SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204
Estd:1980

Regulation: R20	II / IV - B.Tech. I - Semester

COMPUTER SCIENCE AND DESIGN

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2021-22 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20BS2101	Numerical Methods & Vector Calculus	BS	3	3	0	0	30	70	100
B20BS2103	Mathematical Foundations of Computer Science	BS	3	3	0	0	30	70	100
B20AM2102	Object Oriented Programming with JAVA	PC	3	3	0	0	30	70	100
B20AM2103	Database Management Systems	PC	3	3	0	0	30	70	100
B20HS2101	Managerial Economics and Financial Accountancy	HS	3	3	0	0	30	70	100
B20AM2105	Object Oriented Programming with JAVA Lab	PC	1.5	0	0	3	15	35	50
B20AM2106	Database Management Systems Lab	PC	1.5	0	0	3	15	35	50
B20CD2101	Full Stack Web Application Lab	PC	1.5	0	0	3	15	35	50
B20CD2102	Game Development Lab (Skill Oriented Course-I)	SOC	2	1	0	2	--	50	50
B20MC2103	English Proficiency	MC	0	2	0	0	--	--	--
B20CD2103	Community Service Project	PR	4	--	--	--	--	100	100
	TOTAL		**25.5**	**18**	**0**	**11**	**195**	**605**	**800**

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS2101	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

NUMERICAL METHODS & VECTOR CALCULUS

(Common to CE, CSG, CSE, EEE & IT)

Course Objectives: Students are expected to learn

1	Numerical methods to solve algebraic and transcendental equations and the concept of interpolation and its use for equally and unequally spaced data points,
2	Methods for numerical evaluation of integrals and for solving first order ODEs.
3	Concepts of double, triple integrals and its applications.
4	Concepts of Gradient, divergence, curl.
5	Vector integral theorems.

Course Outcomes: At the end of the course students will be able to

S. No	Outcome	Knowledge level
1	Determine a real root of an algebraic or transcendental equation. Fit an interpolation formula and perform interpolation for equally spaced and unequally spaced data.	K3
2	Evaluate numerically certain definite integrals. Solve a first order ordinary differential equation by Euler and RK methods.	K3
3	Evaluate double integrals and determine the areas.	K3
4	Evaluate triple integrals and determine the volumes.	K3
5	Find the gradient of a scalar function, divergence and curl of a vector function.	K3
6	Solve simple problems using vector integral theorems.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Solution of Algebraic and Transcendental Equations:** Introduction, Bisection method, Method of false position, Iteration method Newton-Raphson method. **Interpolation:** Introduction, forward differences, backward differences, and Central differences. Differences of a polynomial, Newton's forward, and backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange interpolation formulae.
UNIT-II (10 Hrs)	**Numerical Integration and solution of Ordinary Differential equations:** Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Solution of first order ordinary differential equations subjected to initial conditions by Taylor's method, Picard's method, Euler's method, Modified Euler's method and Fourth order Runge -Kutta method.

UNIT-III (12 Hrs)	**Multiple integrals:** Double and triple integrals, Change of order of integration. Change of variables, applications to find Areas and Volumes.
UNIT-IV (10 Hrs)	**Vector differentiation:** Scalar and vector point functions, Vector Differentiation, Gradient, Directional derivative, Divergence, Curl, Scalar Potential.
UNIT-V (14Hrs)	**Vector Integration**: Line integral, Work done; Area, Surface and volume integrals, Vector integral theorems: Greens, Stokes, and Gauss Divergence theorems (without proof).

Text Books:	
1.	Scope and Treatment as in "Higher Engineering Mathematics", by Dr.B.S.Grewal,43rd Edition, Khanna Publishers.
Reference Books:	
1.	Advanced Engineering Mathematics, by Erwin Kreyszig,Wiley
2.	Higher Engineering Mathematics, by B.V.Ramana, Tata Mc Graw Hill Company.
3.	A text book of Engineering Mathematics, by N.P.Bali and Dr. Manish Goyal, Lakshmi Publications.
4.	Peter O' Neil, Advanced Engineering Mathematics, Cengage.
5.	Advanced Engineering Mathematics, by H.K.Dass, S.Chand Company.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS2103	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to AIDS & CSG)

Course Objectives: Students are expected to

1.	Understand propositional and predicate calculus.
2.	Know about concepts of counting techniques.
3.	Identify various types of relations and discuss their properties.
4.	Understand the concepts in Lattices and Boolean Algebra.
5.	Know about generating functions and methods of solving recurrence relations
6.	Have an idea on the concepts of Graph theory & Tree structures

Course Outcomes: At the end of the Course the students will be able to

S.No	Outcome	Knowledge level
1.	Write and verify the arguments for their validity using propositional and predicate logic.	K3
2.	Utilize different counting methods in their fields of study.	K3
3.	Make use of various types of relations and their properties.	K3
4.	Identify different Lattices and Boolean expressions.	K3
5.	Formulate and solve the recurrence relations.	K3
6.	Utilize the concepts in graphs and trees.	K3

SYLLABUS

UNIT-I (8 Hrs)	**Mathematical Logic:** Propositional Calculus: Statements and Notations, Connectives, Well-formed Formulae, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises. Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.
UNIT-II (8 Hrs)	**Combinatorics**: Basics of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Theorems, Binomial and Multinomial Coefficients, Principle of Inclusion–Exclusion.

UNIT-III (8 Hrs)	**Relations, Lattices & Boolean Algebra:** **Relations :** Definition of Relation, Properties of Binary Relations, Relation matrix and diagraph, Operations on Relations, Transitive Closure, Warshall's algorithm, Equivalence and Compatibility relations, Partial Ordering Relations, Hasse Diagrams. **Lattices & Boolean Algebra:** Lattices and their properties, different types of lattices, Boolean algebra- Boolean expressions, truth tables and karnaugh maps
UNIT-IV (8 Hrs)	**Recurrence Relations**: Generating Functions, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations
UNIT-V (8 Hrs)	**Graph Theory:** Basic Concepts of Graphs, Sub graphs, Isomorphism of Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite graphs, Planar Graphs, Euler's Formula. **Trees**: Definition of Tree, properties of Trees, Different tree structures, Binary trees, Spanning trees, Minimal Spanning Trees, Kruskal's and Prim's Algorithms.

Text Books:	
1.	Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2.	Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P.Baker, 2nd Edition, Prentice Hall of India
Reference Books:	
1.	Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D.P. Mahapatra, 3rd Edition, Tata McGraw Hill.
2.	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen,7th Edition, Tata McGraw Hill.
3.	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.
4.	Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.

E -Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/
4.	https://www.linkedin.com/in/jamesgosling
5.	https://en.wikipedia.org/wiki/James_Gosling#Books

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2102	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

OBJECT ORIENTED PROGRAMMING WITH JAVA

(Common to AIML & CSG)

Course Objectives:

1.	To identify Java language components and how they work together in applications
2.	To learn the fundamentals of object-oriented programming in Java, including defining classes, Invoking methods, using class libraries and collections.
3.	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling, file I/O in Java applications
4.	To understand how to design applications with threads in Java.
5.	To understand how to use Java JDBC APIs and SWING framework for program development.

Course Outcomes: At the end of the course Students will be able to

S. No	Outcome	Knowledge Level
1.	Demonstrate the syntax and semantics of java programming language and basic concepts of OOP.	K2
2.	Explain array data structure, collections and string manipulation operations	K2
3.	Use input & output streams for persistent storage of data and develop reusable programs using the concepts of inheritance, interfaces and packages	K3
4.	Apply the concept of Exception handing and multithreading to build an efficient and error free code.	K3
5.	Develop a GUI application using SWING and apply JDBC to interface with database.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to JAVA:** Structure of JAVA, Features of JAVA, JAVA Tokens, Command Line Arguments, User input to programs, Data Types, Literals Constants, Variables, Operators, Type Casting, Control Statements. **Classes & Objects:** Introduction, Class Declaration and Modifiers, Class Members, Methods, Defining methods, Declaration of Class Objects, Method overloading and Nested classes. **Constructors:** Default Constructor, Parameterized Constructor, Copy Constructor and Constructor Overloading, Types of variables, Instance Variables, Static variables, Local Variables and This Keyword.

UNIT-II (10 Hrs)	**Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Dynamic Change of Array Size, Two-dimensional Arrays and Three-dimensional Arrays. **Collections:** Introduction to Collections, ArrayList: add, remove and access elements, HashMap: add, remove, access and search and HashSet: add, remove, iterate, union, intersection, subset. **String Handling in Java:** Introduction, Methods in String Class, Methods for comparison of Strings, Methods for Modifying Strings, Methods for searching Strings, String Constant Pool and String Buffer class.
UNIT-III (10Hrs)	**Inheritance:** Introduction, Types of Inheritances, Single inheritance, Multi-level inheritance, Hierarchical Inheritance, Hybrid Inheritance and Multiple inheritance, Method Overriding, Super Keyword, Final Keyword and Abstract Classes. **Interfaces and Packages:** Introduction, Declaration of Interface, Implementing Interfaces, Extending interfaces, Interface Variables, Interface Variable Naming conflicts, Interface Methods, Interface Method Naming Conflicts and Adapter classes. **Packages:** Introduction, Defining Package, Importing Packages, Static import and Access Modifiers. **File IO:** Introduction, IO classes and interfaces, Stream classes, Byte Streams, the character streams
UNIT-IV (10Hrs)	**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Statements, Class Throwable, Custom Exceptions, Nested try and catch Blocks. **Multithreaded Programming:** Introduction, Need for Multiple Threads, Thread class, Thread Life Cycle, Extending Thread class, Implementing Runnable interface, Thread Priorities, Thread Synchronization and Inter-thread communication.
UNIT-V (12 Hrs)	**GUI programming with Swing**: Introduction, limitations of AWT, MVC Architecture, containers. Understanding Layout Managers: Flow, Border, Grid Event Handling: The Delegation event model-Events, Event sources, Event Listeners, Event classes, A Simple Swing Application. Exploring swing controls: Jlabel, Jtextfield, The swing buttons-JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs **Java Database Connectivity**: Introduction, Structure of JDBC, JDBC Architecture, Types of JDBC Drivers, JDBC API (java. sql package), Establishing JDBC Database Connections.

Text Books:	
1.	Core Java Volume I--Fundamentals: 1 (Core Series)11th edition (2020) by Cay Horstmann, Publisher: Pearson
2.	The complete Reference Java, 12th edition (2021), Herbert Schildt, Publisher: TMH.

3.	Jdbc Api Tutorial and Reference 3E(2003), by Maydene, Jon Ellis (Author), Jonathan Bruce, Publisher : Addison-Wesley Professional
Reference Books:	
1.	Introduction to java programming, 9th edition (2014) by Y Daniel Liang, Pubisher:Pearson
2.	Murach's Java Programming, 5th edition (2017) Joel Murach , Pubisher: Mike *Murach*
3.	JAVA one step ahead, 1stedition (2017) Anitha Seth, B.L.Juneja, Oxford.
4.	Java: A Beginner's Guide, Eighth Edition 8th Edition (2018)by Herbert Schildt,Pubisher:McGraw-Hill Education
5.	Head First Java 3e (2021)(A Brain Friendly Guide) by Kathy Sierra & Bert bates, Pubisher: O′Reilly
6.	Programming With Java: A Primer 6E (2019)By Balagurusamy, Pubisher:TMH.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/
4.	https://www.linkedin.com/in/jamesgosling
5.	https://en.wikipedia.org/wiki/James_Gosling#Books

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2103	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs.**

DATABASE MANAGEMENT SYSTEMS

(Common to AIML & CSG)

Course Objectives:

1.	To introduce about database management systems
2.	To give a good formal foundation on the relational model
3.	To introduce the concepts of basic SQL as a universal Database language
4.	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design and normalization
5.	To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques
6.	To explain Transaction management techniques

Course Outcomes: At the end of the course Students will be able to

S.No	Course Outcome	Knowledge Level
1.	Describe fundamental concepts of a relational database	K2
2.	Create, maintain and manipulate a relational database using SQL	K3
3.	Apply Conceptual and Logical database design	K3
4.	Apply normalization for database design	K3
5.	Illustrate Storage management and Transaction management techniques.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Introduction:** Database system, Database Vs File System, Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence, Three layer schema architecture for data independence, Database system structure, environment.
UNIT-II (10 Hrs)	**Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Key constraints, integrity constraints) and their importance **BASIC SQL:** Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).
UNIT-III (10 Hrs)	**Entity Relationship Model:** Introduction, Basic features of ER model, Representation of entities, attributes, entity set, relationship, relationship set, types of relationships, ER diagrams Generalization/specialization and Aggregation**.** **SQL:** Creating tables with relationships, implementation of key and integrity constraints in

	SQL, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views (updatable and non-updatable), relational set operations.
UNIT-IV (10 Hrs)	**Schema Refinement (Normalization):** Purpose of Normalization, concept of functional dependency, Closure of functional dependency and attribute closure, Normal forms based on functional dependency (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form (BCNF), Lossless join and dependency preserving decomposition, Fourth normal form (4NF), Fifth Normal Form (5NF).
UNIT-V (10 Hrs)	**Transaction Concepts:** Transaction State, Implementation of Atomicity and Durability, Schedules, Serializability, Recoverability, Implementation of Isolation levels in SQL, 2PL protocol, Introduction to indexing, B+ Tree indexing and locking, and Time stamp ordering protocol, Failure Classification, Recovery and Atomicity, ARIES Recovery algorithm.

Text Books:	
1.	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th Edition, McGraw-Hill Education, 2019.
2.	Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition., McGraw-Hill Education (India), 2014.
Reference Books:	
1.	Database Principles: Fundamentals of Design, Implementation, and Management by Steven Morris, Keeley Crockett, Carlos Coronel, Craig Blewett, Cengage, 2020.
2.	Fundamentals of Database Systems by Ramez Elmasri, Shamkant B. Navathe, 7th Edition, Pearson Education India, 2015.
3.	Introduction to Database Systems by C J Date, 8th Edition, Pearson Education, 2009.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS2101	**HS**	**3**	**0**	**0**	**3**	**30**	**70**	**3Hrs**

MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY

(Common to CSG & ME)

Course Objectives:

1	To Study Managerial Economics and Demand Analysis
2	To familiarize about the Concepts of Cost and Break-Even Analysis
3	To understand the nature of markets and to know the Pricing Policies
4	To learn about accounting cycle and preparation of Financial Statements
5	To know the concept of Capital and sources of raising and Depreciation

Course Outcomes At the end of the Course the students will be able to

S.No	Outcome	Knowledge level
1	Equip oneself with the knowledge of estimating the Demand and demand elasticities for a product.	K2
2	Have knowledge of Cost and its types and ability to calculate BEP	K3
3	Understand the nature of different markets and Pricing Practices Prevailing in the today's business world	K2
4	Prepare Financial Statements and know how to calculate Profit & Loss for a firm	K3
5	Know Types of capital and their sources and know how to calculate Depreciation	K2

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Managerial Economics and demand Analysis:** **Managerial Economics:** Definition of Economics & Classification of Economics (Micro & Macro), Meaning, Nature, & Scope of Managerial Economics. **Demand Analysis:** Concept of Demand, Determinants of Demand, Demand schedule, Demand curve, Law of Demand and its exceptions. Elasticity of Demand, Types of Elasticity of Demand. Importance of demand forecasting and its Methods.

UNIT-II (10 Hrs)	**Cost Analysis**: Importance of cost analysis, **Types of Cost-** Actual cost Vs Opportunitycost, Fixed cost Vs Variable cost, Explicit Vs Implicit cost, Historical cost Vs Replacement cost, Incremental cost Vs Sunk cost; **Elements of costs** – Material, Labour, Expenses; **Methods of costing** - Job costing, contract costing, Process costing, Batch costing, Unitcosting, Service costing, Multiple costing. **Break-even analysis:** Determination of Breakeven point - Applications, Assumptions and Limitations of Break -even analysis (Theory only).
UNIT-III (10 Hrs)	**Introduction to Markets & Pricing Policies** **Market Structures:** Salient Features of Perfect Competition, Monopoly, Monopolisticcompetition, Oligopoly and Duopoly. **Pricing:** Importance of pricing and its meaning; **Methods of Pricing**: **Cost Based** -Full cost, Mark-up, Marginal &Break-even; **Demand Based** - Penetrating, Skimming; **Competition Based-** Going rate, Sealed Bid, Discount; **Internet Pricing** - Flat-rate, Usage sensitive.
UNIT-IV (08 Hrs)	**Introduction to Financial Accounting:** Importance of Accounting - Double Entry System of Accounting - Types of Accounts - Journal, Ledger, Trail Balance, Trading Account, Profit and Loss Account and Balance Sheet.
UNIT-V (12 Hrs)	**Capital & Depreciation:** Types of Capital - Fixed capital & Working Capital, Componentsof Working Capital, Factors influencing Working capital. Methods of Raising Finance -Short term, medium term and Long term. **Depreciation** - Meaning, Importance and causes of depreciation; Methods of Depreciation- Straight line and diminishing balancing methods (Theory only)

Text Books:	
1.	A R Aryasri, Managerial Economics and Financial Analysis, TMH Pvt. Ltd, New Delhi
2.	Dr.N.Appa Rao, Dr.P. Vijayakumar:Managerial Economics and Financial Analysis', Cengage Publications, New Delhi
Reference Books:	
1.	Dr.B.Kuberudu & T.V. Ramana : Managerial Economics and Financial analysis, Himalaya Publishing House
2.	Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd
3.	Shashi K. Gupta & R.K. Sharma Management Accounting, Kalyani Publishers
4.	Maheshwari S.N, An Introduction to Accountancy, Vikas Publishing.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2105	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

OBJECT ORIENTED PROGRAMMING WITH JAVA LAB

(Common to AIML & CSG)

Course Objectives:

1.	Practice programming in the Java
2.	Gain knowledge of object-oriented paradigm in the Java programming language
3.	Learn use of Java in a variety of technologies and on different platforms

Course Outcomes: At the end of the course, Students will be able to

S.No	Outcome	Knowledge Level
1.	Develop simple programs using command line arguments, arrays, collections and strings.	K3
2.	Apply the concepts of Classes, Objects, Constructors, Methods and Runtime Polymorphism in solving fundamental problems.	K3
3.	Develop reusable programs using the concepts of inheritance, interfaces and packages.	K3
4.	Develop Applications using exception handing and multithreading.	K3
5.	Apply the concepts of Java IO Files and database in real time problem solving.	K3

SYLLABUS

1.	**Exercise - 1 (Basics)** a) Write a JAVA program to read and display values of all primitive data types of JAVA. b) Write a JAVA program using Command line arguments
2.	**Exercise - 2 (Classes, Objects, Constructors)** a) Write a JAVA program to implement Classes and Objects. b) Write a JAVA program implement method overloading. c) Write a JAVA program to implement Default Constructor. d) Write a JAVA program to implement Parameterized Constructor. e) Write a JAVA program to implement constructor overloading. f) Write a JAVA program to implement this keyword.
3.	**Exercise - 3 (Arrays, Collections, Strings)** a) Write a JAVA program to search for an element in a given list of elements using linear search. b) Write a JAVA program to search for an element in a given list of elements using binary search. c) Write a JAVA program to sort for an element in a given list of elements using bubble sort. d) Write a JAVA program to sort for an element in a given list of elements using merge sort. e) Write a JAVA program to implement Matrix Multiplication. f) Write a JAVA program to implement ArrayList Operations. g) Write a JAVA program to implement HashMap Operations.

	h) Write a JAVA program to implement String Operations. i) Write a JAVA program to implement StringBuffer class.
4.	**Exercise - 4(Inheritance)** a) Write a JAVA program to implement Single Inheritance. b) Write a JAVA program to implement multilevel Inheritance. c) Write a JAVA program to implement hierarchical Inheritance. d) Write a java program for abstract class to find areas of different shapes. e) Write a JAVA program to implement "super" keyword. f) Write a JAVA program to implement "final" Keyword.
5.	**Exercise - 5 (Interfaces, Packages)** a) Write a JAVA program to implement Interface. b) Write a JAVA program to create a user defined package called NUM having even and prime as methods. Then access those methods in another program to find given number are even or prime? c) Write a JAVA program to implement sub Packages.
6.	**Exercise - 6 (Exception Handling)** a) Write a JAVA program to implement the following Built in Exceptions. i) Arithmetic Exception. ii) Array Index Out Of Bounds Exception iii) Number Format Exception. iv) Null Pointer Exception. b) Write a JAVA program to implement multiple catch statements. **c)** Write a JAVA program to implement user defined Exception.
7.	**Exercise – 7 (Multithreading)** a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds . b) Write a JAVA program to implement Runnable Interface. c) Write a program to implement priorities to Thread. d) Write a JAVA program to implement Thread Synchronization(Multiplication tables)
8.	**Exercise - 8 (File IO)** a) Write a JAVA program to copy contents of file into another using Byte Oriented IO. b) Write a JAVA program to copy contents of file into another using Character Oriented IO. c) Write a JAVA program to display contents of file using Line Oriented IO. d) Write a JAVA program to convert the values into tokens using Scanner class.
9.	**Exercise - 9 (JDBC)** a) Write a JDBC program to insert data into database. b) Write a JDBC program to delete data from database. c) Write a JDBC program to update data into database. d) Write a JDBC program to retrieve data from database.

Reference Books:	
1.	Core Java Volume I--Fundamentals: 1 (Core Series) 11th Edition(2020) by Cay Horstmann, Publisher: Pearson
2.	The complete Reference Java, 12th edition (2021), Herbert Schildt, Publisher: MH.
3.	JdbcApi Tutorial and Reference 3rd Edition(2003), by Maydene , Jon Ellis (Author), Jonathan Bruce, Publisher : Addison-Wesley Professional
4.	Introduction to java programming, 9th Edition(2014) by Y Daniel Liang, Publisher: Pearson
5.	Murach's Java Programming, 5th Edition(2017) Joel Murach , Publisher: Mike *Murach*
6.	JAVA one step ahead, First Edition (2017) Anitha Seth, B.L.Juneja, Oxford.
7.	Programming With Java: A Primer 6th Edition (2019) By Balagurusamy, Publisher: MH.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.coursera.org/learn/java-introduction
3.	https://docs.oracle.com/javase/tutorial/
4.	https://www.linkedin.com/in/jamesgosling
5.	https://en.wikipedia.org/wiki/James_Gosling#Books
6.	https://nptel.ac.in/courses/106/105/106105191/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2106	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATABASE MANAGEMENT SYSTEMS LAB

(Common to AIML & CSG)

Course Objectives:

1.	Populate and query a database using SQL DDL/DML Commands
2.	Declare and enforce integrity constraints on a database
3.	Writing Queries using advanced concepts of SQL
4.	Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes: At the end of the course Students will be able

S.No	Outcome	Knowledge Level
1.	Apply DDL, DML and DCL commands of SQL	K3
2.	Build PL/SQL programs including stored procedures, functions, cursors and triggers.	K3
3.	Design a database application	K4

SYLLABUS

1	Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION,INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY,HAVING and Creation and dropping of Views.
4	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5	i.Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) ii. Insert data into the student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, User defined Exceptions, RAISE APPLICATION ERROR.
8	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9	Program development using creation of stored functions, invoke functions in SQL Statements and

	write complex functions.
10	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11	Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12.	Design a Database mini project
Reference Books:	
1.	Oracle Database 10C: The Complete Reference by Byrla, McGraw Hill Education, 2017.
2.	SQL The Complete Reference by James Groff, Paul Weinberg, Andy Oppel, 3rd Edition, McGraw Hill Education, 2017.
3.	SQL, PL/SQL by Ivan Bayross, 4th Revised Edition, 2020.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2101	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3Hrs**

FULL STACK WEB APPLICATION LAB

(For CSG)

Pre-requisites: Programming in Java, DBMS

Course Objectives:

1.	Understand the principles of creating an effective web page.
2.	Understand elements of design with regard to the web
3.	Learn the language of the web: HTML and CSS.
4.	Develop skills in analyzing the usability of a web site.
5.	Understand how to develop a PHP web application with database connectivity.
6.	Learn CSS grid layout.

Course Outcomes:

S.No	Outcome	Knowledge level
1.	Apply the principles of creating an effective web page	K3
2.	Apply the elements of design with regard to the web.	K3
3.	Create the language of the web: HTML and CSS	K4
4.	Develop skills in analyzing the usability of a web site	K4
5.	Understand how to plan and conduct user research related to web usability	K2
6.	Create CSS grid layout	K4

SYLLABUS

LIST OF PROGRAMS

1.	Exercise 1 Introduction to HTML 1.1 What is HTML 1.2 HTML Documents 1.3 Basic structure of an HTML document 1.4 Creating an HTML document 1.5 Markup Tags 1.6 Heading-Paragraphs 1.7 Line Breaks 1.8 HTML Tags.

2.	Exercise 2 Elements of HTML 2.1 Introduction to elements of HTML 2.2 Working with Text 2.3 Working with Lists, Tables and iFrames 2.4 Working with Hyperlinks, Images and Multimedia 2.5 Working with Forms and controls.
3.	Exercise 3 Introduction to Cascading Style Sheets 3.1 Concept of CSS 3.2 Creating Style Sheet 3.3 CSS Properties 3.4 CSS Styling(Background, Text Format, Controlling Fonts) 3.5 Working with block elements and objects 3.6 Working with Lists and Tables 3.7 CSS Id and Class 3.8 Box Model (Introduction, Border properties, Padding Properties, Margin properties)
4.	Exercise 4 4.1 The Basic of JavaScript: Objects, 4.2 Primitives Operations and Expressions, 4.3 Screen Output and Keyboard Input,' 4.4 Object Creation and Modification, Arrays, Functions 4.5 DHTML: Positioning Moving and Changing Elements
5.	Exercise 5 5.1 Introducing PHP: Creating PHP script, 5.2 Running PHP script. 5.3 Using variables, constants, Data types, Operators. 5.4 Conditional statements, Control statements, Arrays ,functions 5.5 Working with forms and Databases such as My SQL.
6.	Case Study: Develop PHP MySQL CRUD Application
Reference Books:	
1.	Web Technologies, Uttam K Roy, Oxford
2.	HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, j Query) 2Ed,Dreamtech Press; Second edition
3.	The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak,Karparhi, Macintyre, Morrissey, Cengage
e-Resources:	
1.	Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5, Shroff Publishers & Distributers Private Limited - Mumbai; Fourth edition
2.	PHP: The Complete Reference, McGraw Hill Education; Raunakphp

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2102	**SOC**	**1**	**0**	**2**	**2**	**--**	**50**	**3Hrs**

GAME DEVELOPMENT LAB

(SKILL ORIENTED COURSE- I)

(For CSG)

Pre-requisites: Basic Computer Knowledge

Course Outcomes: At the end of course, student will be able to

S.No	Out Come	Knowledge level
1.	Understand how to use the various fundamentals of Unity	K2
2.	Understanding how everything works in the engine	K2
3.	Understanding the basic concepts of game design	K2
4.	Creating and building actual sample games	K4
5.	Learning how to deploy your projects to the market	K3

LIST OF PROGRAMS

1.	Unity Installation and Setup
2.	Creating and Modifying Sprites
3.	Transforms and Object Parenting
4.	Creation of Internal assets
5.	Saving and Loading Scenes
6.	Basic Movement Scripting
7.	Understanding Collisions, Rigid bodies
8.	Custom Collision Boundaries
9.	Understanding Prefabs and Instantiation
10.	Game Object Destruction
11.	Starting with UI
12.	The Button and Text Element, slider
13.	Materials and Shaders
14.	The Particle System
15.	Using the Asset Store
16.	Case Study: Develop a simple game and convert into an app.

Resources

1.	Build Mobile Apps With Ionic 4 And Firebase: Hybrid Mobile App Development by Fu Cheng, Apress, January 2018
2.	https://www.tutorialspoint.com/ionic/index.htm
3.	https://ionicframework.com/docs/angular/your-first-app

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC2103	**MC**	**2**	**--**	**--**	**0**	**--**	**--**	**--**

ENGLISH PROFICIENCY

(Common to CSE, ECE, IT, AIML & CSG)

Course Objectives: Students are expected to

1.	Communicate their ideas and views effectively
2.	Practice language skills and improve their language competency.
3.	Know and perform well in real life contexts
4.	Identify and examine their self-attributes which require improvement and motivation.
5.	Build confidence and overcome their inhibitions, stage freight, nervousness etc.,
6.	Improve their reading skills.

Course Outcomes: The students will be able to

S.No.	Outcome	Knowledge Level
1.	Improve speaking skills.	K3
2.	Enhance their listening capabilities	K3
3.	Learn and practice the skills of composition writing.	K3
4.	Enhance their reading and understanding of different texts.	K3
5.	Improve their communication both in formal and informal contexts.	K3
6.	Be confident in presentation skills.	K3

SYLLABUS

UNIT-I	**Listening Skills** Types of listening Hearing and Listening Listening as a receptive skill
UNIT-II	**Speaking Skills** Presentation skills Describing event/place/thing Extempor, Debate, Group Discussion
UNIT-III	**Reading Skills** Types of Reading (Intensive and Extensive reading, Skimming, Scanning), Reading/Summarizing News Paper Articles
UNIT-IV	**Writing Skills** Essay Writing (Argumentative, Analytical and Descriptive)E-Mail Writing Business LettersResume Writing
UNIT-V	**Integrated Language Skills** Listening Skills for Speaking and WritingReading Skills for Writing and Speaking

Reference Books:	
1.	Fundamentals of Technical Communication by Meenakshiraman, Sangeta Sharma of OUP, 2014
2.	English and Communication Skills for Students of Science and Engineering, by S.P. Dhanavel, Orient Blackswan Ltd. 2009
3.	Enriching Speaking and Writing Skills, Orient Blackswan Publishers, 2014
4.	The Oxford Guide to Writing and Speaking by John Seely OUP, 1998
5.	Effective Technical Communication by M.Ashraf Rizwi. Tata Mcgraw hill, 2005
6.	Six Weeks to Words of Power by Wilfred Funk. W.R.Goyal Publishers, 1990
Note: Internal Assessment is carried out throughout the semester.	

Regulation: R20	II / IV - B.Tech. II - Semester

COMPUTER SCIENCE AND DESIGN

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2021-22 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CD2201	Data Science and Statistical Methods	ES	3	3	0	0	30	70	100
B20AM2201	Computer Organization	PC	3	3	0	0	30	70	100
B20CD2202	Design and Analysis of Algorithms	PC	3	3	0	0	30	70	100
B20CD2203	Operating Systems	PC	3	3	0	0	30	70	100
B20CD2204	Computer Graphics	PC	3	3	0	0	30	70	100
B20CD2205	UNIX Operating Systems Lab	PC	1.5	0	0	3	15	35	50
B20BS2205	Statistical Methods with R Lab	BS	1.5	0	0	3	15	35	50
B20CD2206	Mobile App Development Lab	PC	1.5	0	0	3	15	35	50
B20CD2207	Multimedia & Graphic Design Lab (Skill Oriented Course)	SOC	2	1	0	2	--	50	50
B20MC2202	Environmental Science	MC	0	2	0	0	--	--	--
	TOTAL		**21.5**	**18**	**0**	**11**	**195**	**505**	**700**

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2201	**ES**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA SCIENCE & STATISTICAL METHODS

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives: Students are expected to

1.	Have an idea of data science and single and joint random variables.
2.	Apply discrete and continuous probability distributions to the given data.
3.	Learn sampling distribution of means and Types of estimation.
4.	Know about hypothesis testing and a few large sample tests.
5.	Apply small sample tests to the given data and Know how to design and conduct experiments by ANOVA.
6.	Explain correlation and regression and curve fitting models.

Course Outcomes: At the end of the course students will be able to

S.No	Outcome	Knowledge level
1.	Understand the concepts of data science and identify a random variable as discrete/continuous and analyze it.	K3
2.	Solve simple problems based on discrete and continuous probability distributions.	K3
3.	Explain sampling distribution and construct sampling distribution for means.	K3
4.	Apply testing of the hypothesis for getting inferences about Population Parameters based on Sample statistics using large samples.	K3
5.	Demonstrate Inferences based on small sample tests and ANOVA techniques.	K3
6.	Determine correlation coefficient, regression lines and fit a best suitable curve for a given data using the method of least squares.	K3

SYLLABUS

UNIT-I (14 Hrs.)	**Descriptive statistics and methods for data science:** Data science, Statistics Introduction, Collection of data,internal and external data, primary and secondary data,population and sample, Type of variables: dependent and independent, Categorical and Continuous variables, Data visualization,Descriptive Statistics: classification and tabulation of univariate data, graphical representation, frequency curve, Measures of Central tendency and dispersion.Bivariate data, summarization, marginal and conditional frequency distribution. Moments, Measures of Skewness and Kurtosis. **Random Variables:** Random Variables- Discrete, Continuous random variables-Expectation, Variance, Moment Generating Function.

UNIT-II (10 Hrs.)	**Probability Distributions** Discrete Probability distributions- Binomial Distribution, Poisson Distribution Continuous Probability Distributions- Normal Distribution- Gamma distribution
UNIT-III (12 Hrs.)	**Sampling Theory and Test of Hypothesis** Sampling – Central limit theorem (without proof) – Sampling distribution of means – point estimation – interval estimation. **Test of hypothesis:** Concept & formulation of hypothesis Type I and Type II errors, Neyman Pearson lemma (without proof), Procedures of testing of hypothesis. **Large Sample Theory:** Test of significance for single proportion and difference of proportions.
UNIT-IV (12 Hrs.)	**Small Sample Theory:** Student's-t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means. F-distribution: definition, F-test for equality of two population variances. Chi-square distribution: definition, Chi-square test for goodness of fit. **ANOVA:** Introduction, Analysis of Variance one-way classification, Analysis of Variance two-way classification.
UNIT-V (8 Hrs.)	**Correlation**: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient (without proofs). **Regression Analysis:** Regression Lines, Regression Coefficients and their properties (without proofs). **Curve fitting**: Method of least Squares, fitting of a Straight line, Fitting of a Parabola, fitting of Exponential curves: $y = ae^{bx}, y = ab^{x}$ and Power curve: $y = ax^{b}$
Text Books:	
1.	Fundamentals of Mathematical Statistics by S. C. Gupta and V.K. Kapoor, Sultan Chand & Sons Publishers.
2.	Probability and statistics for Engineers, Miller and Freund, 7th edition, Prentice-Hall India.
Reference Books:	
1.	Higher Engineering Mathematics, Dr. B. S. Grewal, 43rd Edition, Khanna Publishers.
2	Fundamentals of Statistics, S C Gupta, 7th Edition, Himalaya publishing house
3.	Higher engineering mathematics, B V Ramana , MCGraw Hill Education publications
4.	Probability and statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Eighth edition, Pearson Education.
e-Resources	
1.	http://www.swayam.gov.in
2.	https://onlinecourses.nptel.ac.in/noc16_ma03/preview
3.	http://www.stat.umn.edu/geyer/old/5101/rlook.html

Code	Category	L	T	P	C	I.M	E.M	Exam
B20AM2201	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**3Hrs**

COMPUTER ORGANIZATION

(Common to AIML & CSG)

Course Objectives:

1.	Learn basic building blocks of a computer and their organization.
2.	Design a basic computer.

Course Outcomes: At the end of the Course the students will be able to

S.No	Outcome	Knowledge Level
1.	Understand basic building blocks of a computer and algorithms on arithmetic operations.	K2
2.	Develop computer functional blocks	K3
3.	Identify Regular operation of a computer	K2
4.	Understand Memory Hierarchy & I/O Organization.	K2
5.	Identify the parameters that enhance system performance	K2

SYLLABUS

UNIT-I (10 Hrs)	Digital Computers and Arithmetic Historical perspective and von Neumann computers, Fixed and floating-point representation of numbers, Addition and Subtraction, Multiplication and Division algorithms, Floating- point arithmetic operations.
UNIT-II (10 Hrs)	Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input Output and Interrupt, Complete Computer Description, Design of Basic Computer. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit
UNIT-III (10 Hrs)	Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)
UNIT-IV (10 Hrs)	Memory and I/O Organization Memory Hierarchy, Associative Memory, Cache Memory, Virtual memory.

	I/O Organization: Peripheral devices, I/O interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, direct memory access and IOP
UNIT-V (10 Hrs)	Pipeline and Vector Processing, Parallel Processing, Pipelining, Arithmetic and Instruction Pipelines, RISK Pipeline, Vector Processing, Array Processors, Multiprocessors, Interconnection structures, Cache coherence.
Text Books:	
1	Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
Reference Books:	
1.	Computer Organization and Architecture-Designing for Performance, William Stallings, Pearson,9th ed.,2013
2.	Essentials of Computer Organization and Architecture, Linda Null, JuliaLobur, Narosa Pub., 3rded.,2003,
3.	Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Zvonko Vranesic, 5thed., TMH, 2011.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2202	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs**

DESIGN AND ANALYSIS OF ALGORITHMS

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives:

1.	Analyze the asymptotic performance of algorithms
2.	Write rigorous correctness proofs for algorithms.
3.	Demonstrate a familiarity with major algorithms design paradigms and data structures
4.	Synthesize efficient algorithms in common engineering design situations

Course Outcomes: At the end of the Course the students will be able to

S.No	Outcome	Knowledge level
1.	Apply mathematical analysis methods to analyze the algorithm running times using asymptotic notations	K3
2.	Compare and understand how the choice of data structures impact the performance of various greedy algorithms	K2
3.	Describe, apply and analyze the complexities of Dynamic Programming Algorithms	K3
4.	Describe, apply and analyze the complexity of Backtracking and Branch and Bound, and explain the situations which call for usage of these paradigms	K3
5.	Understand the concepts of P, NP classes	K2

SYLLABUS

UNIT-I (8 Hrs)	INTRODUCTION: Getting Started: Insertion sort, Analyzing algorithms, Designing algorithms, Growth of Functions: Asymptotic Notation, Standard notations and common functions, Master method for solving recurrences DIVIDE AND CONQUER: General method, Finding maximum and minimum, Merge sort, Quick sort, Performance Measurement, Selection Problem, A Worst-Case Optimal Algorithm, Strassen's matrix multiplication, Convex hull Problem- Quick Hull Algorithm
UNIT-II (8 Hrs)	Sets and Disjoint set union, Union and Find Operations THE GREEDY METHOD: General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees- Prim's algorithm, Kruskal's algorithm, Optimal storage on tapes, Optimal merge patterns , Huffman coding, Single source shortest paths.

UNIT-III (8 Hrs)	DYNAMIC PROGRAMMING: General method, Multistage graphs, All pairs shortest paths, Optimal binary search trees, String editing, 0/1 Knapsack, The traveling salesperson problem
UNIT-IV (8 Hrs)	BACKTRACKING: General method, 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles BRANCH AND BOUND: The method, Least Cost (LC) Search, The15-puzzle problem, Control abstractions for LC Search, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem: LC Branch and Bound, FIFO Branch-and-Bound, Traveling salesperson problem: LC Branch and Bound
UNIT-V (8 Hrs)	NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, Nondeterministic Algorithms, The Classes NP-hard and NP-complete,Cook's theorem. Modular Arithmetic-Large Integer multiplication: Extended Euclid's algorithm, Chinese Remainder theorem.

Text Books:	
1.	Fundamentals of Computer Algorithms 2nd edition by Ellis Horowitz, SartajSahni, S. Rajasekharan, university press, 2008
2.	Introduction to Algorithms 3rd edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI, 2010
Reference Books:	
1.	Design and Analysis Algorithms - ParagHimanshu Dave, Himanshu Bhalchandra Dave Publisher: DhanpatRai& co, 2017
2.	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tamassia,Johnwiley and sons, 2006
3.	Introduction to the Design and Analysis of Algorithms, AnanyLevitin, PEA, 3rd Edition.
4.	Foundations of Algorithms, R. Neapolitan and K. Naimipour, Jones and Bartlett, Pearson,2011
5.	Advanced Data Structures – Peter Brass, Cambridge University Press, 2008
E-Resources:	
1.	https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2.	https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2203	PC	3	--	--	3	30	70	3Hrs

OPERATING SYSTEMS

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives:

1	Introduce to the internal operation of modern operating systems
2	Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
3	Understand File Systems in Operating System like UNIX/Linux and Windows
4	Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
5	Analyze Security and Protection Mechanism in Operating System

Course Outcomes: Upon successful completion of this course, the student should be able to

S.No	Outcome	Knowledge level
1	Describe basic concepts, Generations, Functions, Services and Structures of different Operating Systems	K2
2	Describe the concept of Process, Thread and also Utilize different algorithms for Scheduling multiple Processes & Threads.	K3
3	Apply different Mechanisms to implement Inter Process Communication without occurring dead lock	K3
4	Classify Memory Management Schemes and Apply and Compare various Page Replacement Techniques for better allocation	K3
5	Understand the File structure, Disk Structure and System Protection.	K3

SYLLABUS

UNIT-I (10 Hrs)	Operating Systems (OS) Overview: OS Concepts, OS functions, Evaluation of Operating systems. OS Services, OS structures: Monolithic structure, Layered structure, MicroKernel structure, Modular structure, Virtual Machines, Interrupts, Systems calls- Types of System Calls, OS debugging, OS generations.
UNIT-II (10 Hrs)	Process Concept: Basic concepts, Process states, process control block, Operations on processes, Process Scheduling: Scheduling Criteria, Scheduling Algorithms. Multiple Processor Scheduling, Thread Scheduling, Examples. Multithreaded Programming: Multithreading Models, Thread Libraries, Threading Issues, Examples

UNIT-III (10 Hrs)	Process Concurrency and Synchronization: Introduction, Race Condition, Critical Region, Mutual Exclusion, Peterson's Solution, Hardware Support, Operating System Support, Semaphores, Monitors, Classic Synchronization problem: Reader's-Writer's Problem, Barber problem, Producer –Consumer problem, Dining philosopher's problem. Deadlocks: Resources, Conditions for resource deadlocks, Graph models of deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
UNIT-IV (8 Hrs)	Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Free space Management Techniques, Paging, Virtual Memory Management: Introduction, Demand paging ,Copy on-write, Page replacement, Page replacement algorithms, Frame allocation, Inverted paging, Pre-Paging, Segmentation, Paged Segmentation, Thrashing, Memory-mapped files.
UNIT-V (12 Hrs)	File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of Disk structure, Disk scheduling, RAID structure.System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control List (ACLs), Revocation of access rights, Capabilities List (c-List) . Case Studies: Study of Operating System Functionalities in various operating Systems like Windows, Unix, Linux and Mobile Operating Systems.

Text Books:	
1	Silbers chat z A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013
2	Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.
Reference Books:	
1.	Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata Mc Graw Hill, 2012
2.	Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems.)
3.	Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.
e-Resources:	
1	https://nptel.ac.in/courses/106/105/106105214/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2204	**PC**	**3**	**0**	**0**	**3**	**30**	**70**	**3 Hrs**

COMPUTER GRAPHICS

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives:

1	Provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, technology, progress and trends
2	Design of algorithms for digitization of graphic primitives.
3	Apply computer graphics techniques for two-dimensional and three-dimensional transformations
4	Visualize viewing transformations.
5	Demonstrate working of I/O devices

Course Outcomes: At the end of the Course the students will be able to

S.No	Outcome	Knowledge level
1	Summarize the application areas of computer graphics and the working of I/O devices	K2
2	Implement algorithms for scan converting graphic primitives in a graphic package	K3
3	Apply direct and indirect methods for two-dimensional transformations using matrices	K3
4	Construct two-dimensional viewing transformations.	K3
5	Produce three-dimensional geometric transformations and viewing them.	K3

SYLLABUS

UNIT-I (10 Hrs)	Overview of Graphics Systems: Applications of Computer Graphics-Graphical User Interfaces-Video Display Devices-Raster Scan Systems-Random Scan Systems-Graphics Monitors and Workstations -Input Devices- Logical Classification of Input Devices-Hard Copy Devices- Graphics Software-Overview of C- Graphics, Open GL and PHIGS.
UNIT-II (10 Hrs)	Output Primitives and it Attributes: Points and Lines-Line Drawing Algorithms-Circle Generating Algorithms- Parallel Line Algorithms-Functions in C-Graphics for Output Primitives-Color and Gray Scale Levels - Boundary Fill Algorithm- Flood Fill Algorithm -Anti-aliasing Techniques.

UNIT-III (10 Hrs)	Two-Dimensional Geometric Transformations:Basic Transformations- Matrix Representations- Homogeneous Coordinates- Composite Transformations- Reflection- Shear- Transformations between Coordinate Systems- Affine Transformations- Raster Methods for Transformations
UNIT-IV (10 Hrs)	Two-Dimensional Viewing: The Viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping- Text and Exterior Clipping
UNIT-V (10 Hrs)	Three-Dimensional Geometric Transformations and Viewing: 3D Transformations: Translation- Rotation- Scaling- Reflection -Shear- Composite Transformations- Modeling and Coordinate Transformations. 3D Display Methods: Spline Representations-Natural Cubic Spline- Bézier Curves and Surfaces 3D Viewing: 3D Viewing Pipeline- Viewing Coordinates- View Volumes- General Computer Animation: Design of Animation Sequence, General computer Animation functions, Raster animation.
Text Books:	
1	Computer Graphics C Version, Donald Hearn& M. Pauline Baker, 2nd Edition, Pearson Education, 2014.
2	Computer Graphics with Open-GL, Donald Hearn, M. Pauline Baker& Warren Carithers, 4th Edition, Pearson Education, 2014
Reference Books:	
1.	Procedural Elements for Computer Graphics, David F. Rogers, Indian Edition, Tata McGraw Hill Education, 2017
2.	Computer Graphics, Zhigang Xiang and Roy A. Plastock, 2nd Edition (Indian Edition) McGraw- Hill Education, 2015
3.	Computer Graphics: Principles and Practice, John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley, 3rd Edition, Addison- Wesley Professional, 2013.
4.	Mathematical and computer programming techniques for computer graphics, Peter Comninos, Springer, 2010.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2205	**PC**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3Hrs**

UNIX OPERATING SYSTEMS LAB

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives:

1.	To understand the design aspects of operating system
2.	To study the process management concepts & Techniques
3.	To study the storage management concepts
4.	To familiarize students with the Linux environment
5.	To learn the fundamentals of shell scripting/programming

Course Outcomes: Students will be able to

S.No	Out Come	Knowledge level
1.	Use Unix utilities and perform basic shell control of the utilities	K3
2.	Use the Unix file system and file access control	K3
3.	execute commands and programs Linux environment efficiently	K3
4.	Solve problems using bash for shell scripting	K3

LIST OF PROGRAMS

1	a. Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown. b. Study of vi editor c. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system d. Study of Unix/Linux file system (tree structure) e. Study of .bashrc, /etc/bashrc and Environment variables.
2	Write a C program that makes a copy of a file using standard I/O, and system calls
3	Write a C program to emulate the UNIX ls –l command.
4	Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort
5	Simulate the following CPU scheduling algorithms: Round Robin (b) SJF (c) FCFS (d) Priority
6	Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

7	Simulate the following: i. Multiprogramming with a fixed number of tasks (MFT) ii. Multiprogramming with a variable number of tasks (MVT).
8	Simulate Bankers Algorithm for Dead Lock Avoidance
9	Simulate Bankers Algorithm for Dead Lock Prevention.
10	Simulate the following page replacement algorithms: FIFO b) LRU c) LFU
11	Simulate the following File allocation strategies Sequenced (b) Indexed (c) Linked
12	Write a C program that illustrates two processes communicating using shared memory
13	Write a C program to simulate producer and consumer problem using semaphores
14	Write C program to create a thread using pthreads library and let it run its function
15	Write a C program to illustrate concurrent execution of threads using pthreads library
Reference Books:	
1.	Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2.	Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS2205	**BS**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

STATISTICAL METHODS WITH R LAB

(For CSG)

Prerequisite: Basic concepts of programming.

Course Objectives: The student who successfully completes this course will have

1.	The knowledge to use R for statistical programming, computation, modeling and graphics.
2.	The skill to write functions and use R in an efficient way.
3.	The ability to fit some basic types of statistical models using R.
4.	The idea to expand the knowledge of R on their own.

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

S.No	Out Come	Knowledge level
1.	Write programs in R to solve the Statistical Methods.	K3
2.	Apply various built-in functions in R to solve the computational and modeling problems.	K3
3.	Interpret statistical data by various functions of graphical representation	K4
4.	Understand- reading, writing, working and manipulating the data in various data frames.	K3

LIST OF PROGRAMS

1	Download and install R-Programming environment and install basic packages using install. packages() command in R.
2	Study of basic Syntaxes in R and learn all the basics of R-Programming (Data types, Variables, Operators etc.).
3	Implementation of vector data objects operations.
4	Implementation of matrix, arrays and factors and perform va in R
5	Implementation and use of data frames in R
6	Study and implementation of various control structures in R
7	Implement R-Loops with different examples.
8	Create Sample (Dummy) Data in R and perform data manipulation with R
9	Learn the basics of functions in R and implement with examples
10	Importing and exporting files in R
11	Implementing basic graphs in R (Histograms pie charts and bar charts).
12	Implementing summary statistics(mean, sd, max, min etc)
13	Finding correlation and covariance using R
14	Implementing ANOVA and simple linear regression

15	Drawing random numbers, calculating distribution, density and quantile of probability distributions(Binomial, Poisson and Normal distributions) using R
16.	Implementing testing of hypothesis(Z, t, chi-square and F test) using R
Reference Books:	
1.	R for Everyone, Jared P Lander, Pearson
2.	The Art of R Programming, Norman Matloff, No Starch Press

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2206	**PC**	**0**	**0**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

MOBILE APP DEVELOPMENT LAB

(For CSG)

Pre-requisites: Programming in Java.

Course Objectives:

1.	To understand the basic and important design concepts and issues in development of mobile applications.
2.	To create responsive and user friendly mobile interface using themes
3.	To develop hybrid mobile apps using a mobile app framework.
4.	To understand the capabilities and limitations of mobile devices.

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

S.No	Out Come	Knowledge level
1.	Use ionic components to develop the UI.	K4
2.	Develop a hybrid app using an ionic framework.	K4
3.	Use cordova plugins and write angular code to build cross-platform mobile apps.	K4
4.	Deploy an ionic app to real native Android and iOS mobiles	K3

LIST OF PROGRAMS

1	Install Nodejs, npm, Ionic CLI, Cordova and related environment
2	Creating first Ionic App "Hello CSD, SRKREC"
3	Implementing Ionic Basic Components - Buttons, Form Inputs, Lists, Header & Footer, Colors, Icons, Avatars, Cards, Grid and SCSS Styling
4	Implementing Ionic Advanced Components - Basic Interactivity with Form Fields, Controllers - Loading, Toast, Alert, Action Sheet
5	Navigating with in the App - Creating New Pages, Page Navigation, Passing Data, Lazy Loading of Pages, Modal Controller and Popover Controller
6	Network & API - Asynchronous & Synchronous Code, Understanding Observables and Promises, HTTP and APIs, Requesting, Retrieving and Displaying Data in App.
7	Using Ionic Native and Cordova Plugins - Ionic Native, Camera Plugin, Geolocation, Native Storage, Vibration and Video
8	Building and Publishing the App - Building the App for Android, Signing and Verifying the App and Uploading into Playstore

Reference Books:	
1.	https://ionicframework.com/angular
2.	https://enappd.com/blog/how-to-create-an-ionic-app-for-beginners/144/
3.	https://www.tutorialspoint.com/ionic/index.htm
4.	https://www.techiediaries.com/ionic/ionic-5-tutorial-storage-crud-theming-example/
5.	https://youtu.be/PExk4luoBiE

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CD2207	**SOC**	**1**	**0**	**2**	**2**	**0**	**50**	**3 Hrs.**

MULTIMEDIA & GRAPHIC DESIGN LAB

(SKILL ORIENTED COURSE II)

(For CSG)

Pre-requisites: Basic Computer Knowledge

Course Objectives:

1.	To understand the core multimedia technologies and standards (Digital Audio, Video, Graphics, Text and Animation).
2.	To learn the usage and application of various open source tools for creating multimedia content.
3.	To design, create and edit images/pictures using various tools.
4.	To understand the relevance and underlying infrastructure of multimedia systems

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

S.No	Out Come	Knowledge level
1.	Design creative content using graphic design tools.	K4
2.	Design & Develop multimedia content for real world applications	K4
3.	Utilize multimedia technologies to develop multimedia content	K4
4.	Design & Develop creative banners, logos, videos, animations and other formats of digital content	K3

LIST OF PROGRAMS

1	Canva - Graphic Design - Create a sample banner / poster online using various graphic / image editing features.
2	Inks cape - Vector Graphics - Create a scalable Logo of CSD / SRKREC / Your Team / Your Activity Club
3	GIMP - Image Manipulation and Image Editing - Edit and Modify an existing picture / image and enhance it.
4	Kdenlive - Video Editing - Create a video in various formats
5	Audacity - Digital Audio Editor & Recording - Record live audio, edit and mix audio clips, and add effects
6	Blender - 3D Modeling & Rendering - Create 3D effects for a video.
7	OBS - Live Editing, Recording & Streaming - Live stream your activity on youtube using OBS.
8	Mixxx - DJ, Music Mixing - Mix your music collection live and add effects

REFERENCES:	
1	The Book of GIMP: A Complete Guide to Nearly Everything, No Starch Press, 2013
2	Blender For Dummies, Wiley, 2020
3	https://www.canva.com/learn/a-step-by-step-guide-to-designing-from-scratch/
4	https://inkscape.org/learn/tutorials/
5	https://kdenlive.org/en/category/tutorials/
6	https://manual.audacityteam.org/man/tutorials.html
7	https://obsproject.com/forum/threads/tutorial-for-open-broadcaster-software-or-obs.311/
8	https://manual.mixxx.org/2.3/en/chapters/introduction.html

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC2202	**MC**	**2**	**--**	**--**	**--**	**30**	**70**	**3 hrs.**

ENVIRONMENTAL SCIENCE

(For AIML & CSG)

Course Objectives: The objectives of the course are to impart:

1.	Overall understanding of the natural resources.
2.	Basic understanding of the ecosystem and its diversity.
3.	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4.	An understanding of the environmental impact of developmental activities.
5.	Awareness on the social issues, environmental legislation and global treaties.

Course Outcomes: After completion of the course, students will be able to

S. No.	Outcome	Knowledge Level
1	Classify different natural ecosystems	K2
2	Utilize natural resources for sustainable nature	K2
3	Understand the significance of biodiversity	K2
4	Illustrate resourse pollution and control measures at global level	K2
5	Outline the salient features of constitutional provisions for environmental protection	K2

SYLLABUS

UNIT-I (8 Hrs)	**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health. **Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.
UNIT-II (8 Hrs)	**Natural Resources: Natural resources and associated problems.** Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources**:** World food problems, changes caused by non-agriculture activities-effects

	of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.
UNIT-III (8 Hrs)	**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.
UNIT-IV (8 Hrs)	**Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being. **Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.
UNIT-V (8 Hrs)	**Social Issues and the Environment:** Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Sustainability: theory and practice, Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.-Public awareness.
UNIT-VI (8 Hrs)	**Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. Environmental dairy. **The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.**
Text Books:	
1.	Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada Rani; Pearson Education, Chennai
2.	Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3.	Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula
Reference Books:	
1.	Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

2.	A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3.	Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014