

www.sjcit.ac.in

||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

IV Semester
Scheme & Syllabus of B.E. Programme
Computer Science & Design
(2024 Scheme)

Core Values

Spiritual, Judicious, Commitment, Integrity, Trustworthy



NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

NAAC A+

QS I-GAUGE GOLD

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

SJC INSTITUTEOF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV, AE) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

SCHEME OF TEACHING AND EXAMINATION – B.E. – CSD

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

4th Semester

Branch Name- COMPUTER SCIENCE AND DESIGN

Sl. No.	Course Code	Course Title	Course Type	TD/ PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BCS401	Design and Analysis of Algorithms	PCC		3	0	0	**3**	**50**	**50**	**100**	**3**
2	BCG402	Computer Graphics and Visualization	IPCC		3	0	2	**3**	**50**	**50**	**100**	**4**
3	BCS403	Data Base Management Systems	IPCC		3	0	2	**3**	**50**	**50**	**100**	**4**
4	BBI404	Biology for Engineers	BSC	CHE	2	0	0	**3**	**50**	**50**	**100**	**2**
5	BCSL405	Design and Analysis of Algorithms Lab	PCCL		0	0	2	**3**	**50**	**50**	**100**	**1**
6	BXX406x	ESC/ETC/PLC	ESC		If the course is a Theory: 3	0	0	**3**	**50**	**50**	**100**	**3**
					If the course is a Laboratory: 2	0	2					
7	BUH407	Universal Human Values	UHV	ANY DEPT	1	0	0	**1**	**50**	**50**	**100**	**1**
8	BXX408x	Ability Enhancement Course/Skill Enhancement Course - IV	AEC/ SEC		If the course is a Theory: 1	0	0	**1**	**50**	**50**	**100**	**1**
					If the course is a Laboratory: 0	0	2	**2**				

9	BMP409	Metaphysical Science	HSSMC	ANY DEPT	1	0	0	**1**	**50**	**50**	**100**	**1**
10	BNS410	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	-	**100**	-	**100**	**0**
	BPE410	Physical Education (PE) (Sports and Athletics)		Physical Education Director								
	BYO410	Yoga		Yoga Teacher								
	BMU410	Music		Music Teacher								
11	BCE411	Competency Enhancement Course-2	NCMC	CDCAC	2	0	0	-	**100**	-	**100**	**0**
									650	**450**	**1100**	**20**

ASC: Applied Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Engineering Science Course (ESC/ETC/PLC) (Note- Student should opt for the course which should not be similar to the course opted in 1st Year)

Course Code	Course Name	Course Code	Course Name
BCS406A	Discrete Mathematical Structure & Graph Theory	BCS406C	Programming with JAVA
BCS406B	Data Communication	BCG406D	Responsive Web Design with Bootstrap 5.0

Ability Enhancement Course/Skill Enhancement Course – IV

Course Code	Course Name	Course Code	Course Name
BCS408A	Software Testing	BCS408C	JavaScript and JQuery
BCG408B	Mobile First Web Design with W3.CSS	BCS408D	Technical writing using LATEX

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering (B.E.) 2024-25 may please be referred.

National Service Scheme /Physical Education/Yoga/Music: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga and Music with the concerned coordinator / teacher of the course during the first week of 3rd semester. Activities shall be carried out between 3rdsemester to the 6th semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Music activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Semester: IV					
Design and Analysis of Algorithms					
Course Code	**:**	BCS401	**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Problem Solving through Programming and Data Structures and Application.
Knowledge on Fundamental Concepts	Programming skills, Data structures.
Knowledge on Connected Tools (If any)	Text Editor.

Course Learning Objectives: This course will enable the students to	
CLO1	Learn the methods for analyzing the fundamentals of algorithmic problem solving, algorithm efficiency, and important problem.
CLO2	Apply and implement various algorithmic paradigms including brute force, divide and conquer, decrease and conquer, and transform and conquer to solve computational problems.
CLO3	Develop solutions using advanced techniques such as dynamic programming and greedy algorithms for optimization and graph-related problems.
CLO4	Evaluate and compare algorithmic strategies considering time–space trade-offs, efficiency classes, and mathematical analysis of recursive and non-recursive algorithms.
CLO5	Classify and apply methods for handling limitations of algorithmic power, including P, NP, NP-complete classes, backtracking, branch-and-bound, and approximation algorithms.

Module - 1	**08 Hrs**
Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency: Analysis frame work, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms. **Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Text Book 1: Ch 1 : 1.1 - 1.3, Ch 2: 2.1 - 2.4**	
Module - 2	**08 Hrs**
Brute force approaches Selection Sort, Bubble sort, Brute-Force String Matching, Exhaustive Search: Travelling Salesman problem, Knapsack Problem. **Divide and Conquer:** Merge sort, Quick sort, Binary Tree Traversal, Multiplication of Large Integers and Strassen's Matrix Multiplication. **Text Book 1: Ch 3:3.1, 3.2, 3.4, Ch 5: 5.1 - 5.4**	

Module - 3	**08 Hrs**
Decrease and Conquer: Insertion Sort, Topological Sorting. **Transform and Conquer:** Balanced Search Trees, Heaps and Heapsort. **Space-Time Tradeoffs:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm **Text Book 1: Ch 4: 4.1, 4.2, Ch 6: 6.3, 6.4, Ch 7- 7.1, 7.2**	
Module - 4	**08 Hrs**
Dynamic Programming: Three basic examples, The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms. **Greedy Technique:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes. **Text Book 1: Ch 8: 8.1, 8.2, 8.4, Ch 9 : 9.1-9.4**	
Module - 5	**08 Hrs**
Limitations of Algorithmic Power: Decision Trees, P, NP, and NP-Complete Problems. **Coping with Limitations of Algorithmic Power:** Backtracking (n-Queens problem, Subset-sum problem), Branch-and-Bound (Knapsack problem), Approximation algorithms for NP-Hard problems (Knapsack problem). **Text Book 1: Ch 11:11.2, 11.3, Ch 12: 12.1 - 12.3**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze algorithm efficiency using asymptotic notations and classify algorithms into basic efficiency classes based on time and space complexity
CO2	Design and implement solutions to computational problems using Divide & Conquer and Decrease & Conquer strategies**.**
CO3	Develop solutions for real-world and complex computational problems by applying transform & conquer and dynamic programming techniques.
CO4	Construct graph and string processing algorithms using greedy approaches and input enhancement methods.
CO5	Differentiate between classes of computational problems (P, NP, NP-Complete) and apply advanced techniques such as backtracking, branch and bound, and approximation algorithms for efficient problem-solving.

Text Book	
1	Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition, 2017, Pearson, ISBN: 978-0-13-231681-1.

Reference Books	
1	Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press, ISBN: 978-8173716119.
2	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI, ISBN: 978-8120340077.
3	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education), ISBN: 978-0198093695.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106102064
3	https://nptel.ac.in/courses/106105164

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	1	2	1					2
CO2	3	3	3	2	2	1					2
CO3	3	3	3	2	2	1					2
CO4	3	3	3	2	3	2					2
CO5	3	3	3	2	2	2					2

Semester: IV					
Computer Graphics and Visualization					
Course Code	**:**	BCG402	**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40L + 12P	**SEE**	**:**	50 Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Problem Solving through C Programming.
Knowledge on Fundamental Concepts	Knowledge of arrays, Basic Physics (light, reflection, refraction), vectors, matrices, transformations, 2D and 3D geometry, coordinate systems.
Knowledge on Connected Tools(If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand concepts of Computer Graphics along with its applications.
CLO2	Explore mathematics for 2D and 3D graphics along with OpenGL API's.
CLO3	Use of Computer graphics in animation and GUI design.
CLO4	Demonstrate Geometric transformations, viewing on both 2D and 3D objects.
CLO5	Infer the representation of curves, surfaces, Color and Illumination models.

Module – 1	**08Hrs**
Computer Graphics: Application of Computer Graphics. **OpenGL:** Introduction to OpenGL, Coordinate reference frames, Specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, Point attributes, Line attributes, Curve attributes, OpenGL fill area functions, OpenGL Vertex arrays, Line drawing algorithm- Bresenham's. **Text Book 2: Ch 1: 1.1** **Text Book 1: Ch 3: 3.5, Ch 4: 4.1-4.5, 4.8,4.9, Ch 5: 5.1**	
Module – 2	**08Hrs**
2D and 3D graphics with OpenGL: 2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates, Inverse Transformation, Other 2D transformations, OpenGL raster transformations, Transformation between 2D coordinate systems, OpenGL geometric transformation functions. **3D Geometric Transformations:** 3D Translation, rotation, scaling, OpenGL geometric transformations functions. **Text Book 1**: **Ch 6: 6.1-6.3, 6.5–6.9, Ch 8: 8.1-8.3**	
Module – 3	**08Hrs**
Interactive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface. **Computer Animation:** Design of Animation Sequences, Traditional Animation Techniques,	

Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures. **Text Book 1: Ch 18**: **18.1-18.4, 18.7, 18.8 ,Ch 11: 11.2-11.5, 11.8-11.10**
Module – 4 **08Hrs**
Clipping: Clipping window, Normalization and viewport transformations, Clipping algorithms, 2D point clipping, 2D line clipping algorithms: Cohen-sutherland line clipping. **Color Models:** Properties of light, Color models, RGB and CMY color models. **Illumination Models:** Light sources, basic illumination models-Ambient light, Diffuse reflection, Specular and Phong model. **Text Book 1: Ch 7: 7.2, 7.3, 7.5-7.7, Ch 15: 15.1, 15.3, Ch 17:17.1, 17.2, 17.4, 17.6**
Module – 5 **08Hrs**
3D Viewing:3D viewing concepts, 3D viewing pipeline, Transformation from world to viewing coordinates, Projection transformation, Orthogonal projections, Perspective projections, OpenGL 3D viewing functions. **Visible Surface Detection Methods:** Classification of visible surface Detection algorithms, depth buffer method. **Text Book 1: Ch 9: 9.1, 9.2, 9.4-9.6, 9.8, 9.10, Ch 14**: **14.1,14.3**

Practical component of IPCC

Sl.No.	Experiments
1	Develop OpenGL program to draw a line using Bresenham's algorithm for all types of slopes.
2	Develop OpenGL program to create and rotate a triangle about the origin and a fixed point.
3	Develop OpenGL program to implement to recursively subdivide a tetrahedron to form 3D sierpinski gasket. The number of recursive steps is to be specified by the user.
4	Develop OpenGL program to Spin 3D sierpinski gasket using OpenGL transformation matrices.
5	Develop OpenGL program to Clip 2D lines using Cohen-Sutherland algorithm.
6	Develop a menu driven program to animate the polygon using 3D geometric transformations.
7	Develop OpenGL program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.
8	Develop OpenGL program to draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
9	Develop OpenGL program to draw a simple scene containing few 3D objects and provide day and night effect. Define suitably the position and properties of the light source used in the scene.

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate simple algorithms using OpenGL Graphics primitives and attributes.
CO2	Apply mathematical concepts for 2-D and 3-D geometric transformations.
CO3	Make use of OpenGL functions for Interactive Input, GUI and animations.
CO4	Discuss the fundamental principles of clipping algorithms, color models, and illumination models.
CO5	Develop visual representations of surfaces and 3D objects.

Text Books	
1	Computer Graphics with OpenGL, Donald Hearn & Pauline Baker, 4th Edition, 2011, Pearson Education, ISBN-10**:** 0136053580.
2	Interactive Computer Graphics- A Top Down approach with OpenGL, Edward Angel, 5th Edition, 2009, Pearson Education, ISBN-10: 0321535863.

Reference Books	
1	Computer Graphics: Principles and Practice, James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, 3rd Edition,2013, Addison-Wesley, ISBN: 9780321399526.
2	Fundamentals of Computer Graphics, Peter Shirley & Steve Marschner, 5th Edition, 2021, CRC Press, ISBN: 9780367331751.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/106/106/106106090/
2	https://nptel.ac.in/courses/106/102/106102063/
3	https://nptel.ac.in/courses/106/103/106103224/
4	https://nptel.ac.in/courses/106/102/106102065/
5	http://www.opengl-redbook.com/
6	http://www.openGL.org/

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	1	3	-	-	1	-	-	1
CO2	3	2	2	1	3	1	1	1	1	-	1
CO3	2	3	2	1	3	1	-	1	2	-	2
CO4	2	3	2	1	3	2	1	1	1	-	2
CO5	2	2	2	1	3	2	1	1	1	-	1

Semester :IV					
Database Management System					
Course Code	**:**	BCS403	**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40L+12P	**SEE**	**:**	50 Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	-
Knowledge on Fundamental Concepts	File systems
Knowledge on Connected Tools (If any)	-

Course Level Objectives: This course will enable the students to	
CLO1	Analyze and document an application's data needs through conceptual modelling, employing tools like ER diagrams.
CLO2	Design database schemas based on the conceptual model and Construct relational algebraic expressions for queries using the concepts of relational database theory.
CLO3	Construct simple and moderately advanced database queries using Structured Query Language (SQL) and NOSQL.
CLO4	Apply logical database design principles with database normalization.
CLO5	Analyze database transaction operations, concurrency control methods, and recovery strategies.

Module - 1	**08 Hrs**
Databases and Databases Users: Introduction, Characteristics of database Approach, Advantages of using the DBMS Approach **Database System Concepts and Architecture:** Data Models-Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Database System Environment. **Data Modelling Using the Entity-Relationship (ER) Model:** Entity types-Entity sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and structural Constraints, Weak Entity Types, ER Diagrams, Naming convention and design issues. **Text Book: Ch 1: 1.1, 1.3, 1.6, Ch 2: 2.1-2.4, Ch 3: 3.3-3.7**	
Module - 2	**08 Hrs**
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary relational operations :Select ,Project, Relation Algebra Operations from Set Theory, Binary relational operations: join and division, additional relational operations (aggregate, grouping, Outer Join and Union Operations), Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational database design using ER to Relational Mapping. **Text Book: Ch 5: 5.1-5.3 , Ch 8: 8.1-8.6, Ch 9: 9.1**	

Module - 3	**08 Hrs**
Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT – DELETE and UPDATE Statements in SQL, Additional features in SQL. **More SQL:** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema Change Statements. **Text Book: Ch 6: 6.1-6.5, Ch 7: 7.1-7.4**	
Module - 4	**08 Hrs**
Basics of Functional Dependencies and Normalization for Relational Database: Introduction, Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal forms Based on Primary Keys, General Definition of Second and Third Normal forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Introduction to Transaction Processing – Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties on Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Text Book: Ch 14: 14.1-14.7, Ch 20: 20.1-20.6**	
Module - 5	**08 Hrs**
Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Multi-version Concurrency Control Techniques, Other Concurrency Control Issues. **NOSQL Databases and Big Data Storage Systems:** Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. **Text Book: Ch 21: 21.1-21.3, 21.7, Ch 24: 24.1-24.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamental concepts of Database Systems and illustrate data modelling using the Entity-Relationship (ER) model.
CO2	Apply relational database concepts including relations, constraints, and joins using relational algebra operators.
CO3	Develop SQL queries to manipulate and retrieve data from relational databases.
CO4	Analyze functional dependencies and perform normalization to design efficient relational database schemas.
CO5	Examine transaction management and differentiate traditional DBMS with NoSQL.

Text Book	
1	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson. ISBN-13: 978-0137502523.

Reference Books	
1	Database management systems, Ramakrishnan, and Gehrke, 3rd Edition,2014, McGraw Hill ISBN-10**:** 0072465638.
2	Database System Concepts, Silberschatz, H Korth, S Sudarshan, 6th Edition, 2010, McGraw-Hill, ISBN-10**:** 0071289593.
3	Mastering MongoDB 3.x, Alex Giamas, Kindle Edition, 2017, Packt Publishing, ISBN 978-1- 78398-260-8.
4	NOSQL Distilled, Pramod J Sadalage, Martin Fowler, 2013 ,Pearson, ISBN-10**:** 0-321-82662-0.

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc22_cs91/preview
2	https://www.mygreatlearning.com/academy/learn-for-free/courses/database-management-system
3	https://www.simplilearn.com/tutorials/dbms-tutorial
4	https://www.w3schools.com/sql/sql_intro.asp
5	https://www.youtube.com/watch?v=IoL9Ve2SRwQ&list=PLIwC9bZ0rmjSkm1VRJROX4vP2YMIf4Ebh

Practical Component:

Sl. No.	Experiments
1	Create a table called Employee & execute the following. Employee(EMPNO,ENAME,JOB, MANAGER_NO, SAL, COMMISSION) 1. Create a user and grant all permissions to the user. 2. Insert the any three records in the employee table contains attributes 3. EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback.Check the result. 4. Add primary key constraint and not null constraint to the employee table. 5. Insert null values to the employee table and verify the result.
2	Create a table called Employee that contain attributes EMPNO,ENAME,JOB, MGR,SAL & execute the following. 1. Add a column commission with domain to the Employee table. 2. Insert any five records into the table. 3. Update the column details of job 4. Rename the column of Employ table using alter command. 5. Delete the employee whose Empno is 105.
3	Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by, Orderby. Employee(E_id, E_name, Age, Salary) 1. Create Employee table containing all Records E_id, E_name, Age, Salary. 2. Count number of employee names from employeetable 3. Find the Maximum age from employee table. 4. Find the Minimum age from employeetable. 5. Find salaries of employee in Ascending Order. 6. Find grouped salaries of employees.

4	Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName,PLocation, DNo) WORKS_ON(SSN, PNo, Hours) Write SQL queries to 1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project. 2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. 3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs.6,00,000.
5	Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary. CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY)
6	Create cursor for Employee table & extract the values from the table. Declare the variables ,Open the cursor & extrct the values from the cursor. Close the cursor. Employee(E_id, E_name, Age, Salary)
7	Write a PL/SQL block of code using parameterized Cursor that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped.
8	Install an Open Source NoSQL Data base MangoDB & perform basic CRUD(Create, Read, Update & Delete) operations. Execute MangoDB basic Queries using CRUD operations.

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2			2				1		2
CO2	3	3	2	2	3						2
CO3	3	3	2	2	3				1		2
CO4	3	3	3	3	2						2
CO5	3	3	2	3	2	1			1	1	3

Semester: IV					
Biology for Engineers					
Course Code	**:**	BBI404	**Credits**	**:**	2
Hours/Week (L:T:P)	**:**	2:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	30L	**SEE**	**:**	50 Marks
Course Type	**:**	BSC	**SEE Duration**	**:**	3 Hrs

Prerequisites:	
Courses	Biology, Chemistry
Knowledge on Fundamental Concepts	-
Knowledge on Connected Tools	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamental biological structures and biomolecules.
CLO2	Analyze the practical applications of biomolecules in biotechnology and daily life.
CLO3	Relate human organ systems to engineered designs and solutions.
CLO4	Appreciate bio inspired materials and mechanisms derived from nature.
CLO5	Explore emerging trends in bioengineering and biotechnology.

Module – 1	**06 Hrs**
Introduction to Biology: The cell: the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules, Enzymes (Classification (with one example each), Properties and functions), vitamins and hormones.	
Module – 2	**06 Hrs**
Biomolecules and Their Applications (Qualitative): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).	
Module-3	**06 Hrs**
Human Organ Systems and Bio Designs (Qualitative): Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).	
Module-4	**06 Hrs**
Nature-Bioinspired Materials and Mechanisms (Qualitative) Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces),	

Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and per flouro carbons (PFCs).

Module-5	**6 Hrs**
Trends in Bioengineering (Qualitative) Muscular and Skeletal Systems as scaffolds (architecture, mechanisms, bioengineering solutions for muscular dystrophy and osteoporosis), scaffolds and tissue engineering, Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Selfhealing Bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the structure and function of cells and major biomolecules essential for life processes.
CO2	Describe the applications of biomolecules in healthcare, environment, and biotechnology.
CO3	Elucidate the human organ systems using engineering analogies and identify associated bioengineering interventions.
CO4	Illustrate nature-inspired biological mechanisms and their technological applications in engineering and material science.
CO5	Discuss emerging trends and tools in bioengineering for diagnostics, therapeutics and environmental sustainability.

Text Books	
1	Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao, N Publishing, Bengaluru, 2023.
2	Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
3	Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4	Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011.

Reference Books	
1	Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
2	Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
3	Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st Edition, 2012, CRC Press.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/121106008
2	https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
3	https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-

	spring-2009
4	https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006
5	https://www.coursera.org/courses?query=biology
6	https://onlinecourses.nptel.ac.in/noc19_ge31/preview
7	https://www.classcentral.com/subject/biology
8	https://www.futurelearn.com/courses/biology-basic-concepts

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3					1					1
CO2	3	2			2	3					2
CO3	3				3	2	1				2
CO4	2	2			3	2					2
CO5	2	3				3					3

Semester: IV					
Design and Analysis Of Algorithm Laboratory					
Course Code	**:**	BCSL405	**Credits**	**:**	01
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	14P	**SEE**	**:**	50 Marks
Course Type	**:**	PCCL	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Data Structures and Applications, Problem Solving through Programming.
Knowledge on Fundamental Concepts	C Programming Fundamentals and Data Structure Concepts.
Knowledge on Connected Tools (If any)	Text Editor.

Course Learning Objectives: This course will enable the students to	
CLO1	Design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
CLO2	Apply diverse design strategies for effective problem-solving.
CLO3	Measure and compare the performance of different algorithms to determine their efficiency and suitability for specific tasks.
CLO4	Understand limitations and computability of problems related to NP-Completeness and Approximation algorithm
CLO5	Compare algorithm design strategies (divide-and-conquer, greedy, dynamic programming, backtracking, graph algorithms) by developing equivalent programs and analyzing empirical results.

Experiments	
Sl. No.	**List of problems for which student should develop program and execute in the Laboratory**
1	Design and implement C/C++ Program to sort a given set of n integer elements using Selection Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Design and implement C/C++ Program to sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	Design and implement C/C++ Program to sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
4	Design and implement C/C++ Program to obtain the Topological ordering of vertices in a given digraph.

5	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
6	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
7	a. Design and implement C/C++ Program to solve All-Pairs Shortest Paths problem using Floyd's algorithm. b. Design and implement C/C++ Program to find the transitive closure using Warshal's algorithm.
8	Design and implement C/C++ Program to find shortest paths from a given vertex in a weighted connected graph to other vertices using Dijkstra's algorithm.
9	Design and implement C/C++ Program to solve 0/1 Knapsack problem using Dynamic Programming method.
10	Design and implement C/C++ Program to solve discrete Knapsack and continuous Knapsack problems using greedy approximation method.
11	Design and implement C/C++ Program to find a subset of a given set S = {sl , s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d.
12	Design and implement C/C++ Program for N Queen's problem using Backtracking.

Course Outcomes: After completing the course, the students will be able to	
CO1	Develop programs to solve computational problems using suitable algorithm design strategy.
CO2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical).
CO3	Apply integrated development tools (IDEs) effectively to design, develop, and test programs.
CO4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems.
CO5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences.

Web links and Video Lectures (e – Resources)	
1	Virtual Labs : http://cse01-iiith.vlabs.ac.in/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	2	3						2
CO2	3	3	2	2	3						3
CO3	2	1	1	1	3						3
CO4	3	3	3	2	3						3
CO5	2	3	2	1	1				3	2	2

Semester: IV					
Discrete Mathematical Structures and Graph Theory					
Course Code	**:**	BCS406A	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	ESC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering Mathematics, Set Theory
Knowledge on Fundamental Concepts	Understanding of logic, sets, relations, functions, counting principles, and basic proof techniques
Knowledge on Connected Tools (If any)	Mathematical software like Wolfram Alpha, MATLAB, or LaTeX

Course Learning Objectives: This course will enable the students to	
CLO1	Understand logical statements using truth tables, rules of inference and quantifiers to construct valid logical arguments.
CLO2	Explore Fundamental principles of counting, permutations, combinations, recurrence relations and generating functions to solve combinatorial problems.
CLO3	Comprehend properties of relations and functions, including equivalence relations, partial orders, Stirling numbers and function growth analysis.
CLO4	Apply the foundational concepts of group theory to solve problems in coding theory using the Hamming metric and matrix representations.
CLO5	Analyze various graph and tree structures, including their properties, representations and applications in sorting and spanning tree algorithms.

Module – 1	**08Hrs**
Fundamentals of Logic: Basic Connectives and Truth Tables, Tautologies, Logical Equivalence: The laws of logic, Logical Implications, Rules of inference. Open Statement, Quantifiers, Definition and the use of Quantifiers, Definitions, and the proofs of theorems. **Text Book 1: Ch 2: 2.1-2.5**	
Module – 2	**08Hrs**
Fundamental Principles of Counting and Combinatorics: The Rule of Sum and Product, Permutations, Combinations, Principle of Inclusion and Exclusion, Derangements, The Binomial Theorem, Combinations with repetition. **Recursive Definitions, Recurrence Relations:** Recursive definition, First order linear recurrence relation- Formulation problems and examples, Second order linear recurrence relations with constant coefficients- Homogeneous and Non homogeneous, Generating functions. **Text Book 1: Ch 1: 1.1 - 1.4, Ch 10: 10.1 - 10.3, Ch 8: 8.3**	

Module – 3	**08Hrs**
Relations: Properties of relations, Composition of Relations, Partial Orders, Hasse Diagrams, Equivalence Relations, and Partitions. **Functions:** Functions-plain, One-to-one, onto functions, Stirling numbers of the second kind, Function composition and Inverse function, Growth of function. **Text Book 1: Ch. 5: 5.1 - 5.3, Ch. 7: 7.1 - 7.4**	
Module – 4	**08Hrs**
Groups theory: Definition, Examples and Elementary properties, Abelian groups, Homomorphism isomorphism, cyclic groups, cosets and Lagrange's theorem. **Coding Theory:** Elementary coding theory, the hamming metric, the parity-Check and Generator Matrices. **Text Book 1: Ch.15: 15.1 - 15.5, 15.7 - 15.9, 15.11**	
Module – 5	**08Hrs**
Introduction to Graph Theory: Graphs and their basic properties - degree, path, cycle, complement, subgraphs, isomorphism, Computer representations of graphs. Eulerian and Hamiltonian graphs, Graph coloring, Planar graphs. **Trees:** Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Spanning trees. **Text Book 1: Ch.11: 11.1 - 11.6, Ch. 12: 12.1 - 12.3**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Comprehend the foundational concepts of logic, combinatorics, relations and functions.
CO2	Apply counting techniques, recurrence relations, and function properties to solve computational problems.
CO3	Analyze complex problem scenarios and construct solutions using logical inference, graph theory and algebraic structures.
CO4	Develop innovative approaches using discrete structures like graphs, groups and recurrence relations.
CO5	Utilize the fundamental properties of graphs and trees to solve problems related to connectivity, traversal and optimization.

Text Book	
1	Discrete and Combinatorial Mathematics- An Applied Introduction, Ralph P. Grimaldi and B V Ramana, 5th Edition, 2017, Pearson Education Asia, ISBN: 978-0321385024.

Reference Books	
1	Introduction to Graph Theory, Garry Chartand and Ping Zhang, 2006, Tata McGraw-Hill, ISBN: 978-0070616080.
2	Discrete Mathematical Structures Theory and Applications, D.S. Malik and M.K. Sen, Latest Edition, 2004, Thomson, ISBN: 978-0619212858.
3	Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition, 2017, Tata McGraw Hill, ISBN-(13): 978-0070681880.
4	Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, 5th Edition, 2004, Pearson Education, ISBN: 978-0-201-72634-3.
5	Graph theory with the applications to engineering & Computer Science, Narsingh Deo, 2016, Dovers Publications, ISBN: 978-0486807935.

Web Links	
1	https://www.youtube.com/playlist?list=PLHXZ9OQGMqxersk8fUxiUMSIx0DBqsKZS
2	https://www.youtube.com/playlist?list=PLl-gb0E4MII0sGLCJeqDB3y63HZ6lM5LJ
3	https://discrete.openmathbooks.org/dmoi4.html

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	1						1	
CO2	3	3	2	2						1	
CO3	3	2	3	2					1	1	
CO4	3	2	3	3					1	1	
CO5									2	2	2

Semester: IV						
Data Communication						
Course Code	**:**	BCS406B		**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Introduction to Electronics & Communication.
Knowledge on Fundamental Concepts	Analog vs Digital signals, Signal representation, noise, Attenuation, Bandwidth.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Comprehend the transmission techniques of digital data between two or more computers and the functioning of computer networks that allow data exchange.
CLO2	Analyze the concepts of data communication and categorize different types of computer networks based on their characteristics.
CLO3	Demonstrate medium access control protocols for both reliable and noisy communication channels.
CLO4	Examine the architecture, standards, and functionalities of wired and wireless LANs.
CLO5	Apply networking concepts to design and evaluate simple network models for specific communication requirements.

Module – 1	**08 Hrs**
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration. **Networks Models:** Protocol Layering, TCP/IP Protocol suite, The OSI model, **Introduction to Physical Layer-1:** Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance. **Text Book 1: Ch 1:1.1-1.5, Ch 2: 2.1-2.3, Ch 3: 3.1, 3.3-3.6**	
Module – 2	**08 Hrs**
Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding). **Physical Layer-2:** Analog to digital conversion (only PCM), Transmission Modes. **Analog Transmission:** Digital to analog conversion. **Text Book 1: Ch 4: 4.1-4.3, Ch 5: 5.1**	
Module – 3	**08 Hrs**
Bandwidth Utilization: Multiplexing and Spread Spectrum. **Switching:** Introduction, Circuit Switched Networks and Packet switching. **Error Detection and Correction:** Introduction, Block coding, Cyclic codes, Checksum. **Text Book 1: Ch 6: 6.1, 6.2, Ch 8: 8.1-8.3, Ch 10: 10.1-10.4**	
Module – 4	**08 Hrs**

Data link control: DLC services, Data link layer protocols, Point to Point protocol (Framing, Transition phases only). **Media Access control:** Random Access, Controlled Access and Channelization. **Introduction to Data-Link Layer:** Introduction, Link-Layer Addressing, ARP. **IPv4 Addressing and subnetting:** Classful and CIDR addressing, DHCP, NAT**.** **Text Book 1: Ch 9: 9.1, 9.2, Ch 11: 11.1, 11.2, 11.4, Ch 12:12.1-12.3, Ch 18:18.4**

Module – 5	**08 Hrs**
Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet. **Wireless LANs:** Introduction, IEEE 802.11 Project and Bluetooth. **Other wireless Networks:** Cellular Telephony. **Text Book 1: Ch 13: 13.1-13.5, Ch 15: 15.1-15.3, Ch 16: 16.2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret the significance of components and core concepts in data communication systems.
CO2	Illustrate the principles of digital communication techniques and various switching methods.
CO3	Apply data link layer protocols to demonstrate error control and flow control mechanisms.
CO4	Analyze and differentiate between various data link layer protocols used in communication networks.
CO5	Evaluate the functionalities of IEEE 802.xx standards in wired and wireless networks.

Text Books	
1	Data Communications and Networking with TCP/IP Protocol Suite, Behrouz A. Forouzan, 6th Edition, 2022, McGraw Hill, ISBN: 978-0-07-802209-8.

Reference Books	
1	Communication Networks – Fundamental Concepts and Key Architectures, Alberto Leon-Garcia and Indra Widjaja, 2nd Edition, 2004, Tata McGraw-Hill, ISBN: 978-0072463521.
2	Data and Computer Communications, William Stallings, 8th Edition, 2007, Pearson Education, ISBN: 978-0132433105.
3	Computer Networks – A Systems Approach, Larry L. Peterson & Bruce S. Davie, 6th Edition, 2021, Elsevier (Morgan Kaufmann), ISBN: 978-0128182000.
4	Computer and Communication Networks, Nader F. Mir, 2nd Edition, 2014, Pearson Education, ISBN: 978-0133814743.

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/8zhdXVh7xtw
2	https://youtu.be/kCuyS7ihr_E
3	https://youtu.be/aPw0pltPrY4
4	https://youtu.be/EVvKAF9-Qfk

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2									
CO2	3	2	2								
CO3	3	3	2	2	3						
CO4	3	3	2	2							
CO5	2	2			2	3	2				2

Semester: IV					
Programming with Java					
Course Code	**:**	BCS406C	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	2:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	30L+10P	**SEE**	**:**	50 Marks
Course Type	**:**	ESC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Problem Solving through Programming.
Knowledge on Fundamental Concepts	Basic understanding of programming logic, data types, control structures, operators and functions.
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand Object-Oriented principles and basic Java constructs such as classes, objects, data types, methods, and control structures.
CLO2	Use the concepts of Inheritance and interfaces to achieve code reusability and polymorphism in Java programs.
CLO3	Develop Modular Java programs using packages and handle runtime errors using appropriate exception handling techniques.
CLO4	Implement concepts of Multithreading and Swings program development.
CLO5	Implement Database application in Java using JDBC.

Module – 1	**06Hrs**
Introduction to Java: Object oriented programming (Two Paradigms, Abstraction, and The Three OOP Principles), Using Blocks of Code, The Bytecode, The Java Buzzwords, and Structure of a Java Program, Data types, variables, operators, control statements and Arrays. **Introducing classes:** Class fundamentals, declaring objects, assigning object reference variables, Introducing methods, Constructors, this keyword, Garbage Collection. **Methods and classes:** Overloading methods, Objects as parameters, argument passing, Returning objects, Recursion, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes. **Text Book 1: Ch 1:1.4, 1.8, Ch 2, Ch 3, Ch 4, Ch 5, Ch 6, Ch 7**	
Module – 2	**06Hrs**
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class. **Interfaces:** Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods. **Text Book 1: Ch 8, Ch 9: 9.4-9.7**	

Module – 3	**06Hrs**
Packages: Packages, Packages and Member Access, Importing Packages. **Exceptions:** Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions. **Text Book 1: Ch.9: 9.1-9.3, Ch.10: 10.1-10.12**	
Module – 4	**06Hrs**
Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State. **Introducing Swing:** The Origin of Swing, Swing Is Built on AWT, Two Key Swing Features, The MVC Connection, Components and Containers, The Swing Packages, A Simple Swing Application. **Text Book 1: Ch 11: 11.1-11.10, Ch 32: 32.1-32.7**	
Module – 5	**06Hrs**
JDBC Objects: The concept of JDBC, JDBC Driver Types, JDBC packages, A brief overview of the JDBC Process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, ResultSet, Transaction Processing, Metadata, Data Types, Exceptions. **Text Book 2: Ch 6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the core object-oriented programming principles in Java through the use of classes, objects, methods, and arrays.
CO2	Illustrate how inheritance and packages can be applied to solve real-world problems.
CO3	Apply the concept of interfaces and exception handling to address complex real-world problems.
CO4	Develop Java applications using multi-threaded programming and Swings.
CO5	Apply JDBC to build database applications.

Text Books	
1	Java: The Complete Reference, Herbert Schildt, 13th Edition, 2024, McGraw-Hill, ISBN: 9781265058432.
2	J2EE - The Complete Reference – Jim Keogh, 1st Edition, 2017, Tata McGraw Hill, ISBN: 978-0070529120.

Reference Books	
1	Programming with Java, E Balagurusamy, 6th Edition, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2	Thinking in Java, Bruce Eckel, Fourth Edition, 2006 , Prentice Hall, ISBN-13: 978-0131872486. (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)
3	Introduction to Java Programming, Y. Daniel Liang, 6th Edition, 2007, Pearson Education, ISBN-13 978-0132221580.

Web links and Video Lectures (e – Resources)	
1	Java Tutorial: https://www.geeksforgeeks.org/java/
2	Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu): https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
3	Java Tutorial: https://www.w3schools.com/java/
4	Java Tutorial: https://www.javatpoint.com/java-tutorial
5	Programming in Java: https://onlinecourses.nptel.ac.in/noc20_cs58/preview

Practical Components:

Sl. No.	Experiments
1	Create a class namely Account with the data members (Accno : integer, name :String, Phone No: integer, balance_amt:float), and following methods : a. CreateAccount() method to create an account. b. Deposit() method to deposit amount to an account. c. Withdraw() method which gets the amount to be withdrawn from his/her account. d. PrintAccount() method to display account details.
2	Write a JAVA Program that does the following related to Inheritance: a. Create an abstract class called Vehicle which contains the 'year of manufacture' data member and two abstract methods getdata() and putdata() with a constructor. b. Create two derived classes 'Two-wheeler' and 'Four-wheeler' and implement the abstract methods. Make 'Four-wheeler' as final class. c. Create class 'MyTwoWheeler' which is a subclass of 'Two-wheeler' and demonstrate the use of super keyword to initialize data members of 'MyTwoWheeler'.
3	Write a JAVA program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods.
4	Create a package CIE which has two classes - Personal and Internals. The class Personal has members like usn, name, sem. The class Internals has an array that stores the internal marks scored in five courses of the current semester of the student. Create another package SEE which has the class External which is a derived class of Personal. This class has an array that stores the SEE marks scored in five courses of the current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.
5	Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of ArrayIndexOutOfBound-Exception.
6	Write a JAVA program that implements a multi-thread application that has two threads. One thread displaying "SJC Institute of Technology" once every ten seconds and another displaying "CSD" once every two seconds.
7	Demonstrate a swing event handling application that creates 2 buttons Alpha and Beta and displays the text "Alpha pressed" when alpha button is clicked and "Beta pressed" when beta button is clicked.

8	Write a JAVA Program to insert data into Student Data Base and retrieve info based on particular queries (For example update, delete, search etc…).

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2									1
CO2	3	3	2								1
CO3	3	3	2	2	3						1
CO4	3	3	2	2	3						2
CO5	3	2	2	2	2				1		1

Semester: IV					
Responsive Web Design With Bootstrap 5.0					
Course Code	**:**	BCG406D	**Credits**	**:**	03
Hours/Week (L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	ESC	**SEE Duration**	**:**	03 Hours

Prerequisites:	
Courses	Problem Solving through Programming.
Knowledge on Fundamental Concepts	Foundational web concepts like structure of websites, HTTP, browsers.
Knowledge on Connected Tools (If any)	Text Editors.

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the structure and role of the Bootstrap 5.0 framework in web development.
CLO2	Explore Bootstrap utility classes for managing text, headings, fonts, colors, and spacing.
CLO3	Learn responsive layouts using containers, grid systems, and responsive breakpoints.
CLO4	Gain the Knowledge of interactive components such as buttons, badges, modals, alerts, and popups using Bootstrap.
CLO5	Identify responsive web projects such as portfolios and landing pages using integrated Bootstrap components and layout strategies.

Module – 1	**08Hrs**
Introduction to Bootstrap Framework: Why front-end developer, What is Bootstrap, Versions, What's New in v5, Requirements, Why Bootstrap 5. **Typography:** Typography in Bootstrap 5, Headings (h1–h6), Display heading, Text Alignment, Font Sizing, Styles and Weight. **Text Book 1: Ch 10, Ch 13: 13.1, 13.5, 13.7-13.9**	
Module – 2	**08Hrs**
Typography: Text Line Height, Transformations, Lists, Bootstrap Colors, Borders, Margin, Padding, Buttons, Buttons with Outlines. **Text Book 1: Ch 13: 13.10, 13.11, 13.13-13.19**	
Module – 3	**08Hrs**
Responsive Layout: Bootstrap Containers, Breakpoints, Fluid Container, Grid System, Column Breakpoints, Column Sizing, Images, Cards, Gutters, Nav, Footer. **Text Book 1: Ch 14: 14.1-14.6, 14.8-14.12**	
Module – 4	**08Hrs**
Customize Bootstrap: When we should customize Bootstrap, What elements can be customized, How we can customize Bootstrap 5, Examples of user interfaces with a customized version of Bootstrap 5, The card component, Forum, The contact page, Portfolio. **Text Book 2: Ch 1**	

Module – 5	08Hrs
Using and Compiling Sass: What is Sass, Sass syntax, Parent selector, Sass features, Variables, Nesting, Partials and import, Mixins, Extend, Operators, Functions, Built-in modules. **Text Book 2: Ch 2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Infer the principles of responsive web design and the Bootstrap 5 framework.
CO2	Apply Bootstrap utility classes *to* format text, manage spacing, colors, borders and buttons.
CO3	Create responsive layouts using Bootstrap containers, grid system, breakpoints and navigation elements.
CO4	Develop customized Bootstrap components and user interfaces using cards, forms, contact pages and portfolios.
CO5	Design enhanced styles using Sass features such as variables, nesting, mixins and built-in modules for Bootstrap 5 projects.

Text Books	
1	Bootstrap 5 Foundations, Daniel Foreman, 2nd Edition, 2021, Foreman Technology, ISBN: 979-8749992465.
2	The Missing Bootstrap 5 Guide, Jeppe Schaumburg Jensen, 1st Edition, 2022, Packt, ISBN: 978-1-80107-643-2.

Reference Books	
1	Bootstrap: Responsive Web Development, Jake Spurlock, 1st Edition, 2013, O'Reilly Media, ISBN: 1449343910.
2	Responsive Web Design with HTML 5 & CSS, Jessica Minnick, 9th Edition, 2020, Cengage Learning, ISBN: 9780357423875.

Suggested Learning Resources:	
1	https://www.w3schools.com/bootstrap5/
2	https://www.geeksforgeeks.org/bootstrap-5-introduction/

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2		1				1	1	2
CO2	3	2	2	1	2				1	2	2
CO3	3	2	2	1	2			2	2	2	3
CO4	3	2	2	1	2			2	2	2	3
CO5	3	2	2	1	2			1	2	1	2

Semester: IV					
Universal Human Values (UHV)					
Course Code	**:**	BUH407	**Credits**	**:**	01
Hours/Week(L:T:P)	**:**	1:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	15	**SEE**	**:**	50 Marks
Course Type	**:**	UHV	**SEE Duration**	**:**	1 Hour

Course Objectives: This course will enable the students to	
CLO1	Understand the need, purpose, and content of value-based education.
CLO2	Facilitate self-exploration as a process to understand human aspirations and their fulfillment.
CLO3	Understand harmony at various levels – individual, family, society, nature, and existence.
CLO4	Promote ethical competence and awareness of professional ethics.
CLO5	Encourage the adoption of a holistic and humanistic approach in personal and professional life.

Module-1	**03 Hrs**
Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations. **Text Book 1: Ch 1, 2**	
Module-2	**03 Hrs**
Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health. **Text Book 1: Ch 3**	
Module-3	**03 Hrs**
Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order. **Text Book 1: Ch 4, 5**	
Module-4	**03 Hrs**
Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels and The Holistic Perception of Harmony in Existence. **Text Book 1: Ch 6, 7**	

Module-5	03 Hrs
Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession **Text Book 1: Ch 8, 9**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the need and importance of value education and the process of self-exploration.
CO2	Explain the concept of harmony in the human being, differentiating the needs of the self and the body.
CO3	Apply the principles of trust, respect, and justice to improve relationships within the family and society.
CO4	Analyze and appreciate the interconnectedness and mutual fulfillment among the four orders of nature.
CO5	Demonstrate ethical behavior and decision-making in professional and personal contexts by integrating human values.

Text Books	
1	The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, 2019, Excel Books, New Delhi, ISBN: 978-93-87034-47-1.
2	The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G, 2nd Edition, 2002.

Reference Books	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, 2004.
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews.
7	Economy of Permanence - J C Kumarappa.
8	Bharat Mein Angreji Raj – Pandit Sunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)
13	Gandhi - Romain Rolland (English)
14	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
15	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
16	A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
17	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
18	A N Tripathy, 2003, Human Values, New Age International Publishers.

19	SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
20	E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
21	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
22	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
23	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Web links and Video Lectures (e – Resources)	
1	https://www.uhv.org.in/uhv-ii,
2	http://uhv.ac.in,
3	http://www.uptu.ac.in
4	http://www.storyofstuff.com
5	https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
6	https://fdp-si.aicte-india.org/8dayUHV_download.php
7	https://www.youtube.com/watch?v=8ovkLRYXIjE
8	https://www.youtube.com/watch?v=OgdNx0X923I
9	https://www.youtube.com/watch?v=nGRcbRpvGoU
10	https://www.youtube.com/watch?v=sDxGXOgYEKM

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1					2	3	2	2		2
CO2	2	2				2	3		1		2
CO3						3	3	3	2		2
CO4						2	2		1		2
CO5						3	3	2	2		3

Semester: IV					
Software Testing					
Course Code	:	BCS408A	**Credits**	:	1
Hours/Week (L:T:P)	:	0:0:2	**CIE**	:	50 Marks
Total Hours	:	15P	**SEE**	:	50 Marks
Course Type	:	AEC	**SEE Duration**	:	2 Hours

Prerequisites:	
Courses	-
Knowledge on Fundamental Concepts	Basic programming constructs (loops, conditionals, functions)
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the test cases for any given problem.
CLO2	Analyze the requirements for the given problem statement.
CLO3	Design the solution and write test cases for the given problem.
CLO4	Construct control flow graphs for the solution that is implemented.
CLO5	Create appropriate document for the software artifact.

Sl. No.	**PART A – List of problems for which student should develop program and execute in the Laboratory**
1	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.
2	Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.
3	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of decision table-based testing, derive different test cases, execute these test cases and discuss the test results.
4	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, equivalence class partitioning and decision-table approach and execute the test cases and discuss the results.
5	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.
6	Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

	PART B – Project Based Learning
1	Develop a Mini Project with documentation of suitable test-cases and their results to perform automation testing of any E-commerce or social media web page. Suggested Guidelines: ● Create a WebDriver session. ● Navigate to a Web page. ● Locate the web elements on the navigated page. ● Perform an actions on the located elements. ● Assert the performed actions did the correct thing. ● Report the results of the assertions. ● End the session. Each inputs / data feeds (ex: website, username, password, mobile no, product name, etc.,)must be provided through a file linked with code and neither to be entered manually nor to be included in the code Use any software testing tool like selenium, Katalon, etc.,

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify and document the functional and non-functional requirements for a given problem statement, and develop comprehensive test cases.
CO2	Design and implement the solution for given problem and to design flow graph.
CO3	Utilize Eclipse/NetBeans IDE and relevant testing tools to design, develop, debug, and produce complete documentation for the developed software artifact.
CO4	Apply appropriate functional testing strategies and critically compare various testing techniques based on effectiveness and efficiency.
CO5	Compare the problems according to a suitable testing model applying the test coverage metrics.

Web links and Video Lectures (e – Resources)	
1	https://www.javatpoint.com/selenium-tutorial
2	Introduction to Selenium - https://www.youtube.com/watch?v=FRn5J31eAMw
3	Introduction to programming - https://www.youtube.com/watch?v=2Xa3Y4xz8_s
4	Introduction to OOPS - https://www.youtube.com/watch?v=pBlH24tFRQk
5	Introduction to Java - https://www.youtube.com/watch?v=mAtkPQO1FcA
6	Eclipse for java - https://www.youtube.com/watch?v=8cm1x4bC610

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3		2							
CO2	2	3	3		2						
CO3			2		3			2	2	1	2
CO4	2	3	2	2							2
CO5	2	3		3	2						2

Semester: IV					
Mobile First Web Design with W3.CSS					
Course Code	**:**	BCG408B	**Credits**	**:**	01
Hours/Week (L:T:P)	**:**	0:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	14P	**SEE**	**:**	50 Marks
Course Type	**:**	AEC	**SEE Duration**	**:**	02 Hours

Prerequisites:	
Courses	Problem Solving through Programming.
Knowledge on Fundamental Concepts	Web concepts like structure of Websites, HTTP and Browsers.
Knowledge on Connected Tools (If any)	Text Editors.

Course Learning Objectives: This course will enable the students to	
CLO1	Identify the core principles of mobile-first web design their role in building responsive websites.
CLO2	Learn basic classes of CSS framework: W3.CSS.
CLO3	Design visually appealing and accessible web interfaces.
CLO4	Make use of JavaScript and W3.CSS classes for Web based User Interfaces
CLO5	Develop responsive personal or thematic website integrating animations and interactive features.

Sl. No.	**Experiments**
1	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes for layouts: CSS Layouts (CSS layout, CSS responsive, CSS grid and CSS display).
2	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes for color and features: CSS colors and CSS Helper classes (Tabs and Sidebar).
3	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes for enhancement: Helper classes (Accordions, cards, panels).
4	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes: CSS containers.
5	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes: CSS visual elements.
6	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes: CSS Text.
7	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes: CSS Menus.
8	Develop a Web page(s) with suitable HTML elements to demonstrate the following

	W3.CSS framework classes: CSS Tables and Lists.
9	Develop a Web page(s) with suitable HTML elements to demonstrate the following W3.CSS framework classes: CSS Buttons, Labels and Form Elements.
10	Develop a Web page(s) with suitable HTML elements and JavaScript to demonstrate the following W3.CSS framework classes: Animations, Modals and Images.
11	Design a personal portfolio showcasing: Home, About Me, Projects, and Contact sections.
12	Design a visually appealing website on your favorite topic (e.g., Travel Diary**,** Food Recipes, Tech Reviews.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the mobile-first design approach and its significance in modern web development.
CO2	Develop structured and accessible web pages using semantic HTML5 and W3.CSS layout and container classes.
CO3	Apply W3.CSS framework classes for colors, text, menus, and visual enhancements to improve user experience.
CO4	Design responsive web interfaces using W3.CSS layout tools such as grid, display, tabs, sidebars, and accordions.
CO5	Build and deploy fully responsive, visually appealing websites or portfolios incorporating animations and interactivity.

Web links and Video Lectures (e – Resources)	
1	https://www.syncfusion.com/succinctly-free-ebooks/w3-css-
2	https://www.syncfusion.com/succinctly-free-ebooks/confirmation/w3-css-succinctly
3	https://www.w3schools.com/w3css/
4	https://www.tutorialspoint.com/w3css/w3css_tutorial.pdf

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	2			3						2
CO2	3	2	2		3						2
CO3	3	2	2		3				2		3
CO4	3	2	2		3			2	2		3
CO5	3	2	2	2	3	2	2	3	3	2	3

Semester: IV					
Javascript and Jquery					
Course Code	**:**	BCS408C	**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	15P	**SEE**	**:**	50 Marks
Course Type	**:**	AEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Object Oriented Programming with JAVA
Knowledge on Fundamental Concepts	Variables, Functions, Control Structures, HTML and CSS
Knowledge on Connected Tools (If any)	Visual Studio Code (VS Code)

Course Learning Objectives: This course will enable the students to	
CLO1	Understand primitives of JavaScript Programming.
CLO2	Implement arrays and objects in JavaScript to create structured and functional programs.
CLO3	Make Use of basic jQuery methods to access and manipulate HTML elements in web pages.
CLO4	Demonstrate jQuery methods to manipulate HTML elements and handling events.
CLO5	Apply JavaScript and jQuery techniques to build interactive web applications with form handling, animations, and dynamic styling.

Sl. No.	**Experiments**
1	a. Develop a JavaScript program to Capitalize the first letter of each Word of a sentence (String). b. Develop a JavaScript program to Check a string starts with 'Java'.
2	a. Develop a JavaScript program to display the current day and time. b. Develop a JavaScript program to reverse a given string
3	a. Develop a JavaScript program to display a message using alert. b. Develop a JavaScript program to display a confirm message on a button click. c. Develop a JavaScript program to read value through prompt window and display the value on a button click.
4	a. Develop a JavaScript program to display (on respective button clicks) multiplication and division of two numbers. Read values from the textboxes and design two buttons (use DOM). b. Develop a JavaScript program to highlight with red color the HTML links (<a>) having class name “high” (use DOM).
5	a. Develop a JavaScript program to read the content of HTML paragraph and update (on button click event) with the suitable Text read from the HTML Textbox (Use innerHTML) b. Develop a JavaScript program to check for an attribute (‘href’ in <a>) and get its value/display on the Web page on a button click.
6	a. Develop a JavaScript program to sort a list of numbers (Use arrays and

	functions) b. Develop a JavaScript program to create a hotel object using object literal syntax having properties (name, location, room rate, discount etc), constructors and method (offer-price). Create few objects to demonstrate the access of properties and an associated method.
7	a. Develop a jQuery program to disable/enable the form and disable right click menu. b. Develop a jQuery program to Underline all the words and first word bold.
8	a. Develop a jQuery program to Add options to a drop-down list. b. Develop a jQuery program to Change the button text.
9	a. Develop a jQuery program to Disable a link. b. Develop a jQuery program to Delete all table rows except first one.
10	a. Develop a jQuery program to Change a CSS class. b. Develop a jQuery program to Set the background color.
11	a. Develop a jQuery program to Add two classes. b. Develop a jQuery program to Add a specified class.
12	a. Develop a jQuery program to read and display the value entered in a Textbox and option chosen in dropdown list with relevant events. b. Develop a jQuery program to Animate paragraph element.

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply fundamental concepts of JavaScript to develop simple programs.
CO2	Design programs to handle structured data (object) and data items (array).
CO3	Develop programs to access and manipulate HTML with DOM and event handling.
CO4	Demonstrate the role of jQuery selectors to access HTML elements of Web pages.
CO5	Implement jQuery methods to manipulate HTML and trigger events in Web pages.

Text Books	
1	Javascript and jQuery: Interactive Front-End Web Development, Jon Duckett, 1st Edition, 2014, Willey, ISBN-13: 978-1118871652.

Reference Books	
1	Learning Web Design: A Beginners Guide to HTML, CSS, JavaScript, and Web Graphics, Jennifer Robbins, 5th Edition,2018, O'Reilly Media, ISBN-13: 978-1491960202.
2	JavaScript: The Definitive Guide, David Flanagan, 7th Edition, 2020, O'Reilly Media, ISBN-13 978-14 91952023.
3	JavaScript: The Good Parts, Douglas Crockford, 1st Edition, 2008, O'Reilly Media, ISBN-13: 978-0596517748.

Web links and Video Lectures (e – Resources)	
1	https://www.w3schools.com/js/
2	https://www.javascript.com/learn/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	1	1	1	2		1				2
CO2	3	2	2	2	2		1		1		2
CO3	3	2	2	2	2		1		1		2
CO4	3	2	2	2	2		1	1	1		2
CO5	3	2	2	2	2		1		1		2

Semester: IV					
Technical Writing using LaTeX					
Course Code	:	BCS408D	**Credits**	:	1
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	50Marks
Total Hours	:	12P	**SEE**	:	50Marks
Course Type	:	AEC	**SEE Duration**	:	2 Hours

Prerequisites:	
Courses	Technical English.
Knowledge on Fundamental Concepts	Document Structure and Algorithm presentation.
Knowledge on Connected Tools (If any)	TeXStudio, MiKTeX.

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamentals of LaTeX and its role in scientific and academic documentation.
CLO2	Work with documents that contain sections, tables, figures and math content to format them properly.
CLO3	Use LaTeX to include referencing, theorem Environments and bibliographies in documents.
CLO4	Prepare documents with clear structure, such as reports, articles and project files.
CLO5	Utilize LaTeX packages for drawing diagrams, writing algorithms and preparing conference templates.

<table>
<tr><th>Sl. No.</th><th>Experiments</th></tr>
<tr><td>1</td><td>Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.</td></tr>
<tr><td>2</td><td>Develop a LaTeX script to create a document that contains the following table with proper labels.
<table>
<tr><th rowspan="2">Sl.No.</th><th rowspan="2">USN</th><th rowspan="2">Student Name</th><th colspan="3">Marks (Subjects of 4th Semester)</th></tr>
<tr><th>Subject1</th><th>Subject2</th><th>Subject3</th></tr>
<tr><td>1</td><td>1XX22XX001</td><td>Name1</td><td>89</td><td>60</td><td>90</td></tr>
<tr><td>2</td><td>1XX22XX002</td><td>Name2</td><td>78</td><td>45</td><td>98</td></tr>
<tr><td>3</td><td>1XX22XX003</td><td>Name3</td><td>67</td><td>55</td><td>59</td></tr>
</table></td></tr>
<tr><td>3</td><td>Develop a LaTeX script to include the side by side graphics /pictures /figures in the document by using the sub graph concept.</td></tr>
<tr><td>4</td><td>Develop a LaTeX script to create a document that consists of the following two mathematical equations.
$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
$= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$
$= \frac{-2 \pm \sqrt{4+32}}{2}$
$\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \mathrm{sgn}(\pi)\varphi_\sigma^\lambda \varphi_\pi^\lambda$
$= \sum_{\tau \in C_{\sigma t}} \mathrm{sgn}(\sigma^{-1}\tau\sigma)\varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$
$= A_{\sigma t}\varphi_\sigma^\lambda$</td></tr>
</table>

5	Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries and lemmas in the document.
6	Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section.
7	Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library.
8	Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm 2e library.
9	Develop a LaTeX script to create a simple title page of the VTU SJCIT project Report [Use suitable Logos and text formatting].
10	Develop a LaTeX script to create the Certificate Page of the Report of SJCIT [Use suitable commands to leave the blank spaces for user entry].
11	Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.
12	Develop a LaTeX script to create an article of IEEE/Springer (Conference) template.

Course Outcomes: After completing the course, the students will be able to	
CO1	Create well-structured documents using LaTeX including sections, headers and footers.
CO2	Design and format tables, figures, mathematical content, and bibliographies.
CO3	Demonstrate LaTeX libraries to include graphics, theorems, and reference management.
CO4	Develop technical and academic documents such as reports and project files.
CO5	Apply advanced LaTeX packages like TikZ, algorithmic environments, and IEEE templates.

Text Book	
1	A Short Introduction to LaTeX: A book for beginners, Firuza Karmali (Aibara), 2019, Create space Independent Publishing Platform, ISBN-13: 978-1543162646.

Reference Book	
1	Formatting Information: A Beginner's Introduction to Typesetting with LaTeX, Peter Flynn, 1st Edition, 2005, Comprehensive TeX Archive Network.

Web links and Video Lectures (e – Resources)	
1	https://latex-tutorial.com/tutorials/
2	https://www.javatpoint.com.cach3.com/what-is-latex.html
3	https://www.youtube.com/watch?v=ydOTMQC7np0

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3		2		3					2	
CO2	3	2	3		3					2	
CO3	3		2		3					3	
CO4	3	2	3		3				2	3	
CO5	3		3		3			2	2	3	2

Semester: IV					
Metaphysical Science					
Course Code	:	BMP409	**Credits**	:	1
Hours/Week(L:T:P)	:	1:0:0	**CIE**	:	50 Marks
Total Hours	:	15L	**SEE**	:	50 Marks
Course Type	:	HSSMC	**SEE Duration**	:	1 Hour

Course Learning Objectives: This course will enable the students to	
CLO1	Explore the philosophical and spiritual aspects of the universe.
CLO2	Compare and contrast ontological & Epistemology theories
CLO3	Analyze metaphysical perspectives on time, space, and the origin of the universe.
CLO4	Inculcate the Metaphysical inquiries into the nature of mind and consciousness.
CLO5	Apply and analyze the nature of reality, existence, and universe beyond the physical sciences.

Module 1	**03 Hrs**
Introduction to Metaphysics: Definition of Metaphysics, scope, and historical roots (Aristotle, Plato, Kant). Distinction between metaphysics, physics and spirituality. **Branches of Metaphysics:** Ontology, cosmology, epistemology, and their interconnections. **Key Metaphysical Questions:** Why is there something rather than nothing? The nature of abstract entities (numbers, moral values). **Text Book 2: Ch 1, 2**	
Module 2	**03 Hrs**
Ontology (Study of Being): Materialism vs. Idealism vs. Dualism, The Problem of Universals (Realism vs. Nominalism). **Epistemology (Study of Knowledge):** Rationalism (Descartes) vs. Empiricism (Locke, Hume). Theories of truth (Correspondence, Coherence, Pragmatic). **Skepticism & Constructivism:** Can we truly know reality? (Descartes' Evil Demon, Simulation Theory). **Text Book 2: Ch 3-5**	
Module 3	**03 Hrs**
Cosmology – Metaphysical Perspectives on the Universe: Philosophical cosmology vs. physical cosmology, Metaphysical views on time, space, and the origin of the universe, The Anthropic Principle and Fine-Tuning debate, Creation, causality, and the infinite regress problem, Multiverse theory and its metaphysical implications, Spiritual and ancient. **Cosmologies:** Vedic, Taoist, and Indigenous models. **Text Book 1: Ch 1** **Text Book 2: Ch 6-7**	
Module 4	**03 Hrs**
Mind and Consciousness: Definition of mind and consciousness, Mind-body problem: Dualism vs. Physicalism. **Theories of consciousness:** Integrated Information Theory (IIT), Global Workspace, Panpsychism, Eastern and Western views of the self and mind; Artificial intelligence and machine consciousness, Role of consciousness in observation and decision-making. **Text Book 1: Ch 2** **Text Book 2: Ch 8**	

Module 5	03 Hrs
Quantum Healing and Energy Medicine: Basics of quantum mechanics (superposition, entanglement, observer effect), Quantum theory and the mind: Role of consciousness in quantum collapse, Overview of Quantum Healing – Deepak Chopra's model. **Energy fields:** Biofield theory, chakras, subtle energy systems, Placebo effect, intention and non-local healing, Implications for engineering bio-resonant technologies. **Text Book 1: Ch 3-15**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Assess the nature of reality, existence and the universe.
CO2	Evaluate the competing ontology and epistemological frameworks.
CO3	Interpret the various multiverse models and their philosophical significance.
CO4	Analyze the mind-body problem and theories of consciousness.
CO5	Differentiate the theoretical and practical intersections between quantum physics, quantum healing and meditation.

Text Books	
1	Quantum Metaphysics, Tarja Kallio-Tamminen, 2004, Otamedia, Oy, ISBN 952-10-1927-1.
2	Metaphysics-A Very Short Introduction, Stephen Mumford, Sl. No. 20129780191640261, 0191640263, 2012, OUP Oxford.

Reference Books	
1	Quantum Healing (Revised and Updated): Exploring the Frontiers of Mind/Body Medicine, Deepak Chopra M.D., 2015.
2	Quantum Body: The New Science of Living a Longer, Healthier, More Vital Life, Deepak Chopra M.D., 2023.

Web links	
1	https://www.yogajournal.com/meditation/
2	https://youtube.com/shorts/JgCVh6wwgNg?si=R87-PGIrUSII774w
3	https://www.youtube.com/watch?v=XvyuUqlX7fE
4	https://core.ac.uk/download/pdf/14914967.pdf
5	https://www.youtube.com/watch?v=_ba0yIAZ9ok
6	https://www.youtube.com/watch?app=desktop&v=fzxohf49loU
7	https://www.youtube.com/watch?v=SSGKowtXS3Y
8	https://www.youtube.com/watch?v=r_piRatnFlY

Course Outcomes: After completing the course, the students will be able to	
CO1	Assess the nature of reality, existence and the universe.
CO2	Evaluate the competing ontology and epistemological frameworks.
CO3	Interpret the various multiverse models and their philosophical significance.
CO4	Analyze the mind-body problem and theories of consciousness.
CO5	Differentiate the theoretical and practical intersections between quantum physics, quantum healing and meditation.

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2				2	2				3
CO2	3	2	2	2		2	2				3
CO3		3				2	2				2
CO4		3				2	2				
CO5		3				2	2				

Semester: IV					
National Service Scheme					
Course Code	**:**	BNS410	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	12P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community in general in which they work
CLO2	Identify the needs and problems of the community and involve them in problem – solving
CLO3	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions.
CLO4	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
CL05	Appraise the importance of ethical issues and team working abilities pertaining to the social services

Activity– 1	**08 Hrs**
Water conservation techniques – Role of different stakeholders– Implementation.	
Activity – 2	**08 Hrs**
Preparing an actionable business proposal for enhancing the village income and approach for implementation.	
Activity – 3	**08 Hrs**
Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	

Pedagogy – Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

Sl.	**Topic**	**Group Size**	**Location**	**Activity Execution**	**Reporting**	**Evaluation of the Topic**
1	Water conservation techniques – Role of different stakeholders– Implementation.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board.	Report should be submitted by individual to the concerned evaluation authority.	Evaluation as per the rubrics Of scheme and syllabus by NSS officer.
2	Preparing an	May be individual	Villages/ City Areas / Grama	Group selection /proper	Report should be	Evaluation as per the

	actionable business proposal for enhancing the village income and approach for implement ation.	al or team	panchayat/ public associations/Go vernment Schemes officers/ campus etc.....	consultation/Conti nuous monitoring/ Information board.	submitted by individual to the concerned evaluation authority.	rubrics Of scheme and syllabus by NSS officer.
3	Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	May be individual or team.	Local government / private/ aided schools/Govern ment Schemes officers/ etc.....	School selection/pro per consultation/Conti nuous monitoring/ Information board.	Report should be submitted by individual to the concerned evaluation authority.	Evaluation as per the rubrics Of scheme and syllabus by NSS officer.

Plan of Action

Sl. No.	Practice Session Description
1.	Lecture session by NSS Officer.
2.	Selection of topic, Commencement of activity and its progress.
3.	Execution of Activity.
4.	Case study based Assessment, Individual performance.
5.	Sector wise study and its consolidation.
6.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- In the 4th semester, each student should do activities according to the scheme and syllabus.
- At the end of the semester student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
- At the end of the 4th semester, consolidated report of all activities compiled report should be submitted as per the instructions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Exploit the importance of his / her responsibilities towards society.
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field of societal problems.
CO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Assessment Details for CIE

Weightage	**100 Marks**
Selection of Topic, Commencement of activity and its progress.	**40 Marks**
Case study based Assessment.	**20 Marks**
Sector wise study and its consolidation.	**20 Marks**
Video based seminar for 10 minutes by each student at the end of semester with Report.	**20 Marks**
Total Marks for the course in each semester.	**100 Marks**

Suggested Learning Resources:	
Books:	
1	NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2	Government of Karnataka, NSS cell, activities reports and its manual.
3	Government of India, NSS cell, Activities reports and its manual.

CO – PO MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						3					3
CO2						3					3
CO3						3					3
CO4						3					3
CO5						2	3	3			3

Semester: IV					
Physical Education (PE) (Sports & Athletics)					
Course Code	**:**	BPE410	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:1	**CIE**	**:**	100 Marks
Total Hours	**:**	12P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Develop an understanding of ethical principles and moral values and their importance in sportsmanship, fair play, and personal conduct in games and athletic activities.
CLO2	Acquire practical skills and demonstrate technical proficiency in selected sports or athletic events through structured physical training and performance.
CLO3	Understand the role of effective organization, administration, and management in the successful conduct of sports events and athletic programs.

Module – 1	**4 Hrs**
Ethics and Moral Values a. Ethics in Sports. b. Moral Values in Sports and Games.	
Module – 2	**16 Hrs**
Specific Games (Any one to be selected by the student) a. Volleyball – Attack, Block, Service, Upper Hand Pass and Lower hand Pass. b. Athletics (Track Events) – Any event as per availability of Ground.	
Module-3	**4 Hrs**
Role of Organization and Administration	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles of ethics and moral values and their application in sports and games.
CO2	Demonstrate fundamental skills, techniques and rules of the selected game or athletic event.
CO3	Apply sportsmanship, fairness and respect for rules during practice and competition
CO4	Analyze the role of organization and administration in conducting sports events effectively.
CO5	Develop teamwork, leadership and decision-making skills through participation in sports activities.

Scheme and Assessment for auditing the course and Grades:

Sl. No.	Activity	Marks
1.	Participation of student in all the modules.	20
2.	Quizzes – 2, each of 15 marks.	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students.	50
	Total	**100**

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2						3	3			
CO2	3		2		2		1	2	3		
CO3	2		1				3	3	2		
CO4	2	2				2		2	3		2
CO5	1	2							3		2

Semester: IV					
Yoga					
Course Code	:	BYO410	**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	100 Marks
Total Hours	:	12P	**SEE**	:	-
Course Type	:	NCMC	**SEE Duration**	:	-

Course Learning Objectives: This course will enable the students to	
CLO1	Describe patanjali's ashtanga yoga and its role in holistic well-being.
CLO2	Perform the suryanamaskar sequence with correct breathing and posture.
CLO3	Identify different types of asanas with their techniques and benefits.
CLO4	Utilize the knowledge of kapalabhati with proper technique and safety measures.
CLO5	Apply pranayama techniques to enhance physical and mental health.

Module - 1	**05 Hrs**
Patanjali's Ashtanga Yoga: Introduction, its need and importance, Eight limbs of Yoga – overview. **Yama:** Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha. **Niyama:** Shoucha, Santosha, Tapa, Svaadhyaya, Eshvarapranidhana. **Text Book 1: Ch 1 (Part 1)**	
Module - 2	**05 Hrs**
Surya Namaskar: Concept and significance of Surya Namaskar, 12-step Surya Namaskar sequence, Practice - 4 rounds of Surya Namaskar, Breathing coordination and posture alignment. **Text Book 1: Ch 2 (Part 2)**	
Module - 3	**05 Hrs**
Asanas: Meaning of Asana, Need and importance of practicing Asanas, Classification of Asanas, Sitting Asanas - Sukhasana, Paschimottanasana, Standing Asanas - Ardhakati Chakrasana, Parshva Chakrasana, Prone Line Asana - Dhanurasana, Supine Line Asanas - Halasana, Karna Peedasana, For each Asana - Meaning by name, Technique of performing, Precautionary measures, Benefits. **Text Book 1: Ch 2 (Part 2)**	
Module - 4	**05 Hrs**
Kriyas: Introduction to Shatkarmas (Cleansing practices), Meaning and importance of Kapalabhati, Technique of Kapalabhati (40 strokes/min, 3 rounds), Precautionary measures and benefits. **Text Book 1: Ch 3 (Part 3)**	
Module - 5	**04 Hrs**
Pranayama: Meaning, need, and importance of Pranayama, Types of Pranayama and their benefits, For each type - Meaning by name, Technique, Precautionary measures, Benefits, Types included – Suryanuloma-Viloma, Chandranuloma–Viloma, Suryabhedana, Chandra Bhedana, Nadishodhana. **Text Book 1: Ch 3 (Part 3)**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Summarize patanjali's ashtanga Yoga and its significance in promoting daily well-being.
CO2	Demonstrate surya namaskar with correct sequence, breathing and posture alignment.
CO3	Classify various types of asanas with their benefits and precautions.
CO4	Utilize the knowledge to practice kapalabhati with correct technique, breathing rhythm and safety guidelines.
CO5	Apply pranayama to improve overall physical fitness and mental wellness.

Text Book	
1	The Illustrates Light on Yoga, BKS Iyengar, HarperCollins Publishers,ISBN-81:7223-606-9.

Reference Books	
1	Teaching Methods for Yogic practices, Dr. M L Gharote & Dr. S K Ganguly, 4th Edition, Kaivalyadhama Publishers, ISBN-10 : 9788189485245.
2	Yoga Instructor Course hand book, SVYASA University, Bengaluru.
3	Yogapravesha in Kannada, Ajitkumar.
4	Yoga for Children –step by step, Yamini Muthanna.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/playlist?list=PLzF4lOyPf_Z9yQ_Gphjh1wZ5fEhMg6hmP
2	https://www.youtube.com/playlist?list=PLOzRYVm0a65cCcY4qKX5MIyJxBt7hJgQY
3	https://youtu.be/KB-TYlgd1wE
4	https://youtu.be/aa-TG0Wg1Ls

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						2			2		
CO2						2	2	3	2		2
CO3						2	2	3	2		2
CO4						2	2	3	2		2
CO5						2	2	3	2		2

Semester: VI					
Music					
Course Code	:	BMU410	**Credits**	:	0
Hours/Week(L:T:P)	:	0:0:2	**CIE**	:	100 Marks
Total Hours	:	12P	**SEE**	:	-
Course Type	:	NCMC	**SEE Duration**	:	-

Course Objectives: This course will enable the students to	
CLO1	Understand the foundational concepts of Indian classical music, including the evolution and structure of Shruthi, Nada, Swara, Laya, Raga, Tala and Mela systems.
CLO2	Recognize and describe various types of Carnatic compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, along with the basics of the notation system.
CLO3	Appreciate the contributions of key composers like Purandaradasa, Thyagaraja and Mysore Vasudevacharya to Indian music and understand their musical legacy.
CLO4	Identify and explain the classification and basic construction of traditional Indian musical instruments, including string, wind, percussion and idiophones, with appropriate examples.
CLO5	Demonstrate basic vocal proficiency through the practice of Sarale Varase exercises, notations for Suladi Sapta Tala in Mayamalavagowla raga and performance of selected compositions such as Geethe, Jathi Swara and Krithi.

Module - 1	**03 Hrs**
Preamble: Contents of the curriculum intended to promote music as language to develop an analytical, creative and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela. **Textbook 1: V-1 Ch. 1-4**	
Module – 2	**03 Hrs**
Compositions: Introduction to the types of composition in Carnatic Music – Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, Notation System. **Textbook 2: Ch. 4-7**	
Module – 3	**03 Hrs**
Composers: Biography and contributions of Purandaradasa, Thyagaraja, Mysoro asudevacharya, Kanakadasa. **Textbook 3: Ch. 2-5**	
Module – 4	**03 Hrs**
Music Instruments: Classification and construction of string instruments, wind instruments, percussion Instruments, Idiophones (Ghana Vaadya), Examples of each class of instruments. **Textbook 1: V-4 – Ch. 2-6**	
Module – 5	**12 Hrs**
Abhyasa Gana: Singing the swara exercises (Sarale Varase Only), Botatio writing for sarale varase and sulafi sapta tala (Only in mayamalavagowla raga), singing 4 geethe in malahari and one jathi swara, oe krithi in a mela raga. **Textbook 1: V-1&2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Outline the evolution of Indian music and key concepts like Shruthi, Swara, Raga and Tala.
CO2	Identify and interpret basic Carnatic compositions using standard notation.
CO3	Summarize the contributions of composers.
CO4	Classify Indian musical instruments and describe their construction and use.
CO5	Demonstrate basic Carnatic vocal skills through selected exercises and compositions.

Text Books	
1	South Indian Music – Vol. I to VI, Prof. P. Sambamoorthy, The Indian Music Publishing House, Chennai.
2	A Textbook of Carnatic Music, Dr. S. Bhagyalekshmy, CBH Publications
3	Karnataka Sangeetha Charitre, Dr. V. S. Sampathkumaracharya, Kannada University, Hampi.

Reference Books	
1	Music of India, B. Chaitanya Deva, Munshiram Manoharlal Publishers.
2	Essentials of Musicology in South Indian Music, Prof. S. R. Janakiraman, Asian Educational Services.

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3		1		1		1	1	1		1
CO2	3		3	1	2	1	2	1	1		1
CO3	1				1	1	1		1		
CO4	2		2		3	1	1	1	1		1
CO5	3			1	2	1	1	1	1		1

Semester: IV					
Competency Enhancement Course-2					
Course Code	**:**	BCE411	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	2:0:0	**CIE**	**:**	100 Marks
Total Hours	**:**	40L	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Prerequisites:	
Courses	Competency enhancement course-1
Knowledge on Fundamental Concepts	Arithmetic operations, fractions, decimals and elementary algebra. comprehension of basic English
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Enhance Quantitative Problem-Solving Skills.
CLO2	Master Data Interpretation and Visual Analysis.
CLO3	Strengthen Logical Reasoning and Spatial Intelligence.
CLO4	Develop Advanced Verbal Aptitude and Communication Accuracy.
CLO5	Sharpen Critical Thinking through Assumptions and Analytical Judgment.

Module – 1	**8 Hrs**

Partnership

Definition of Partnership, Types of Partnerships (Simple and Compound), Calculation of Profit Sharing Ratio, Capital and Time of Investment, Working and Sleeping Partners, Admission and Retirement of Partners, Distribution of Profits and Losses, Partnership Formulas, Complex Partnership Problems.

Time and Work

Definition and Concept of Time and Work, Relation between Work, Time, and Efficiency, Calculation of Individual and Combined Work, Work Rate and Work Done in a Given Time, Efficiency Comparison of Different Workers, Time Taken by Individuals or Groups, Alternate Work and Negative Work (Destructive Work), M:W:D Rule (Men:Work:Days Problems), Work Equivalence Formula, Problems Involving Wages Based on Work, Pipes and Cisterns (Work with Inlets and Outlets), Successive Work Distribution, Complex Time and Work Questions

Coding and Decoding

Letter Coding, Number Coding, Symbol Coding, Mixed Letter-Number Coding, Substitution Coding, Decipher Coding, Direct Coding-Decoding, Conditional Coding, Message Coding, Operations-Based Coding-Decoding, and Complex Coding-Decoding Problem

Analogy

Number Analogy, Alphabet Analogy (using letter sequences or codes), Symbol Analogy, Figure/Pattern Analogy, Geometrical Shapes Analogy, Matrix-Based Analogy, Series-Based Numeric Analogy, Mirror and Water Image Analogy, Classification-Based Figure Analogy, Embedded Figure Analogy, Complex Numerical and Visual Analogy Problems.

Text Book 1: Ch 36

Module – 2	**8 Hrs**

Time, Speed and Distance

Definition and Relationship of Time, Speed, and Distance, Units and Conversion of Speed and Distance, Average Speed, Relative Speed, Problems on Trains, Problems on Boats and Streams, Upstream and Downstream Concepts, Races and Games, Time to Meet/Opposite Direction Problems, Circular Tracks, Shortcut Tricks and Application-Based Problems.

Trains, Boats and Streams, Races

Trains: Problems on Trains, Time Taken to Cross a Stationary Object, Time Taken to Cross Another Moving Train, Relative Speed in Same and Opposite Direction, Length of Train and Platform Calculations, Speed and Time Conversions, Overtaking and Passing Scenarios, Shortcut Tricks for Train Problems.

Boats and Streams: Upstream and Downstream Concepts, Speed of Boat in Still Water, Speed of Stream, Calculation of Effective Speed (Upstream and Downstream), Time and Distance in Streams, Problems on Boats Overtaking/Meeting, Relative Speed in Water, Application-Based Boat and Stream Questions.

Races: Types of Races (Straight, Circular, Relay), Start Types (Head Start, Dead Heat), Calculating Winner and Margin, Calculation of Lead or Lag, Relative Speed in Races, Time Calculations to Meet or Overtake, Race Completion Time, Use of Ratio and Proportion in Races, Application-Based Race Problems.

Seating Arrangement

Linear Arrangement, Circular Arrangement, Square/Rectangular Arrangement, Single-Row and Double-Row Arrangements, Facing Inside and Outside Arrangements, Arrangement Based on Directions (Left/Right/Clockwise/Counterclockwise), Seating Based on Conditions or Constraints, Position and Order Determination, Seating with Blood Relations or Attributes, Arrangement with Vacant Seats.

Data Arrangement

Linear Data Arrangement, Circular Data Arrangement, Matrix/Table-Based Data Arrangement, Parallel/Double Row Arrangement, Attributes/Property-Based Arrangement (with multiple characteristics), Sequencing and Ranking Arrangement, Floor/Building Arrangement, Conditional Arrangement (with Direct and Indirect Clues), Application of Consolidated Table and Matrix Methods.

Text Book 1: Ch 14-18

Module-3	**8 Hrs**

Permutation and Combination

Understanding the difference between the permutation and combination, Rules of Counting-rule of addition, rule of multiplication, factorial function, Concept of step arrangement, Permutation of things when some of them are identical, Concept of 2n, Arrangement in a circle.

Probability

Single event probability, multi event probability, independent events and dependent events, mutually exclusive events, non-mutually exclusive events, combination method for finding the outcomes.

Clocks and Calendars

Clocks: Calculation of Angle Between Hands (Hour, Minute, Second), Time Gains and Losses by Clocks, Number of Times Hands Coincide or Oppose, Incorrect/Slow/Fast Clocks, Mirror and Water Image Questions on Clocks, Alarm and Time Calculation Problems, Calculation of Overlapping/Adjacent Hands, Problems on Clock Striking.

Calendars: Odd Days Concept, Leap Year and Ordinary Year Calculation, Counting Odd Days in Multiple Years, Day of the Week Calculation for a Given Date, Calendar Repetition, Month and Year Code Methods, Finding Dates with Same Day, Calculation of Future/Past Day from

a Given Day, Number of Sundays/Saturdays/Specific Weekdays in a Period, Day-Difference Problems.

Text Book 1: Ch 6-9, Ch 13-16

Module-4	**8 Hrs**

Data Interpretation

Tables, Bar Graphs, Line Graphs, Pie Charts, Caselets (Paragraph-based Data Sets), Radar Charts, Mixed or Combination Graphs (Multiple Data Forms Together), Data Comparison and Analysis, Calculation-Based Data Interpretation, Ratio and Percentage Interpretation, Data Sufficiency in Data Interpretation.

Ages

Present age and future age calculations, past age calculations, age problems in ratios, age difference problems, multiple or submultiple age relations, product of ages problems, age problems involving sum of ages, age relationships in family contexts, age-based word problems with equation formulation, and age problems involving time intervals such as years ago or years hence.

Crypt arithmetic

Basic concepts, addition, subtraction, multiplication of coded alphabets, Types of cryptarithm.

Syllogisms

Basic Concepts of Syllogism, Types of Statements (A, E, I, O), Venn Diagram Representation, Rules of Syllogism, Direct and Indirect Syllogism Questions, Condition-based Syllogism, Coded Syllogism, Double/Triple Syllogism Problems, Syllogism with Quantifiers, Syllogism in Data Interpretation, and Conclusions Drawing from Statements.

Text Book 1: Ch 28-29

Module-5	**8 Hrs**

Mensuration

Basic Geometrical Figures, Perimeter and Area of Plane Figures (Square, Rectangle, Triangle, Parallelogram, Rhombus, Trapezium), Area and Circumference of Circle, Area of Sector and Segment of a Circle, Surface Area and Volume of Cuboid, Surface Area and Volume of Cube, Surface Area and Volume of Cylinder, Surface Area and Volume of Cone, Surface Area and Volume of Sphere and Hemisphere, Frustum of a Cone, Conversion between Units of Measurement, Application-Based Problems on Mensuration.

Data sufficiency

Statement Evaluation, Identifying Sufficient and Insufficient Statements, Dealing with Irrelevant Information, Definite vs. Indefinite Information, Elimination Method, Data Sufficiency on Blood Relations, Data Sufficiency on Order and Ranking, Data Sufficiency on Direction and Distance, Data Sufficiency on Coding-Decoding, Data Sufficiency on Seating Arrangement, Data Sufficiency on Puzzles, Data Sufficiency on Syllogism, Data Sufficiency on Alphanumeric Series.

Visual Reasoning and Cubes

Visual Reasoning: Figure/Image Series Completion, Odd-One-Out (Visual Discrimination), Mirror Images, Water Images, Embedded Figures, Paper Folding and Cutting, Analytical Puzzles with Patterns, Figure Counting, Pattern Completion, Analogy in Figures, Classification of Visual Data, Venn Diagrams, Direction and Distance with Visuals.

Cubes: Basic Properties of Cubes (Faces, Vertices, Edges), Cube and Dice Basics, Counting of Smaller Cubes, Painted Cube Problems (Counting Cubes with 0/1/2/3 Painted Faces), Cube Cutting and Partitioning, Dice (Number/Colour/Letter Arrangements), Unfolded (Net) Cube to Folded Cube Problems, Opposite and Adjacent Faces of Dice, Identification of Hidden Surfaces,

Face Rotation and Positioning, Shortcuts and Tricks for Cubes and Dice Problems

Para Jumbles and Cloze Test

Sentence Jumble/Ordering, Identification of Opening/Closing Sentences, Logical Sequencing and Linking, Transitional Words and Connectors, Theme Identification in Jumbled Passages, Cloze Test with Contextual Blanks, Vocabulary and Grammar-based Blanks, Contextual Inference for Blank Filling, Error Detection in Cloze Test.

Reading Comprehension

Main Idea Identification, Factual/Inference-based Questions, Tone and Attitude Analysis, Vocabulary in Context, Passage Summarization, Structure and Organization of Passage, Logical Completion of Paragraphs, Supporting/Contradicting Evidence, Eliminating Irrelevant Information, Comparative Comprehension Passages.

Critical Reasoning

Assumption-Based Questions, Strengthen/Weaken the Argument, Inference Drawing, Conclusion Identification, Evaluating Arguments and Evidence, Identifying Flaws in Reasoning, Paradox/Discrepancy Resolution, Cause-and-Effect Reasoning, Analogy and Parallel Reasoning, Application of Logical Principles.

Text Book 1: Ch 22-25,

Textbook 2 & 3

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply arithmetic and logical reasoning to solve problems.
CO2	Develop spatial and logical skills to solve cube, dice, puzzle and seating arrangement questions.
CO3	Develop reading, vocabulary and grammar through para jumbles, sentence completion and idioms.
CO4	Enhance verbal reasoning by solving analogies, rearranging sentences and identifying assumptions and conclusions.
CO5	Apply combinatorics and probability to solve permutation, combination and crypt arithmetic problems.

Text Books	
1	Quantitative Aptitude for Competitive Examinations, R.S. Aggarwal Chand Publishing, 2023. ISBN-10: 9355012322
2	Word Power Made Easy, Norman Lewis, 2015, PENGUIN INDIA, ISBN: 978-0143424680.
3	How to Prepare for Quantitative Aptitude for the CAT, Arun Sharma, 6th Edition, 2014, McGraw-Hill Education, ISBN- 978-9339205126.

Reference Books	
1	Puzzle Test & Seating Arrangements, K. Kundan, 1st Edition, 2023, BSC Publishing Company Pvt Ltd., ISBN: 9789394666023.
2	A Modern Approach to Verbal & Non-Verbal Reasoning, R.S. Aggarwal, 2025-26 Edition, S. Chand Publishing -2024

Web links and Video Lectures (e – Resources)	
1	https://youtu.be/KWZ0lR8cCwc
2	https://youtu.be/mBtBD1N7ywQ
3	https://youtu.be/B9MhxmcwnpQ
4	https://youtu.be/VaEbefWFIlc
5	https://youtu.be/3AL_6EQmnkY

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2									1
CO2	2	2									
CO3	1	1							3		
CO4	2	2	2						2		1
CO5	3	3	2								1

Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas.
- Imparting Value based Professional Education with a sense of Social Responsibility.

Department Vision

Building up-skilled Computer Professionals, enriched with interactive design skills as to serve the dynamic needs of the Industry and Society

Department Mission

- Develop Innovative, Proficient and ethically strong Computer Design Engineers with design skills to meet Universal Challenges.
- Nurture competence as well as Applied Research activities to solve concrete problems.
- Aspire for constant up-gradation of engineering skills to cater the needs of the Corporate and Society.
- Imbibing the spirit of teamwork, core skills, professionalism and confidence to take the Leadership role.
- Inculcate Research culture to design and develop smart computing solutions for Humanity and Nation.

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

P.B. No.20, B.B Road,
Chikkaballapur - 562 101, Karnataka