topology for input impedance, output impedance, gain and bandwidth.	
UNIT-V	**Power Amplifiers and Their Classification**	**(6 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-VI	**Current Mirrors and Differential Amplifiers**	**(6 Hours)**
	Concept of current mirror, Analysis of Widlar current source (BJT), Wilson current mirror (BJT), 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, Constant current bias, Differential mode gains, common mode gain, CMRR calculation, Derivation for output voltage, input and output impedances	

List of experiments:

1.	Measure and plot the frequency response of single stage CE voltage amplifier
2.	Measure and plot the frequency response of single stage JFET CS voltage amplifier
3.	Construct BJT switch circuits and compare the performance (power dissipation, transient response)
4.	Construct MOSFET switch circuits and compare the performance (power dissipation, transient response)
5.	To measure the gain and bandwidth of a 2-stage CE RC coupled amplifier
6.	To measure the gain of a direct coupled amplifier.
7.	To measure the gain of a cascade amplifier.
8.	To measure the gain and bandwidth of a voltage series negative feedback amplifier.
9.	To build and test a simple current mirror
10.	Measure THD for audio power amplifier

Project Based Learning: Maximum 4 students per group , projects based only on the course

Reference books:

1.	Fundamentals of Electronic Devices and Circuits, David A. Bell, 5th Edition,2008, ISBN:0195425235, 9780195425239, Oxford University Press
2.	Microelectronics Circuits, Adel S. Sedra & Kenneth C. Smith,7th Edition, 2015, ISBN 9780199339136, Oxford University Press

3.	Millman's Electronic Devices and Circuits (SIE) , Jacob millman, Christos C. Halkias, Satyabrata Jit, 4th Edition,2015 , ISBN 9789339219543**,** McGraw-Hill
4.	Linear Integrated Circuits, D Roy Choudhury, Shail B Jain,6th Edition 2021, ISBN 9788122472127,NEW AGE International Publishers.

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

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Lectures: 03 Hours / Week	End Semester Examination :60 Marks	Theory : 03
Tutorial: 01 Hours / Week	Internal Assessment :40 Marks	Tutorial : 01
Total : 04 Hours/Week	Total :100 Marks	Total Credit : 04

Course Pre-requisites:

	Engineering Mathematics I, Engineering Mathematics II, MATLAB fundamentals

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Characterize and analyze the properties of signals.
CO2	Classify the systems and analyze in time domain using convolution.
CO3	Apply Fourier transform for analysis of LTI systems.
CO4	Apply Laplace transform for analysis of LTI systems.
CO5	Apply discrete transforms for analysis of LTI systems.
CO6	Evaluate the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

UNIT – I	**Introduction to signals**	**(06 Hours)**
	Definition of signals, classification of signals: continuous time signals & discrete timesignals, 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**	**(06 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**	**(06 Hours)**
	Response of LTI Systems to exponential signals, periodic signals. Derivation Fourier series, Fourier Transforms and properties Duality and Parseval'stheorem, Fourier analysis examples: Output of LTI Systems Described by Differential, convolution with FT , UNIT step response of RC circuit, filtering, FT of Gaussian Pulse.	

UNIT -IV	**Laplace Transform and Application**	**(06 Hours)**
	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**	**(06 Hours)**
	Discrete time Fourier series and properties, Z-Transform and properties, Region of Convergence for the Z-Transform, Convolution with ZT, Application of Z-Transformto the LTI system analysis.	
UNIT -VI	**Correlation and Spectral Density**	**(06 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.	

Project Based Learning: Maximum 4 students per group , projects based only on the course

Reference Books:

1. Roberts M. J., Signals & Systems, TMH.
2. Oppenheim, Wilsely &Nawab, Signals & Systems, MGH.
3. B.P.Lathi, Signal Processing & Linear Systems, Berkeley Cambridge, 1998 Edition.

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B. Tech. Sem. III: Electronics & Telecommunication Engineering

COURSE: - NETWORK ANALYSIS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Lectures: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 03
--	Internal Assessment: 40 Marks	--
Total : 03 Hours/Week	Total :100 Marks	Total Credit : 03

Course Pre-requisites:

	Elementary Electronics, Electrical Technology

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Analyze DC circuits using Mesh Analysis, Node Analysis.
CO2	Analyze Network Theorems.
CO3	Apply graph theory by formulating the network equilibrium equations for circuit analysis.
CO4	Sketch the resonance curves for a given series and parallel resonant circuits.
CO5	Compute two port parameters for a given network
CO6	Design constant-k prototype low pass, high pass, band pass and band stop passive filters.

UNIT – I	**Circuit Analysis**	**(06 Hours)**
	Kirchhoff's Current Law, Kirchhoff's Voltage Law, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node.	
UNIT – II	**Network Theorems**	**(06 Hours)**
	Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.	
UNIT - III	**Formulation of network equilibrium equations using Graph Theory**	**(06 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 -IV	**Transient Analysis of the Series Reactive Circuits**	**(06 Hours)**
	Time and frequency domain analysis of linear circuits such as RL, RC and RLC circuits, A procedure for evaluating initial conditions, the step response in RC, RL, RLC circuits using Laplace Transform.	
UNIT -V	**Two Port Networks**	**(06 Hours)**
	Concept of Two port network, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Reciprocity and Symmetry conditions	
UNIT -VI	**Passive Filter Analysis**	**(06 Hours)**

	Filter Fundamentals, Constant K prototype for Low Pass Filter, High Pass Filter, Band Pass Filter and Band Stop Filter,m-derived Low Pass Filter and High Pass Filter, Terminating half sections, Composite filters, Applications of passive filters.	

Project Based Learning: Maximum 4 students per group , projects based only on the course

Reference Books:

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)
3. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
4. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
COURSE: - DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 03
Practical: 02 Hours / Week	Internal Assessment :40 Marks TW: 25 Marks OR: 25 Marks	Term Work & Oral : 01
Total : 05 Hours/Week	Total :150 Marks	Total Credit : 04

Course Pre-requisites: Computer Programming-II

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Design E-R Model for given requirements and convert the same into database tables.
CO2	Use database techniques such as SQL & PL/SQL.
CO3	Use Algorithms for Decomposition such as 2NF, 3NF, BCNF.
CO4	Use algorithms to solve scheduling conflicts.
CO5	Identify the Pros and cons of Parallel and Distributed Databases
CO6	Use modern database techniques such as NOSQL.

UNIT – I	**Introduction**	**(06 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**	**(06 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**	**(06 Hours)**
	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	
UNIT -IV	**Database Transactions and Query Processing**	**(06 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**	**(06 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**	**(06 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	

Project Based Learning: Maximum 4 students per group , projects based only on the course

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

1. Schema: a) Borrower(Rollin, Name, Date of Issue, Name of Book, Status)
2. Fine(Roll.no, Date ,Amt)

a) Accept roll.no & name of book from use.
b) Check the number of days (from date of issue), if days are between 15 to 30 then fine amount will be Rs 5per day.
c) If no. of days>30, per day fine will be Rs 50 per day & for days less than 30, Rs. 5 perday.
d) After submitting the book, status will change from I to R.
e) 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.

7. 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.
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, inline with above statement. The problem statement should clearly state the requirements
9.	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
10.	Write a program to implement Mogo DB database connectivity with python Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC.
11.	Implement MYSQL/Oracle database connectivity with python Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC
Reference 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
4.	C J Date, “An Introduction to Database Systems”, Addison-Wesley, ISBN: 0201144719
5.	S.K.Singh, “Database Systems : Concepts, Design and Application”, Pearson, Education, ISBN 978-81-317-6092-5
6.	Kristina Chodorow, Michael Dirolf, “MangoDB: The Definitive Guide” ,O’Reilly Publications, ISBN: 978-1-449-34468-9.
7.	Adam Fowler, “NoSQL For Dummies”, John Wiley & Sons, ISBN-1118905628
8.	Kevin Roebuck, “Storing and Managing Big Data - NoSQL, HADOOP and More”, Emereopty Limited, ISBN: 1743045743, 9781743045749
9.	Joy A. Kreibich, “Using SQLite”, O'REILLY, ISBN: 13:978-93-5110-934-1
10.	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
COURSE: EDA TOOL PRACTICE

Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Lectures : 00 Hours/Week	End Semester Examination :-Marks	Theory : 00
Practical : 02 Hours / Week	TW: 25 Marks OR: 25 Marks	Term Work & Oral : 01
Total : 02 Hours/Week	Total: 50 Marks	Total Credits : 01

Pre-requisites: Elementary Electronics, Digital Electronics

Course Outcomes: After successfully completing the course the student will be able to:

CO1	Perform Transient Analysis of simple circuits using EDA tool.
CO2	Perform AC Analysis of simple circuits using EDA tool.
CO3	Use an EDA tool for simulating basic analog electronic circuits.
CO4	Use an EDA tool for simulating basic digital electronic circuits.
CO5	Use virtual instruments in an EDA tool for analyzing and testing basic electrical and electronic circuits.
CO6	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.
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.

References Books:

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

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
COURSE: - Electromagnetics

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 03
Tutorial: 01 Hours / Week	Continuous Assessment: 40 Marks	Tutorial : 01
Total : 04 Hours/Week	Total :100 Marks	Total credit : 04

Course Pre-requisites: Engineering Mathematics I, Engineering Mathematics II,

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Analyze the physical concepts of static electric fields
CO2	Analyze the physical concepts of static magnetic fields.
CO3	Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either side.
CO4	Apply the Maxwell's equations to solve problems in electromagnetic field theory
CO5	Visualize and analyze wave propagation phenomena in media with different interfaces
CO6	Interpret and apply the transmission line equation to solve the problems and determine various parameters with Smith chart

UNIT – I	**Electrostatics**	**(06 Hours)**
	3D Coordinate Geometry, Vector Calculus, Physical significance of Gradient, Divergence, Curl, coulomb's Law, Electric field intensity(E), Displacement Flux Density(D), Gauss's law, Electric potential(V), Potential Gradient, E/D/V due to uniform sources (point charge, infinite line charge, infinite surface charge) Application Case study: electrostatic discharge ,CRO	
UNIT – II	**Magneto statics**	**(06 Hours)**
	Biot–Savart's Law , Ampere's Circuit Law ,Lorentz force equation, magnetic field intensity (H), Magnetic Flux Density(B), H due to straight conductors, circular loop, infinite sheet of current, Maxwell Equations for Magneto Statics, physical interpretation. Application Case study: Magnetic Resonance Imaging (MRI)	
UNIT - III	**Boundary Conditions**	**(06 Hours)**
	Properties of Conductors, Dielectric Materials, Dielectric Polarization ,Boundary conditions (dielectric-dielectric, conductor –dielectric), significance and applications of Poisson's and Laplace's equations Magnetization, magnetic	

	materials, Boundary conditions for Magnetic Fields. Application Case study:magnetic levitation ,RF MEMS	
UNIT -IV	**Time Varying Electromagnetic Fields: Maxwell Equations**	**(06 Hours)**
	Faraday‘s law, Translational and motional e.m.f, Poisson’s and Laplace Equations, , Displacement current density, Time varying Maxwell‘s equations - point form, integral form, Power and Poynting theorem Application Case study: Motors ,Generators	
UNIT -V	**Uniform Plane Wave**	**(06 Hours)**
	Maxwell‘s equation using Phasor notations, Electromagnetic wave equations (Helmholtz equation), Relation between E and H, depth of penetration, concept of polarization, plane waves in free space, plane waves in conductors, plane waves in lossless dielectric , Snell‘s law, Application Case study: Antenna radiation mechanism	
UNIT -VI	**Transmission Line Theory**	**(06 Hours)**
	Transmission Line parameters, skin effect, physical significance of the Transmission line equations, the distortion less line, Reflection on a line not terminated in Z0, open and short circuited lines, reflection coefficient and reflection loss, standing waves, standing wave ratio, Input impedance of dissipation less line, Smith Chart and its applications in solving the Transmission line parameters, Application Case study: twisted pair cable, coaxial cable, waveguide	

List of experiments:
At least 4 Assignments should be conducted using Virtual Electromagnetic Lab,**https://www.ee.iitb.ac.in/course/~vel/**
1. Vector analysis, Electric field Intensity(E): Due to Q, ρL, ρS
2. Gauss's Law, Electric flux Density(D) & Electrical Potential (V) : Due to Q, ρL, ρS ,
3. Electrostatic Boundary Conditions: dielectric-dielectric, conductor –dielectric
4. Poisson's and Laplace's Equation: Capacitance, Energy density.
5. Magnetic field Intensity (H)- Biot -Savart: Due to I dL, K dS, J dV, and Ampere’s circuital law
6. Magnetic Boundary Conditions, Inductance, Force, Torque, Energy density.
7. Faradays Law, Maxwell’s Equations
8. Poynting Theorem, Retarded Magnetic Potential
9. Transmission line: Primary & Secondary Constants , V & I
10 computation Reflection Coefficient, SWR using Smith Chart
Project Based Learning: Maximum 4 students per group, Case studies based only on the course
Reference books

1. M.N.O. Sadiku and S.V. Kulkarni, “Principles of Electromagnetics”, Oxford University Press, India, 2015 (Asian adaptation of 'M.N.O. Sadiku, Elements of Electromagnetics, Sixth International Edition, Oxford University Press'), 6th Edition
2. William H. Hayt and John A. Buck, “Engineering Electromagnetics”, Tata McGraw Hill, 8th Revised Edition.
3. Kraus and Fleish, “Electromagnetics with Applications”, McGraw Hill International Editions, 5th Edition.
4. Jordan and Balmain, “Electromagnetic Waves and Radiating Systems”, PHI, 1964.

B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - CONTROL SYSTEMS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 03
--	Continuous Assessment: 40 Marks	--
Total : 03 Hours/Week	Total :100 Marks	Total credit : 03

Course Pre-requisites: Engineering Mathematics I, Engineering Mathematics II, MATLAB fundamentals, Signals and Systems

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction techniqueand signal flow graph.
CO2	Determine the time response for different system, the errors in various control systems; evaluate the stability of a systemusing Routh's Stability Criterion and analysis graphical technique such as root locus.
CO3	Demonstrate the knowledge of control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID andcompensators.
CO4	Determine frequency response and different graphical methods like Bode plot and polar plot.
CO5	Calculate the time response for digital control systems and design digital control system.
CO6	Implement the state variables for state variable model for linear as well as digital control systems.

UNIT – I	**Introduction to Control System**	**(06 Hours)**
	Introduction to analog as well as digital control system, Classification of Control System, controlproblem, 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**	**(06 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**	**(06 Hours)**
	Effect of Poles and Zeros on the System Stability, Types of Compensators, Lead, Lag, Lead-LagCompensators design, Control actions – On/Off, P, PI, PD, PID.	
UNIT -IV	**Frequency Domain Analysis**	**(06 Hours)**
	Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.	
UNIT -V	**Digital control systems**	**(06 Hours)**
	Time Response of discrete time systems: Time response specifications, Steady state error, errorconstants, time response for 1st order and 2nd order systems. Design of sampled data control system: Root locus technique, Bode plot, Nyquist stability Criteria.	
UNIT -VI	**State variable analysis**	**(06 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 Function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.	

Project Based Learning: Maximum 4 students per group , projects based only on the course

Reference 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
5. Norman S. Nise "Control Systems Engineering", 4th edition, Wiley edition.
6. Samarjeet Ghosh, "Control Systems Theory & Applications", 1st edition, Pearsoneducation.
7. S.K. Bhattacharya, "Control Systems Engineering", 1st edition, Pearson education.

Bharati Vidyapeeth
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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
COURSE : INTEGRATED CIRCUITS AND APPLICATIONS

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 03 Hours/Week	End Semester Examination:60 Marks	Theory : 03
Practical: 02 Hours/Week	Internal Assessment :40 Marks TW: 25 Marks PR: 25 Marks	Term Work & Practical : 01
Total : 05 Hours/Week	Total :150 Marks	Total Credits : 04

Pre-requisites: ELEMENTARY ELECTRONICS, SEMICONDUCTOR DEVICES AND CIRCUITS

Course Outcomes: After successfully completing the course, the student will be able to:

CO1	Visualize the internal blocks of a typical operational amplifier IC and interpret the operational amplifier IC parameters
CO2	Analyze and design inverting, non-inverting, voltage follower, difference amplifier, instrumentation amplifier circuits usingoperational amplifier IC
CO3	Analyze and design active integrator, differentiator,active filters, log, antilog circuits using operational amplifier IC
CO4	Analyze and design operational amplifier circuits for non-linear applications
CO5	Analyze and design waveformgenerators using operational amplifier IC and IC555
CO6	Design linear power supply using three terminal voltage regulators, identify and select ADC and DAC devices based on specific requirements.

UNIT-I	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.	**(6 Hours)**
UNIT-II	DC and AC inverting amplifier, DC and AC Non-Inverting Amplifier, DC and AC Voltage Follower circuit, Summing Amplifier, Difference Amplifier, 2-opamp and 3-opamp Instrumentation Amplifiers, I-V and V-I converters	**(6Hours)**
UNIT-III	Active Integrator, Active Differentiator, 1st and 2nd order active LPF and HPF, All-pass filter, Bandpass and Band reject filters, notch filter, Log and anti-log amplifiers, V-Iconverter ,I-V converter	**(6 Hours)**
UNIT-IV	Analysis and design of Comparator and Schmitt Trigger circuit, Window detector, Precision rectifiers, Peak detector, Sample and Hold circuit	**(6 Hours)**
UNIT-V	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	**(6 Hours)**
UNIT-VI	Three terminal IC voltage regulators, Parameters of DAC, Digital-to-Analog Converters (Binary weighted, R-2R ladder network type), Analog to Digital	**(6 Hours)**

	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
11	Simulate an ADC and DAC circuits

Project Based Learning: Maximum 4 students per group , projects based only on the course

References Books:	
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
COURSE: - ANALOG COMMUNICATION

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Lectures : 03 Hours/Week	End Semester Examination:60 Marks	Theory : 03
Practical : 02 Hours/Week	Internal Assessment :40 Marks TW: 25 Marks PR: 25 Marks	Term Work & Oral : 01
Total : 05 Hours/Week	Total :150 Marks	Total Credits : 04

Course Pre-requisites: Signals and Systems.

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Identify basic components and effect of noise on communication system.
CO2	Analyze DSB-FC modulation and demodulation techniques mathematically.
CO3	Analyze DSB-SC & SSB modulation and demodulation techniques mathematically.
CO4	Analyze frequency modulation and demodulation techniques mathematically.
CO5	Identify components of communication receiver system.
CO6	Use the concepts of sampling for analysis of pulse modulation techniques.

UNIT – I	**Principles of Electronic Communication Systems**	**(06 Hours)**
	Review of signals and systems, RF bands, Block schematic of electronic communication system, base band signals, Necessity of modulation, Types of channels, Noise types -Internal & External, Noise Calculations, Signal to Noise ratio, Noise figure, Noise Temperature	
UNIT – II	**Amplitude Modulation-I**	**(06 Hours)**
	Amplitude Modulation principles, Representation of AM, Frequency spectrum & BW, Modulation index, Percentage modulation, Power relations in AM, 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**	**(06 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**	**(06 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, Indirect modulator- Armstrong method, FM demodulators - Direct & Indirect detector, Direct detectors- Balanced slope detector, Ratio detector, Indirect detector- phase locked loop.	
UNIT -V	**Radio Receivers**	**(06 Hours)**
	Block diagram of AM receiver- TRF and Super heterodyne receiver, FM receiver, receiver performance 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**	**(06 Hours)**
	Sampling process, 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. To perform Amplitude Modulation and Demodulation.
2. Write a MATLAB program for generation of AM signal.
3. To perform DSB-SC Modulation & Demodulation.
4. Write a MATLAB program for generation of DSB-SC signal.
5. To perform Frequency Modulation and Demodulation.
6. Write a MATLAB program for generation of FM signal.
7. To perform Sampling and Reconstruction of a signal.
8. To perform Pulse Amplitude Modulation (PAM)
9. To perform Pulse Width Modulation (PWM)
10. To perform Pulse Position Modulation (PPM)

Project Based Learning: Maximum 4 students per group, projects based only on the course

Reference Books

1. Electronics Communication System, George Kennedy, 4th Edition, Tata McGraw Hill Publication.
2. Modern Digital and analog Communication System, B.P.Lathi, Oxford University press.
3. Communication Systems, Simon Haykin, 4th Edition, John Wiley & Sons.
4. Electronics Communications, Dennis Roddy, John Coolen, 4th Edition- Pearson Education.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
COURSE: - Introduction to Data science

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Lectures : 03 Hours/Week	End Semester Examination:60 Marks	Theory : 03
Practical : 02 Hours/Week	Internal Assessment :40 Marks TW: 25 Marks PR: 25 Marks	Term Work & Oral : 01
Total : 05 Hours/Week	Total :150 Marks	Total Credits : 04

Course Pre-requisites: Database Management Systems, Computer Programming-II

Course Outcomes: After successfully completing the course, the student will be able to

CO1	Develop a schema design, perform ETL operations with normalized techniques.
CO2	Visualize the data and detect anomalies with the help of statistical methods.
CO3	Implement ANOVA test, Regression & Dimensionality Reduction Techniques
CO4	Model different machine learning algorithms and draw predictive outcomes.
CO5	Develop an interactive and functional Dashboard using Power BI.
CO6	Develop a schema design, perform ETL operations with normalized techniques.

UNIT – I	**Fundamentals of Data Analysis using MySQL**	**(06 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**	**(06 Hours)**
	with Excel: Descriptive statistics, Outlier detection, Visualization: Box plot, Line chart, Pie chart, Bar charts, Histogram **With Python:** Pandas and Numpy, Data modeling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn	
UNIT - III	**Advanced Statistics**	**(06 Hours)**
	Analysis of Variance (ANOVA), Regression Analysis: linear regression, multiple linear, and non-linear regression, Dimension Reduction Techniques**.**	

UNIT -IV	**Machine Learning-I**	**(06 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**	**(06 Hours)**
	Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data.	
UNIT -VI	**Data visualization using Power BI**	**(06 Hours)**
	Introduction to Power BI, Basic charts and dashboard, Descriptive Statistics, Dimensions and Measures, Visual analytics: Storytelling through data, Dashboard design & principles.	

List of experiments

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)
11. Power BI – Input & Transforming Data.
12. Power BI – Creating Visuals & Reports.
13. Power BI – Dashboard.

Project Based Learning: Maximum 4 students per group , projects based only on the course

Reference 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,
3. Microsoft Power BI Quick Start Guide: Build dashboards and visualizations
4. Python Machine Learning By Example: The easiest way to get into
5. machine learning, by Yuxi (Hayden) Liu, Packt Publishing
6. 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
COURSE: Microcontroller Programming

Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Lectures : 0 Hours/Week	End Semester Examination :00 Marks	Theory : 00
Practical : 2 Hours/Week	Internal Assessment :00 Marks TW: 25 Marks OR: 25 Marks	Term Work & Oral : 01
Total : 2 Hours/Week	Total : 50 Marks	Total Credits : 01

Pre-requisites: Digital Electronics, Elementary Electronics

Course Outcomes: After successfully completing the course, the student will be able to:

CO1	Draw 8-bit microcontroller architecture- 8051
CO2	Program 8051 microcontroller using various addressing modes and data transfer instructions
CO3	Perform assembly language programming for 8051
CO4	Analyze the operation of timers and counters for delay generation and event counting.
CO5	Interface the different peripherals with microcontroller.
CO6	Design a microcontroller-based prototype system.

List of experiments:

Programming / interfacing experiments with IDE for 8051

Assembly Language Programming experiments GROUP A (All compulsory)

1.	Study architecture and programmer's model of 8051 micro controller
2.	Identify and study various blocks of 8051 micro controller development board.
3.	Study of Addressing modes and Instruction set of 8051 micro controllers
4.	Study Instruction set of 8051 for Arithmetic and Logical operations a. Write an Assembly language program for Addition Subtraction Multiplication and Division of 2 – 8 bit and16 bit numbers
5.	Study Instruction set of 8051 for Arithmetic /Logical and Program and branching instructions a. Write an Assembly language program for Addition and Subtraction of N - 8 bit numbers. Perform simple logical operations on 16 bit data.
6.	Study Instruction set of 8051 for Data transfer instructions a. Write an Assembly language program for Block of Data transfer between specified memory locations. Consider Overlap and nonoverlap type of data Interfacing experiments using 8051 Trainer kit and interfacing modules or simulation. Implementation in Embedded C /Assembly (Any 4 between 07 to 11)

7.	Study port structure and interfacing concepts of 8051 a. Write an Assembly language program to Interface 7-segment display to show the decimal number from 0 to 9.
8.	Write an Assembly language program to interface LCD and LEDs with port and display information.
9.	Study DAC interfacing concepts of 8051 a. Write an Assembly language program for generation of following waveform with DAC /Simulation 1. Triangular 2. Staircase 3. sine
10.	Study Timers/counters in 8051 microcontrollers. a. Write an Assembly language program to generate pulse and square wave by using on chip timer.
11.	Write an Assembly language program to Interface relay with micro controller and turn it ON and OFF.

Reference Books:

1.The 8051 Microcontroller and Embedded Systems: Using Assembly and C by M.A. MAZIDI

2 The 8051 Micro controller 3rd Edition By Kenneth Ayala

4.Practical Electronics (Volume I): 8085 Microprocessor & 8051 Micro controller Laboratory Manual by Balamurugan A , Veeramanikandasamy T

5. Embedding system building blocks, Labrosse, via CMP publishers.

6. Embedded Systems, Raj Kamal, TMH. 4) Micro Controllers, Ajay V Deshmukh, TMH.

7. Micro Controllers, Ajay V Deshmukh, TMH.

8. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.

9. Micro controllers, Raj Kamal, Pearson Edition.

10.An Embedded Software Primer, David E. Simon, Pearson Edition.

11.Embedded/Real-Time Systems‘, KVKKF Prasad, Dreamtech, Press