



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Syllabus of Second Year BCA

To be implemented for 2025-29 Batch
 Department of Computer Applications

Rev: BC Course Structure/RIT/Rev01/2025-29

Class: S.Y. BCA

Semester: III

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme					
							Max	Min for Passing	Max	Min for Passing	
BC223	Probability and Statistics	3	-	-	3	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15			---	---
						ESE	50			40	---
BC225	Database Management Systems	2	-	-	2	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15			---	---
						ESE	50			40	---
BC227	Python Programming	2	-	-	2	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15			---	---
						ESE	50			40	---
BC229	Database Management Systems Lab	-	-	4	2	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
BC231	Python Programming Lab	-	-	4	2	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
BC233	Software Engineering	3	-	-	3	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15			---	---
						ESE	50			40	---
BC235	Full Stack Development	2	-	2	3	ISE	20	40	---	---	---
						UT 1	15		---	---	
						UT 2	15		---	---	
						ESE	50		40	---	---
BC237	Yoga/Sports/NCC/ NSS/ Disaster Management	-	-	4	2	ISE	---	---	---	100	50
BC239	Mini Project	-	-	2	1	ISE	---	---	---	100	50
	Total	12	-	16	20						
	Total Contact Hours	28									

ISE = In Semester Evaluation, UT-I = Unit Test, UT-II = Unit Test-II, ESE = End Semester Exam

Total Contact Hours/week : 28
Total Credits : 20





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Department of Computer Applications

Rev: BC Course Structure/RIT/Rev01/2025-29

Class: S.Y. BCA

Semester: IV

Course code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min for Passing	Max	Min for Passing	
BC222	Entrepreneurship and Startup Ecosystem	1	1	-	2	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15	40	40	---	---
						ESE	50			---	---
BC224	Computer Networks	2	-	-	2	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15	40	40	---	---
						ESE	50			---	---
BC226	Design and Analysis of Algorithms	3	-	-	3	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15	40	40	---	---
						ESE	50			---	---
BC228	Artificial Intelligence	3	-	-	3	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15	40	40	---	---
						ESE	50			---	---
	Professional Elective – 1	2	-	2	3	ISE	20	40	40	---	---
						UT 1	15			---	---
						UT 2	15	40	40	---	---
						ESE	50			---	---
BC236	Computer Networks Lab	-	-	4	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC238	Artificial Intelligence Lab	-	-	4	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC240	Design Thinking and Innovation	1	1	-	2	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
BC242	MOOCs**		-	-	1	ISE	---	---	---	100	50
	Total	12	2	10	20						
	Total Contact Hours	24									

Professional Elective – 1

Specialization	Course Code	Course
Data Science	BC230	Statistical Methods for Data Science
Artificial intelligence and Machine Learning	BC232	Artificial Intelligence and Knowledge Representation
Information and Cyber Security	BC234	Fundamentals of Information Security

ISE = In Semester Evaluation, UT-I = Unit Test, UT-II = Unit Test-II, ESE = End Semester Exam

Total Contact Hours/week : 24

Total Credits : 20

Note**: MOOC Course certification marks will be carried out for the credits





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Class: S.Y. BCA	Semester: III
Course Code: BC223	Course Name: Probability and Statistics

L	T	P	Credits
3	-	-	3

Course Description:

This course introduces the fundamental concepts of probability and statistical methods essential for data analysis and decision-making. It begins with the basic principles of probability, including axioms of probability, conditional probability, independence of events, the multiplication rule, and Bayes' theorem. The course then covers discrete probability distributions, focusing on random variables, probability mass functions, expectation, and key distributions such as binomial and Poisson. The course further explores continuous probability distributions including exponential, normal, and Weibull distributions and their applications in reliability analysis. Important statistical concepts such as point estimation, interval estimation, and the central limit theorem are introduced. Students also learn statistical inference and hypothesis testing for means, variances, and proportions. The course concludes with techniques for comparing sample means and variances references to ANOVA and introduces regression and correlation analysis, including simple and multiple linear regression models.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand and apply fundamental concepts of probability and probability distributions to model uncertainty and analyze data.
2. Analyze discrete and continuous probability distributions and apply statistical estimation techniques such as point and interval estimation.
3. Perform statistical inference and hypothesis testing for population parameters including mean, variance, and proportions.
4. Apply regression, correlation, and ANOVA techniques to analyze relationships between variables and support data-driven decision making.
5. Evaluate probability models, statistical estimation methods, and hypothesis testing techniques to solve real-world problems involving uncertainty and data analysis.

Prerequisite:

Basic high school mathematics and logical reasoning.



Course Content		
Unit No	Description	Hrs
1	Fundamentals of Probability: Some probability laws: Axioms of Probability, Conditional Probability, Independence of the Multiplication Rule, Bayes' Theorem	06
2	Discrete Probability Distributions: Random Variables, Discrete Probability Densities, Expectation and distribution parameters, Binomial distribution, Poisson distribution, simulating a Discrete distribution	06
3	Continuous Probability Distributions and Estimation: Continuous distributions: continuous Densities, Expectation and distribution parameters, exponential distribution, Normal distribution, Weibull distribution and Reliability. Estimation: Point estimation, interval estimation and the central limit theorem.	06
4	Statistical Inference and Hypothesis Testing: Inferences on the mean and the Variance of a distribution: Hypothesis Testing, significance testing, Hypothesis and significance test on the mean, Hypothesis tests on the Variance Inferences on proportions: estimating proportions, testing hypothesis on a proportion, Comparing two proportions: estimation, comparing two proportions: hypothesis testing.	06
5	Comparison of Samples and Analysis of Variance: Comparing two means and two variances: point estimation: independent samples, Comparing variances: the F-distribution, Comparing means: variances equal, Analysis of Variance: One-way classification fixed effects model, comparing variances, pair-wise comparisons, randomized complete block design	06
6	Regression and Correlation Analysis: Simple linear regression and correlation: model and parameter estimation, inferences about slope, inferences about intercept, Coefficient of determination. Multiple linear regression models: least square procedures for model fitting, a matrix approach to least squares, interval estimation	06



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References -

Text Books:

- J. Susan Milton and Jesse C. Arnold, Introduction to Probability and Statistics, Tata McGraw-Hill.
- Vijay K. Rohatgi and A. K. Saleh, An Introduction to Probability and Statistics, John Wiley & Sons.
- S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
- T. T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons.

Reference Books:

- Dharmaraja Selvamuthu and Dipayan Das, Introduction to Statistical Methods, Design of Experiments and Statistical Quality Control, Springer Nature Singapore Pte. Ltd.
- William Mendenhall, Robert J. Beaver, and Barbara M. Beaver, Introduction to Probability and Statistics, Thomson.
- Richard I. Levin and David S. Rubin, Statistics for Management, Prentice Hall of India.
- A. M. Goon, M. K. Gupta, and T. S. Dasgupta, An Outline of Statistical Theory, Vol. II, The World Press Pvt. Ltd.
- Erwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice Hall of India / Pearson.

Web Links and Video Lectures:

- https://onlinecourses.nptel.ac.in/noc21_ma74/preview
- https://onlinecourses.nptel.ac.in/noc23_ma77/preview
- <https://home.iitk.ac.in/~shalab/onlinecoursematerial>





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC225	Course Name: Database Management Systems	2	-	-	2

Course Description:

This course introduces students to the fundamentals of database systems, focusing on database languages, architectures, and design principles. It covers key concepts such as database models, entity-relationship (ER) diagrams, relational algebra, and SQL. Students will learn how to design normalized database schemas, write complex SQL queries, and implement database solutions. Through practical exercises, students will gain hands-on experience with database management systems and develop skills essential for managing and querying databases effectively.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the fundamental concepts of database systems, including architecture, data models, and database languages.
2. Design databases using ER diagrams and relational model concepts for effective data organization.
3. Apply normalization techniques and relational algebra operations to ensure data integrity and minimize redundancy.
4. Develop SQL queries, including advanced queries, views, constraints, and triggers for efficient data management.
5. Analyze transaction management, concurrency control, and database recovery techniques to ensure consistency and reliability in database systems.

Prerequisite:

Familiarity with general computer science principles.

Course Content

Unit No	Description	Hrs
1	Introduction to Databases and Overview of Database Languages and Architecture: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.	04





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2	Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization.	04
3	Relational Model and Relational Algebra: Relational Model - Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. Relational Algebra- Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.	04
4	Normalization: Database Design Theory - Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	04
5	SQL: SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL	04
6	Transaction management and Concurrency control: Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	04

References -

Text Books:

- Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson.
- Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw Hill.

Web Links and Video Lectures:

- <https://nptel.ac.in/courses/106105175>





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC227	Course Name: Python Programming	2	-	-	2

Course Description:

The course provides the fundamentals of Python programming. It encompasses variables, data types, input output operations, operators and control statements. Other items involved in the course are arrays, functions, modules and Python data structures including strings, lists, tuples and dictionaries. The students will also be taught object oriented programming, GUI development, database connectivity and exception handling to create simple Python programs.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand the basic concepts of Python programming including data types, variables, input output operations, operators and control statements.
2. Apply arrays, functions and modules to develop Python programs for solving computational problems.
3. Use Python data structures such as strings, lists, tuples and dictionaries for data processing and manipulation.
4. Develop Python applications using object-oriented concepts, graphical user interfaces, database connectivity and exception handling.
5. Analyze Python programming constructs, data structures, and exception handling mechanisms to develop efficient and reliable software solutions.

Prerequisite:

Basic knowledge of computer fundamentals and logical problem-solving.

Course Content

Unit No	Description	Hrs
1	Basic Elements, Data Types and Input/Output: Basic Elements of Python, Variables, Comments and Docstrings, Data Types (Numeric, Boolean, Compound), Dictionary, Sets, Mapping, Input Function, Output Statements, print() Function, Formatted Printing, Command Line Arguments.	04
2	Operators and Control Statements: Arithmetic Operators, Assignment Operators, Unary Minus Operator, Relational Operators, Logical Operators, Bitwise Operators,	04





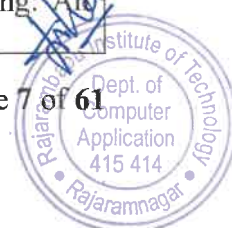
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	Membership Operators, Identity Operators, Operator Precedence, Operator Associativity, if Statement, if-else Statement, if-elif-else Statement, while Loop, for Loop, Infinite Loop, Nested Loop, else Suite, break Statement, continue Statement, pass Statement, return Statement.	
3	Arrays and NumPy Arrays: Creating Arrays, Indexing and Slicing of Arrays, Basic Array Operations, Array Processing, Mathematical Operations on Arrays, Aliasing Arrays, NumPy Arrays, Basic Indexing, Advanced Indexing, Array Dimensions and Attributes (ndim, shape, size, itemsize).	04
4	Functions and Modules: Function Definition and Call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, Difference between Function and Method, Pass by Object Reference, Parameters and Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Arbitrary Arguments, Recursive Functions, Lambda Functions, Lambda with filter(), map(), reduce(), Introduction to Modules.	04
5	Strings, Lists, Tuples and Dictionaries: Strings and String Operations, Indexing and Slicing, Concatenation and Repetition, Searching Substrings, Counting Substrings, Splitting Strings, Joining Strings, Case Conversion, String Formatting, Lists, List Operations, List Methods, Nested Lists, Tuples, Tuple Functions, Dictionaries, Dictionary Methods, Dictionary Operations, Converting Lists into Dictionaries, Converting Strings into Dictionaries, Sorting Dictionaries using Lambda, Ordered Dictionaries.	04
6	Advanced Python Concepts: Classes and Objects, self Variable, Types of Variables, Namespaces, Instance Methods, Class Methods, Static Methods, Exception Handling in Databases, Errors in Python Programs, Types of Exceptions, except Block, assert Statement, User-defined Exceptions, Logging Exceptions, GUI Programming in Python, Widgets, Frames, Fonts, Colors, Layout Manager, Event Handling, Database Programming using SQL in Python, Retrieving Rows, Inserting Rows, Deleting Rows, Updating Rows, Creating Database Tables.	04

References -

Text Books:

- Paul Gries, Jennifer Campbell, and Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf.





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- M. T. Savaliya, R. K. Maurya, and G. M. Magar, Programming through Python, Sybgen Learning India.

Reference Books:

- Dr. Gabriele Lanaro, Quan Nguyen, and Sakis Kasampalis, Advanced Python Programming, Packt Publishing.
- Mark Summerfield, Programming in Python 3, Pearson Education.
- Martin C. Brown, Python: The Complete Reference, McGraw Hill.
- Magnus Lie Hetland, Beginning Python: From Novice to Professional, Apress.





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC229	Course Name: Database Management Systems Lab	-	-	4	2

Course Description:

This course provides practical experience with database management through hands-on exercises covering fundamental and advanced topics. Students will learn to design, manage, and query relational databases using SQL and relational algebra, normalize data, and handle transactions. The course emphasizes practical skills in creating and manipulating database tables, performing queries, and ensuring data integrity and security.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Design Entity-Relationship Diagrams (ERDs) to model database schemas and relationships between entities.
2. Execute SQL queries to retrieve, update, and manipulate data, including complex queries and views.
3. Apply relational algebra operations to query and retrieve data from relational databases.
4. Implement normalization techniques, transactions, and constraints to maintain data integrity and optimize database performance.
5. Develop database applications using views, triggers, stored procedures, transactions, constraints, and security mechanisms for efficient and secure data management.

Prerequisite:

Basic understanding of programming concepts and familiarity with general computer science principles.

List of Experiment

Expr. No	Description			Hrs															
Tables and Sample Records																			
1. Students Table																			
	<table><tr><th>StudentID</th><th>FirstName</th><th>LastName</th><th>DateOfBirth</th></tr><tr><td>1</td><td>John</td><td>Doe</td><td>2000-01-15</td></tr><tr><td>2</td><td>Jane</td><td>Smith</td><td>1999-12-25</td></tr><tr><td>3</td><td>Emily</td><td>Jones</td><td>2001-03-22</td></tr></table>	StudentID	FirstName	LastName	DateOfBirth	1	John	Doe	2000-01-15	2	Jane	Smith	1999-12-25	3	Emily	Jones	2001-03-22		
StudentID	FirstName	LastName	DateOfBirth																
1	John	Doe	2000-01-15																
2	Jane	Smith	1999-12-25																
3	Emily	Jones	2001-03-22																





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2. Courses Table

CourseID	CourseName	Credits
101	Introduction to Programming	3
102	Database Systems	4
103	Data Structures	3

3. Enrollments Table

EnrollmentID	StudentID	CourseID	EnrollmentDate
1	1	101	2024-01-10
2	2	102	2024-01-12
3	1	103	2024-01-15

4. Denormalized Table (for Normalization Practice)

StudentName	CourseName	EnrollmentDate	InstructorName
John Doe	Database Systems	2024-01-10	Dr. Smith
Jane Smith	Data Structures	2024-01-12	Dr. Jones

5. Normalized Students Table

StudentID	FirstName	LastName
1	John	Doe
2	Jane	Smith

6. Normalized Courses Table

CourseID	CourseName	InstructorName
101	Database Systems	Dr. Smith
102	Data Structures	Dr. Jones

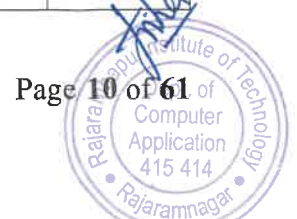
7. Normalized Enrollments Table

EnrollmentID	StudentID	CourseID	EnrollmentDate
1	1	101	2024-01-10
2	2	102	2024-01-12

8. Employees Table (for Self-Join Example)

EmployeeID	FirstName	ManagerID
1	Alice	NULL
2	Bob	1
3	Charlie	1

1	Description: Create an ER diagram for the Students, Courses, and Enrollments tables. Tasks: Use tools like Lucidchart or draw.io to create the ER diagram. Define entities, relationships, and cardinalities.	04
2	Relational Algebra Queries	04



2	Relational Algebra Queries Description: Perform relational algebra operations on the tables. i) Find students enrolled in more than one course. ii) List all courses with credits greater than 3.	04
3	Table Creation Create Students, Courses, and Enrollments tables. Identify and mention the keys and constraints in the table. Insert the records as given in the table.	02
4	Basic SQL Queries i) Retrieve all records from the Students table ii) Retrieve all courses with more than 3 credits. Find all students enrolled in a specific course.	02
5	Data Retrieval and Filtering i) Retrieve students whose last name is "Smith". ii) Retrieve the list of courses sorted by credits in descending order. Find students enrolled in courses with fewer than 4 credits.	02
6	Joining Tables i) Retrieve a list of students and their enrolled courses. ii) Show the names of students and the names of courses they are enrolled in. Retrieve students who are not enrolled in any courses.	04
7	Aggregate Functions and Grouping i) Count the total number of students. ii) Find the average number of credits for courses. List the number of students enrolled in each course.	04
8	Updating and Deleting Data i) Update the credit hours of a specific course. ii) Delete a student record from the Students table. Remove enrollments for a specific course.	02
9	Normalization Practice Given a table with redundant data (e.g., StudentName, CourseName, EnrollmentDate, InstructorName), create normalized tables to eliminate redundancy.	04



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10	SQL Advanced Queries and Views i) Create a view that shows student names and their enrolled courses. ii) Create a trigger to automatically update a LastUpdated field whenever an enrollment record is modified. Implement a stored procedure to enroll a student in a course.	02
11	Transaction Management i) Implement transaction control commands (COMMIT, ROLLBACK). Create a scenario where a transaction is rolled back due to an error.	02
12	Constraints and Indexes i) Add constraints (PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK) to the existing tables. ii) Create indexes on columns that are frequently used in search queries. Demonstrate how constraints and indexes affect data operations.	04
13	Advanced Data Retrieval i) Use subqueries to retrieve data based on results from another query. ii) Implement complex joins (e.g., self-joins) to retrieve data. Create a query that combines results from multiple tables and aggregates data.	02
14	Security and Permissions i) Create user roles and assign permissions (e.g., SELECT, INSERT, UPDATE, DELETE). ii) Restrict access to sensitive data using roles and permissions. Review and modify user access levels.	02

References -

Text Books:

- Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson.
- Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw Hill.

Web Links and Video Lectures:

- <https://nptel.ac.in/courses/106105175>





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC231	Course Name: Python Programming Lab	-	-	4	2

Course Description:

This course provides hands-on experience in Python programming by covering fundamental concepts such as data types, operators, control statements, functions, recursion, and lambda expressions. Students develop problem-solving skills using Python data structures and gain practical knowledge of object-oriented programming, exception handling, GUI development, and database connectivity to design, implement, test, and debug Python applications.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Apply Python programming constructs including data types, operators, control statements, and functions to solve computational problems.
2. Implement data structures such as arrays, lists, tuples, dictionaries, and strings for efficient data handling.
3. Develop Python programs using object-oriented concepts, exception handling, GUI programming, and database connectivity.
4. Demonstrate Python program design, testing, and debugging skills for real-world applications using standard programming practices.
5. Integrate Python programming concepts, GUI components, and database operations to develop interactive and data-driven applications.

Prerequisite:

Basic understanding of computers and programming concepts.

List of Experiment

Expr. No	Description	Hrs
1	Write a Python program to use different data types (numeric, boolean, compound, dictionary, sets).	02
2	Write a Python program to take input and display output using print() function and formatted printing.	02
3	Write a Python program to demonstrate command line arguments.	02
4	Write a program to design and develop python program to implement various control statements using suitable examples	02
5	Write a Python program to create and manipulate arrays in Python.	02





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6	Write a Python program to demonstrate slicing and indexing for accessing elements in arrays.	02
7	Write a Python program using NumPy arrays to show basic and advanced indexing, and array attributes (ndim, shape, size, itemsize).	02
8	Write a Python program to define and call functions for a suitable problem.	02
9	Write a Python program to demonstrate different types of function arguments (positional, keyword, default, arbitrary).	02
10	Write a Python program to implement recursion (Fibonacci series, Factorial, Tower of Hanoi).	02
11	Write a Python program to implement and use lambda functions, including filter(), map(), and reduce().	02
12	Write a Python program to demonstrate string operations (indexing, slicing, concatenation, repetition, splitting, joining, case conversion, formatting).	02
13	Write a Python program to implement lists and demonstrate various operations and methods.	02
14	Write a Python program to implement dictionaries and demonstrate dictionary methods, operations, and sorting using lambda.	02
15	Write a Python program to create classes and objects, demonstrate self-variable.	02
16	Write a Python program to demonstrate instance methods, class methods, and static methods.	02
17	Write a Python Program to demonstrate exception handling.	02
18	Design a Python GUI application using Tkinter to demonstrate different font styles and colors and implement event handling using buttons to change the appearance of text.	02
19	Develop a Python GUI application using Tkinter that utilizes layout managers (such as pack and grid) and handles user input events to display dynamic messages.	02
20	Write a Python program to perform database operations (connect, create/drop tables, insert/update rows)	02

References -

Text Books:

- Paul Gries, Jennifer Campbell, and Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf.
- M. T. Savaliya, R. K. Maurya, and G. M. Magar, Programming through Python, Sybgen Learning India





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Reference Books:

- Dr. Gabriele Lanaro, Quan Nguyen, and Sakis Kasampalis, Advanced Python Programming, Packt Publishing.
- Mark Summerfield, Programming in Python 3, Pearson Education.
- Martin C. Brown, Python: The Complete Reference, McGraw Hill.
- Magnus Lie Hetland, Beginning Python: From Novice to Professional, Apress.





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC233	Course Name: Software Engineering	3	-	-	3

Course Description:

This course provides a comprehensive understanding of software engineering principles, system development methodologies, and best practices for designing and testing software. It covers fundamental concepts such as system analysis, software development models, structured design techniques, and software testing strategies. The course is designed to equip students with essential skills in software project management, requirement gathering, and software quality assurance.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Classify system concepts, characteristics, and types of systems in software engineering contexts.
2. Explain software engineering principles, software quality factors, software processes, and development methodologies.
3. Analyze system requirements using feasibility studies, fact-finding techniques, and Software Requirement Specifications (SRS).
4. Construct analysis and design models using ER diagrams, DFDs, decision tables, decision trees, data dictionaries, and pseudocode.
5. Apply software development life cycle models and software testing techniques to develop and evaluate structured software solutions.

Prerequisite:

Basic knowledge of computers, databases and data storage.

Course Content

Unit No	Description	Hrs
1	Fundamentals of System Concepts: Definition and Elements of a System, Characteristics and Types of Systems, Understanding System Concepts, Information Systems and Their Components, Computer-Based Information Systems (CBIS), System Stakeholders and Their Roles, System Complexity and Decomposition.	06





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2	Introduction to Software Engineering: Meaning and Importance of Software Engineering, Software Crisis and Evolution of Software Engineering, Key Software Characteristics, Software Process and Process Framework, Umbrella Activities in Software Engineering, Software Quality Factors (McCall's Model).	06
3	Requirement Analysis: Overview of System Analysis, Anticipating System Requirements, Essential Knowledge & Skills of a System Analyst, Roles & Responsibilities of a System Analyst, Feasibility Study and Its Classifications, Techniques for Fact Gathering, Understanding User Transaction & Design Requirements, System Requirement Specification (SRS)	06
4	Software Development Methodologies: System Development Life Cycle (SDLC), Traditional & Modern Approaches: Waterfall Model, Spiral Model, Prototyping Model, Incremental Model, Introduction to Agile Development.	06
5	System Analysis and Design Tools: Creating and Interpreting Entity-Relationship (ER) Diagrams, Decision Trees & Decision Tables for Logical Structuring, Data Flow Diagrams (DFD) and Their Role in System Design, Data Dictionary: Elements & Benefits, Writing Pseudo Code for System Representation, Principles of Effective Input and Output Design, Case Studies (Minimum of Four)	06
6	Software Testing: Testing Fundamentals and Key Characteristics, Verification and Validation, Different Approaches to Software Testing: Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing.	06

References -

Text Books:

- Roger S. Pressman, Software Engineering: A Practitioner's Approach.
- Khalkar and Parthasarathy, System Analysis and Design (SADSE).

Reference Books:

- Rajib Mall, Fundamentals of Software Engineering.
- Richard Fairley, Software Engineering Concepts.
- Ian Sommerville, Software Engineering.
- Pankaj Jalote, An Integrated Approach to Software Engineering.
- Ivar Jacobson, Object-Oriented Software Engineering.
- Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing: Principles and Practices.





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC235	Course Name: Full Stack Development	2	-	2	3

Course Description:

This course provides a comprehensive introduction to modern web application development using the MERN stack (MongoDB, Express.js, React.js, and Node.js). Students will learn to design, develop, and deploy full-stack web applications through an integrated approach. The course builds on prior knowledge of HTML, CSS, JavaScript, and Bootstrap. Emphasis will be on creating scalable RESTful APIs, frontend interfaces using React, and deploying live applications. Practical sessions will reinforce theoretical learning by implementing real-world applications.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

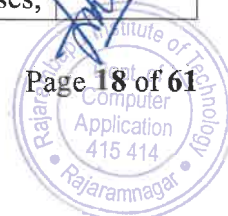
1. Understand and explain the architecture and components of the MERN stack.
2. Develop backend services and APIs using Express.js and MongoDB.
3. Build dynamic frontend applications with React.js, managing state and component lifecycles.
4. Integrate frontend and backend via RESTful services and deploy full-stack applications on cloud platforms.
5. Analyze full-stack application requirements and implement secure, scalable MERN-based solutions using modern development and deployment practices.

Prerequisite:

Basic understanding of HTML, CSS, JavaScript, Bootstrap, Programming Logic, and Git/GitHub.

Course Content

Unit No	Description	Hrs
1	Introduction to MERN Stack: Overview of modern full-stack development, understanding client-server architecture, Components of the MERN stack and their roles, setting up the development environment (Node.js, npm, MongoDB Atlas, GitHub), Using version control (Git basics, branches, GitHub workflows), Introduction to REST architecture and tools like Postman.	04
2	MongoDB: NoSQL database concepts and comparison with relational databases,	04



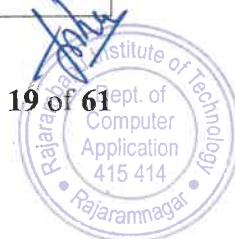


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	Data modeling and schema design in MongoDB, CRUD operations using MongoDB shell and MongoDB Compass, Creating and using Mongoose models in Node.js, Indexing, Aggregation, and Query optimization.	
3	Express.js: Setting up Express server, Creating routes and controllers, Middleware functions and chaining, Route parameters and query strings, Error handling and status codes, Creating RESTful APIs, Using Postman for API testing, Serving static files and using environment variables. Connecting MongoDB with Express using Mongoose, MongoDB Atlas setup.	04
4	React.js: React architecture and single-page applications, JSX syntax and component-based development, Props and state in functional components, useState and useEffect hooks, Conditional rendering and list rendering, Controlled vs uncontrolled components and form handling, React Router: Navigation and routing, Lifting state up and component communication.	04
5	Node.js: Core modules and global objects, Working with File System and Path modules, Creating HTTP server with native Node.js, Event loop and asynchronous programming (callbacks, promises, async/await), Using npm packages and dependency management, Structuring a Node.js project and environment setup.	04
6	Integration & Deployment: Connecting React frontend to Express backend using Axios, Cross-Origin Resource Sharing (CORS) setup, Token-based authentication using JWT, Introduction to deployment platforms: Render, Vercel, Netlify, Building React app for production and environment variables, Deployment best practices and performance auditing (Lighthouse), Securing APIs and frontend from common threats.	04

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below.

List of Experiment		
Expr. No	Description	Hrs
1	Setup development environment and create a simple GitHub repo for MERN stack	02





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2	Design a MongoDB schema and perform basic CRUD operations	02
3	Develop REST APIs with Express.js and test with Postman	02
4	Build a React component with props and state	02
5	Build a frontend app using React Router and Hooks	02
6	Integrate React frontend with Express backend	02
7	Implement user authentication (login/register) using JWT	02
8	Deploy the full-stack app to a cloud platform	02
9	Add validation and error handling across stack	02
10	Create a mini project demonstrating complete CRUD operations and authentication	02

References -

Text Books:

- Brad Dayley, Brendan Dayley, and Caleb Dayley, Node.js, MongoDB and Angular Web Development, Addison-Wesley.
- Alex Banks and Eve Porcello, Learning React: Functional Web Development with React and Redux, O'Reilly Media.
- Jonathan Wexler, Express in Action: Writing, Building, and Testing Node.js Applications, Manning Publications.
- Robin Nixon, Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, O'Reilly Media.

Reference Books:

- Adam Freeman, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress.
- Vasan Subramanian, Pro Express.js: Master Express.js: The Node.js Framework for Your Web Development, Apress.





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC237	Course Name: Yoga/Sports/ NCC /NSS/Disaster Management	-	-	4	2

Note: All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.

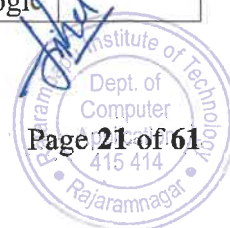
Yoga
Course Description: Yoga course is designed to provide students with a comprehensive understanding of physical fitness, wellness, and nutrition. This course explores the meaning and importance of yoga in the modern era, the role of sports in maintaining physical fitness, and the various components of physical wellness. Students will also learn about the significance of nutrition and weight management, equipping them with the knowledge to promote a healthy and balanced lifestyle. Through this course, students will gain insights into the holistic approach to health and wellbeing.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand yoga's significance and its practical applications for holistic well-being.
2. Explore subtle energy systems and their role in enhancing health through yogic practices.
3. Examine various paths of yoga to foster self-realization and spiritual growth.
4. Master the Eight Limbs of Yoga for physical, mental, and spiritual harmony.
5. Apply yogic principles to manage psycho-somatic ailments and promote resilience.

Course Content		
Unit No	Description	Hrs
1	Yoga: Meaning and definition, Importance of yoga in 21st century, Introduction to Yogic Anatomy and Physiology, Yoga & sports, Yoga for healthy lifestyle, Types of Yoga: - Hatha yoga, laya yoga, mantra yoga, bhakti yoga, karma yoga, jnana yoga, raj yoga, Study of Chakras, Koshas, Pranas, Nadis, Gunas, Vayus and its application in Yogic practices, Ashtang Yoga: - Yama, niyama, asana, pranayama, Pratyahar, dharna, dhyana, Samadhi : Benefits, Utilities & their psychological impact on body and mind, According to yoga concept of normality in modern psychology, concept of personality & its development, yogic	06





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	management of psycho-somatic ailments: frustration, anxiety, depression	
2	Sports for Physical Fitness: Meaning and definition, Physical Activity – Concept, Benefits of Participation in Physical Activities, Components and Significance of Physical Fitness -Health, Skill and Cosmetic Fitness, Types of Physical Activities – Walking, Jogging, Running, Calisthenics, Rope Skipping, Cycling, Swimming, Circuit Training, Weight training, Adventure Sports, Principles of Physical Fitness, Warming Up, Conditioning, Cooling Down, Methods to Develop and Measure Health and Skill related components of Physical Fitness, Measurement of Health Related Physical Fitness (HRPF)	06
3	Physical Wellness: Concept, Components, Types of wellness: psychological, social, emotional, and spiritual, Significance with reference to Positive Lifestyle 2.2, Concepts of Quality of Life and Body Image, Factors affecting Wellness, Wellness Programmes	06
4	Nutrition, Energy Balance and Obesity Management: Concept of Nutrients, Nutrition, Balanced Diet, Dietary Aids and Gimmicks, Energy and Activity- Calorie Intake, Energy Balance Equation, Obesity - Concept, Causes, Obesity Related Health Problems, Weight Management through Behavioural Modifications	06

References -

Text Books:

- Anand O. P., Yog Dawra Kaya Kalp, Swasth Sahitya Prakashan.
- J. E. Brown, Nutrition Now, Thomson-Wadsworth.
- Corbin et al., Fitness & Wellness: Concepts, McGraw Hill.
- C. B. Corbin, G. J. Welk, W. R. Corbin, and K. A. Welk, Concepts of Physical Fitness: Active Lifestyle for Wellness, McGraw Hill.
- W. W. K. Hoeger and S. A. Hoeger, Principles and Labs for Fitness and Wellness, Thomson Wadsworth.
- W. W. Hoeger and S. Hoeger, Fitness and Wellness, Thomson Wadsworth.
- M. L. Kamlesh and M. K. Singh, Physical Education, Naveen Publications.
- D. K. Kansal, Text Book of Applied Measurement, Evaluation and Sports Selection, Sports & Spiritual Science Publications.
- Sheela S. Kumari, Amita Rana, and Seema Kaushik, Fitness, Aerobics and Gym Operations, Khel Sahitya.





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- Angela Lumpkin, Introduction to Physical Education, Exercise Science and Sports Studies, McGraw Hill.
- N. Sarin, Yoga Dawara Rogon Ka Upchhar, Khel Sahitya Kendra.
- M. Savard and C. Svec, The Body Shape Solution to Weight Loss and Wellness, Atria Books.
- Daryl Siedentop, Introduction to Physical Education, Fitness and Sport, McGraw Hill.
- Sri Swami Rama, Breathing, Sadhana Mandir Trust.
- Swami Ram, Yoga and Married Life, Sadhana Mandir Trust.





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Sports Management

Course Description:

Sports Management course is designed to provide undergraduate students with a broad, foundational understanding of the dynamic field of sports management. This course will familiarize students with the fundamental principles and concepts of sports management, including its scope, organizational structure, and ethical considerations. Students will gain insights into the roles of marketing and sponsorship in the sports industry, as well as develop proficiency in financial management techniques specific to sports organizations. Additionally, the course will explore the application of analytics and technology in sports, enhancing the strategic decision-making and fan engagement capabilities.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand the fundamental principles and concepts of sports management, including its scope, organizational structure, and ethical considerations.
2. Analyze the role of marketing and sponsorship in the sports industry, with a focus on branding, target audience segmentation, and event management.
3. Develop proficiency in financial management techniques specific to the sports industry, including revenue generation, cost management, and investment strategies.
4. Explore the application of analytics and technology in sports, including performance evaluation, strategic decision-making, and fan engagement.
5. Apply theoretical knowledge to practical scenarios through case studies and projects, fostering critical thinking and problem-solving skills in sports management contexts.

Course Content

Unit No	Description	Hrs
1	Introduction to Sports Management: Definition and scope of sports management, Significance of sports management in society and its evolution over time, Organizational structure of sports: amateur, professional, and non-profit entities, Roles and responsibilities of key personnel: managers, coaches, and agents, Governance bodies in sports: FIFA, IOC, and NCAA, Legal issues: contracts, negotiations, intellectual property rights, Ethical considerations: fair play and doping	06



2	Sports Marketing and Sponsorship: Unique aspects of sports marketing, Fan engagement strategies, Target audience identification and segmentation, Branding strategies for sports teams and athletes, Sponsorship and endorsement deals, Negotiating and managing partnerships, Event management: planning, organizing, and promoting sports events	06
3	Financial Management in Sports: Revenue generation in sports: ticket sales, broadcasting rights, merchandise sales, Financial models: budgeting and forecasting, Cost management: player salaries, facility expenses, operational costs, Investment opportunities in sports, Risk management techniques specific to sports organizations	06
4	Sports Analytics and Technology: Introduction to sports analytics, Evaluating player performance, Devising game strategies, Fan engagement through technology, Analytical techniques: statistical analysis, data visualization, predictive modeling, Key performance indicators (KPIs) in sports, Applications of analytics: talent scouting, injury prevention, performance optimization.	06

References -

Text Books:

- Pedersen, P. M. and Thibault, L., Contemporary Sport Management, Human Kinetics.
- Hoye, R., Smith, A. C. T., Nicholson, M., et al., Sports Management: Principles and Applications, Routledge.
- Chelladurai, P. and Kerwin, S., Introduction to Sport Management: Theory and Practice, Human Kinetics.
- Hoye, R., Cuskelly, G., and Nicholson, M., Sports Governance: A Guide for Sport Organizations, Routledge.
- Conrad, M., The Business of Sports: A Primer for Journalists, Routledge.
- Shank, M. D., Sports Marketing: A Strategic Perspective, Pearson.
- Collett, P. and Fenton, W., The Sponsorship Handbook: Essential Tools, Tips and Techniques for Sponsors and Sponsorship Seekers, Kogan Page.
- Fullerton, S. Jr. and Funk, D. C., Sports Marketing: A Practical Approach, Routledge.
- Conrad, M., Winning in Sports Business: Essential Marketing, Finance, and Management Strategies, Routledge.
- McCarty, L. A. and McPherson, G., Sports Event Management: The Caribbean Experience, Routledge.



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- Brown, M. T., Rascher, D., and Leeds, M. A., Financial Management in the Sport Industry, Routledge.
- Winfree, J. A. and Rosentraub, M. S., Sports Finance and Management: Real Estate, Entertainment, and the Remaking of the Business, Taylor & Francis.
- Foster, G., O'Reilly, N., and Cuskelly, G., Sports Business Management: Decision Making Around the Globe, Routledge.
- Brown, M. T. and Shick, D. M., Financial Management in the Sport Industry, Routledge.
- Alamar, B. C., Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers, Columbia University Press.
- Miller, T. W., Sports Analytics and Data Science: Winning the Game with Methods and Models, FT Press.
- Marchi, M., Albert, J., and Baumer, B., Analyzing Baseball Data with R, Chapman and Hall/CRC.
- Schumaker, R. P., Hwang, R. S. Y., and Chen, H., Sports Data Mining, Routledge.





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National Cadet Corps (NCC)

Course Description:

This course develops essential skills in discipline, leadership, and tactical operations through structured curriculum and practical exercises. It emphasizes the role of drills in fostering discipline, leadership, and teamwork, and includes comprehensive weapon handling training with a focus on safety protocols. The course teaches map reading, understanding topographical features, and navigating diverse terrains. Practical units cover the history and objectives of the National Cadet Corps (NCC), various maneuvers, parade formations, saluting protocols, and field and battlecraft techniques. By the end, learners will master discipline, leadership, weapon handling, and tactical decision-making, effectively utilizing terrain features for strategic advantages.

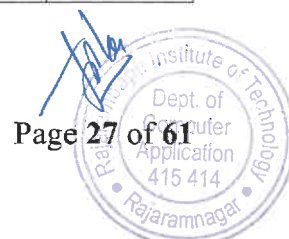
Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand the foundational role of drill in fostering discipline and leadership within a group, enabling effective command towards achieving common goals.
2. Appreciate the importance of grace and dignity in executing foot drill movements, recognizing their significance in enhancing performance and teamwork.
3. Comprehend the criticality of weapon handling and detailed safety measures, emphasizing the importance of accident prevention through strict adherence to safety protocols.
4. Develop an awareness of diverse terrain types and their strategic significance in battle craft, enabling informed decision-making and effective utilization of terrain features for tactical advantage.
5. Apply map reading, field craft, and battle craft techniques to navigate terrain, assess field situations, and support effective tactical operations.

Course Content

Unit No	Description	Hrs
1	Introduction to NCC and Drill: Overview of NCC, its history, aims, objectives, and organizational structure, Incentives and duties associated with NCC cadetship, Maneuvers: Foot drill, Word of Command, Attention, and stand at ease, and Advanced maneuvers like turning and sizing, Parade formations: Parade line, open line, and closed line, Saluting protocols, parade conclusion, and dismissal procedures, Marching styles: style march, double time march, and slow march	06





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2	Weapon Training and Safety: Weapon Training, Handling firearms, Introduction and characteristics of the .22 rifle, Handling Firearm techniques, emphasizing safety protocols and Best practices	06
3	Map Reading (MR): Topographical forms and technical terms, including relief, contours, and gradients, crucial for understanding terrain features, Cardinal points, magnetic variation and grid convergence	06
4	Field Craft & Battle Craft (FC & BC): Fundamental principles and techniques essential for effective field and battle craft operations, Methods of judging distance, including estimation, pacing, and visual cues	06

References -

Text Books:

- Directorate General National Cadet Corps, DGNCC Cadet's Handbook – Common Subjects (All Wings).
- R. Tiwari, NCC: Grooming Feeling of National Integration, Leadership and Discipline among Youth, Edwin Incorporation.
- R. S. Chhetri, Grooming Tomorrow's Leaders, National Cadet Corps.
- Directorate General National Cadet Corps, National Cadet Corps: Youth in Action.
- Ravi Vanshpal, The NCC Days, Notion Press.



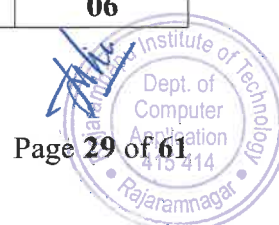


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National Service Scheme (NSS)	
Course Description: This course provides students with an in-depth understanding of the National Service Scheme (NSS), including its history, philosophy, aims, objectives, and organizational structure. It equips students with knowledge about various NSS programmes and activities, emphasizing their relevance and importance. The course also develops skills in community mobilization, teaching students effective techniques for engaging and mobilizing community stakeholders. Additionally, it cultivates an appreciation for volunteerism and shramdan (voluntary labor), highlighting their role in community development initiatives. By the end of the course, students will have a comprehensive understanding of NSS, enhanced leadership and team-building skills, and a strong sense of social awareness and patriotism.	

Course Learning Outcomes: After successful completion of the course, students will be able to,	
1. Explain the history, philosophy, and basic concepts of the National Service Scheme (NSS). 2. Describe the aims, objectives, and organizational structure of NSS. 3. Discuss NSS programmes, activities, and their relevance to society. 4. Apply community mobilization techniques in the planning and execution of NSS activities. 5. Appreciate the role of volunteerism and shramdan in community development initiatives	

Course Content		
Unit No	Description	Hrs
1	Introduction and Basic Concepts of NSS: National Service Scheme (NSS) - history, philosophy, and fundamental concepts, aims and objectives, providing clarity on the organization's overarching goals, Symbols of NSS - Emblem, flag, motto, song, and badge, Organizational structure of NSS	06
2	NSS Programmes and Activities: Diverse programmes and activities conducted under the aegis of the National Service Scheme (NSS), Significance of commemorating important days recognized by the United Nations, Centre, State Government, and University, Examination of the methodology for adopting villages/slums and conducting surveys, Financial patterns of the NSS scheme	06
3	Community Mobilization:	06





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	Dynamics of community mobilization within the framework of the National Service Scheme (NSS), Functioning of community stakeholders, The conceptual lens of community development	
4	Volunteerism and Shramdan in the Indian Context-Roles and Motivations within the NSS Framework: Ethos of volunteerism and shramdan (voluntary labor) within the cultural context of India and the framework of the National Service Scheme (NSS), Motivations and constraints shaping volunteer engagement, Role of NSS volunteers in initiatives such as the Swatch Bharat Abhiyan and Digital India	06

References -

Text Books:

- Ministry of Youth Affairs and Sports, Government of India, National Service Scheme (NSS) Manual, Government of India.
- Agarwalla, S., NSS and Youth Development, Mahaveer Publications.
- Bhattacharya, P., Stories of NSS (English Version), Sahityasree.
- Borah, R. and Borkakoty, B., NSS in Socioeconomic Development, Unika Prakashan.
- Wondimu, H. and Admas, G., The Motivation and Engagement of Student Volunteers in Volunteerism at the University of Gondar, Discover Global Society.
- Saha, A. K., Extension Education – The Third Dimension Needs and Aspirations of Indian Youth, Journal of Social Sciences.
- Mills, S., An Instruction in Good Citizenship: Scouting and the Historical Geographies of Citizenship Education, Transactions of the Institute of British Geographers.
- Mishra, S. K., Sachdev, S., Marwaha, N. and Avasthi, A., Study of Knowledge and Attitude among College-Going Students toward Voluntary Blood Donation from North India, Journal of Blood Medicine.
- Mukherji, B., Community Development in India, Orient Longman.
- Historical Background of NSS and its Philosophy, Aims and Objectives, Osmania University.
- In Defence of Nationalism, Mahatma Gandhi Literature Collection.
- Unlocking Youth Potential for Nation Building: Strengthening NYKS and NSS, United Nations Development Programme (UNDP) India.
- <https://www.osmania.ac.in/NSS%20URL/9.%20%20Historical%20Background%20of%20NSS%20and%20its%20Philosophy,%20Aim.pdf>
- <https://www.undp.org/india/projects/strengthening-nyks-and-nss>
- In Defence of Nationalism <https://www.mk Gandhi.org/indiadreams/chap03.htm>





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DISASTER MANAGEMENT

Course Description:

In our rapidly evolving 21st-century world, challenges emerge in diverse forms, transcending borders and intertwining economic, societal, and environmental realms. These challenges profoundly affect vulnerable communities, magnifying their susceptibility to climate-related shocks and disasters. As we navigate through these complexities, it becomes increasingly evident that aligning strategies with global Sustainable Development Goals (SDGs) across various geographical scales is paramount. This alignment incorporates perspectives of environmental sustainability, climate adaptation, and disaster resilience. In light of these considerations, this course aims to equip students with the knowledge and skills necessary to address and mitigate the impacts of disasters in a holistic manner.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the fundamental concepts, terminology, causes, impacts, and vulnerabilities associated with natural and human-made disasters.
2. Describe the phases of the disaster management cycle and the significance of disaster risk reduction and community-based disaster management.
3. Examine national and international policies, frameworks, institutions, and initiatives related to disaster risk management.
4. Analyze emergency situations such as industrial accidents, hazardous material spills, terrorist threats, and other disasters, along with appropriate response and recovery measures.
5. Demonstrate preparedness, awareness, and disaster response skills through participation in training programs, workshops, and practical activities related to disaster management.

Course Content

Unit No	Description	Hrs
1	Concepts and Terminologies: Understanding key concepts of Hazards, disasters, Disaster types and causes (Geophysical, Hydrological, Meteorological, Biological and Atmospheric, Human-made), Global trends in disasters - Impacts (Physical, Social, Economic, Political, Environmental and Psychosocial), Defining Vulnerability (Physical Vulnerability, Economic Vulnerability, Social Vulnerability)	06



2	Key concepts of Disaster Management Cycle: Components of disaster management cycle (Phases: Response and recovery, Risk assessment, Mitigation and prevention, Preparedness planning, Prediction and warning), Disaster risk reduction (DRR), Community based disaster risk reduction	06
3	Initiatives at national and international level: Disaster Risk Management in India and at international level: Related policies, plans, programmes and legislation, International strategy for disaster reduction and other initiatives	06
4	Emergency Management: Explosion and accidents (Industrial, Nuclear, Transport and Mining), Spill (Oil and Hazardous material), Threats (Bomb and terrorist attacks), Stampede and conflicts, Training and Demonstration Workshops (at least two workshops) be organized in association with the NIDM, NDRF, NCDC, Param Military, Fire Brigade, CISF, local administration etc.	06

References -

Text Books:

- Sharma, S. C., Disaster Management, Khanna Book Publishing.
- Clements, B. W., Disasters and Public Health: Planning and Response, Elsevier Inc.
- Dunkan, K. and Brebbia, C. A. (Eds.), Disaster Management and Human Health Risk: Reducing Risk, Improving Outcomes, WIT Press.
- Singh, R. B. (Ed.), Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications.
- Ramkumar, M., Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency.
- Modh, S., Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan.
- Carter, N., Disaster Management: A Disaster Management Handbook, Asian Development Bank.
- Government of India, Vulnerability Atlas of India, BMTPC.
- Government of India, Disaster Management in India, Ministry of Home Affairs.
- Matthews, J. A., McGuire, B. and Mason, I., Natural Hazards and Environmental Change, Pearson Education.
- Gupta, O. P., Elements of Solid Hazardous Waste and Management, Khanna Publishing House.
- Poonia, M. P. and Sharma, S. C., Environmental Studies, Khanna Publishing House.



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Web Resources:

- <http://www.ndma.gov.in/en/>
- <http://nidm.gov.in/>
- <https://www.unisdr.org/>
- <http://www.emdat.be>
- <https://www.weather.gov/safety/>
- <https://www.preventionweb.net/risk/vulnerability>





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Class: S.Y. BCA	Semester: III	L	T	P	Credits
Course Code: BC239	Course Name: Mini Project	-	-	2	1

Course Description:

During the semester, Bachelor of Computer Applications (BCA) students will undertake a mini project encompassing the complete development cycle of a system or application. The project will be carried out in four main phases: problem analysis to understand and define the problem statement, solution design to plan and architect an effective approach, building and testing which may include software development, hardware integration, or both, and finally, demonstration and reporting of the project outcomes. Students are expected to deliver a functional and efficient design that meets the technical specifications of their assigned project. They must clearly showcase their learning through implementation and comprehensive documentation. Importantly, each mini project should correspond to at least one Sustainable Development Goal (SDG), which must be explicitly stated in the project synopsis, final report, and all assessments.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

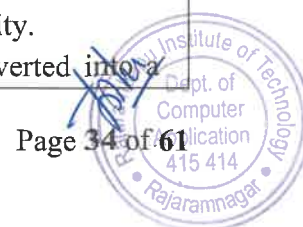
1. Identify and select a suitable mini project topic, define clear objectives, and relate the project to relevant Sustainable Development Goals (SDGs).
2. Analyze the problem requirements and design an appropriate solution using suitable tools, techniques, and technologies.
3. Develop and implement a functional system or application by applying programming, software development, or hardware integration concepts.
4. Evaluate the project outcomes through testing, validation, and performance assessment against the specified requirements.
5. Prepare and deliver comprehensive project documentation, reports, and presentations demonstrating technical knowledge, project outcomes, and SDG relevance.

Prerequisite:

Basic knowledge of programming concepts, problem-solving techniques, and software development fundamentals.

Guidelines for Mini Project

1. Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
2. Students should do survey and identify needs, which should be converted into a





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problem statement for the mini-project in consultation with the faculty supervisor/head of department/internal committee of faculties.

3. A Mini Project Diary to be prepared by each group, wherein the group can record weekly work progress, and a guide/supervisor can verify and record notes/comments.
4. Faculty supervisors may give input to students during mini-project activities; however, the focus shall be on self-learning.
5. Students in a group shall understand the problem effectively, propose multiple solutions and select the best possible solution in consultation with a guide/ supervisor.
6. Students shall convert the best solution into a working model using various components of their domain areas and demonstrate.

Evaluation Scheme for Mini Project (BCA)

Assessment Matrix (Total = 100 Marks)

Sr. No.	Evaluation Component	Assessment Focus	Marks
1	Review I	Problem definition, objectives, SDG mapping, literature survey	10
2	Review II	Requirement analysis, system architecture, database & design	15
3	Review III	Implementation progress, testing strategy, tool usage	15
4	Final Demonstration	Functionality, technical depth, usability & performance	20
5	Project Report	Structure, technical content, SDG impact, results	25
6	Viva-Voce	Concept clarity, individual contribution, communication	15
Total			100



Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC222	Course Name: Entrepreneurship and Startup Ecosystem	1	1	-	2

Course Description:

This course introduces the fundamentals of entrepreneurship, including types of ventures and evaluation of business ideas. It covers financing options, business plan development, and key aspects of startup operations such as marketing, team building, and scaling, while also distinguishing entrepreneurship from family business.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the fundamentals of entrepreneurship, its various types, and its distinction from family business models.
2. Analyze business ideas to evaluate their feasibility and potential for conversion into viable business models.
3. Compare different sources of finance and funding methods suitable for startups and entrepreneurial ventures.
4. Develop a comprehensive business plan incorporating startup operations, marketing strategies, team building, and business scaling.
5. Examine the startup ecosystem, government support schemes, incubation mechanisms, and intellectual property management for entrepreneurial ventures.

Prerequisite:

Basic understanding of business concepts and management principles.

Course Content

Unit No	Description	Hrs
1	Introduction to Entrepreneurship & Family Business: Definition and Concept of entrepreneurship, Entrepreneur Characteristics, Classification of Entrepreneurs, Role of Entrepreneurship in Economic Development –Start-ups, Knowing the characteristics of Family business with discussion on few Indian cases of Family Business like Murugappa, Dabur, Wadia, Godrej, Kirloskar etc.	06



2	Evaluating Business opportunity: Sources of business ideas and opportunity recognition, Guesstimating the market potential of a business idea, Feasibility analysis of the idea, Industry, competition and environment analysis.	06
3	Building Blocks of starting ventures: Low cost Marketing using digital technologies, Team building from scratch, Venture Funding, Establishing the value-chain and managing operations, Legal aspects like IPR and compliances.	06
4	Start-up Ecosystem: Know the components of the start-up ecosystem including Incubators, Accelerators, Venture Capital Funds, Angel Investors etc., Know various govt. schemes like Start-up India, Digital India, MSME etc., Sources of Venture Funding available in India, Source of Technology, Intellectual Property management.	06

References -

Text Books:

- Startup India Learning Program, Startup India Learning Program, Startup India
- Roy, Rajeev, Entrepreneurship, Oxford University Press.
- Ireland, R. Duane and Barringer, Bruce R., Entrepreneurship: Successfully Launching New Ventures, Pearson.
- Agarwal, Rajiv, Family Business Management, Sage Publishing.
- Tiwari, Anish, Mapping the Startup Ecosystem in India, Economic & Political Weekly.
- Bhuvanahandran, Chelat, Innovision, Khanna Publishing House.
- Ramachandran, K., Indian Family Businesses: Their Survival Beyond Three Generations, ISB Working Paper Series.
- Chandrasekhar, Buddha, Future Employment Opportunities Around The World, Khanna Publishing House.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC224	Course Name: Computer Networks	2	-	-	2

Course Description:

This course introduces the basic concepts of computer networks, including networking standards, types of networks, and network models such as OSI and TCP/IP. It covers the fundamental principles of data transmission, physical layer communication, transmission media, switching techniques, and bandwidth utilization. The course also explains the functions of data link, network, and transport layers, including error control, Ethernet technologies, routing, and basic networking protocols.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

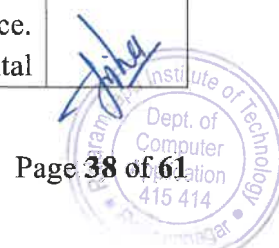
1. Understand the fundamental concepts of computer networks, network types, and networking models such as OSI and TCP/IP.
2. Explain data transmission techniques, signal types, bandwidth utilization, and transmission media used in communication systems.
3. Analyze data link layer functions including error detection, error correction, and media access control mechanisms.
4. Describe network layer and transport layer protocols including IP addressing, routing algorithms, TCP/UDP, and related services.
5. Apply networking concepts to understand routing, switching, and protocol operations in real-world communication systems.

Prerequisite:

Basic knowledge of computer fundamentals and data communication concepts.

Course Content

Unit No	Description	Hrs
1	Introduction to Computer Networks and Network Models: Networking standards and Administrations, networks, network types – LAN, MAN, WAN. Network Models: The OSI model, TCP/IP protocol suite.	04
2	Physical Layer and Data Transmission Techniques: Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Digital transmissions: Digital-to-digital conversion, analog-to-digital	04





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	conversion, transmission modes. Analog transmissions: digital-to-analog conversion, analog-to-analog conversion.	
3	Bandwidth Utilization, Transmission Media and Switching: Bandwidth Utilization – Multiplexing and Spectrum spreading: Multiplexing, Spread Spectrum. Transmission media: Guided Media, Unguided Media. Switching: Introduction, Circuit Switched Network, Packet Switching.	04
4	Data Link Layer and Error Control Techniques: Introduction to Data Link Layer: Link layer addressing, Data Link Layer Design Issues. Error detection and correction: Block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes. Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.	04
5	Media Access Control and Wired LAN Technologies: Media Access Control: Random access, controlled access, channelization. Wired LANs – Ethernet: Ethernet Protocol, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet. Wired Network: Telephone Network, Cable Network, SONET, ATM.	04
6	Network Layer, Transport Layer and Routing Protocols: Introduction to Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets. Network Layer Protocols: Internet Protocol, ICMPv4, Mobile IP. Unicast Routing: Introduction, routing algorithms, unicast routing protocols. Introduction to the Transport Layer: Transport Layer Protocol, User Datagram Protocol, Transmission Control Protocol, SCTP, Next generation IP: IPv6 addressing, IPv6 protocol.	04

References -

Text Books:

- Forouzan, Behrouz A., Data Communications and Networking, TMH.
- Tanenbaum, Andrew S., and Wetherall, David J., Computer Networks, Pearson Education.

Reference Books:

- Trivedi, Bhushan, Computer Networks, Oxford University Press.
- Stallings, William, Data and Computer Communications, PHI.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC226	Course Name: Design and Analysis of Algorithms	3	-	-	3

Course Description:

This course introduces the fundamental concepts of algorithms and their design, analysis, and implementation. Students will learn to analyze algorithm complexity, understand running time, and compare algorithms using asymptotic notations such as Big-O, Omega, and Theta. The course covers recursion, selection techniques, and string algorithms, along with advanced algorithm design methods including greedy techniques, divide-and-conquer, dynamic programming, and backtracking.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

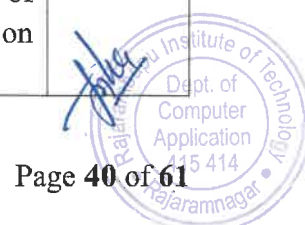
1. Explain the fundamental concepts of algorithms, computational complexity, asymptotic notations, and performance analysis.
2. Apply recursion, iteration, selection techniques, and string-matching algorithms to solve computational problems.
3. Design efficient solutions using greedy and divide-and-conquer algorithmic paradigms.
4. Develop algorithmic solutions using dynamic programming and backtracking techniques for complex problems.
5. Evaluate algorithms based on correctness, time complexity, space complexity, and practical applicability.

Prerequisite:

Basic knowledge of programming concepts, problem-solving techniques, and mathematical reasoning.

Course Content

Unit No	Description	Hrs
1	Introduction to algorithms: What is algorithm, analysis of algorithm, Types of complexity, Running time analysis, How to Compare Algorithms, Rate of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega- Ω Notation, Theta- Θ Notation, Asymptotic Analysis, Performance characteristics of algorithms, Estimating running time / number of steps of executions on paper, Idea of Computability	06





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2	Recursion: What is recursion, Recursion vs Iteration, recursion applications like Factorial of a number, Fibonacci series & their comparative analysis with respect to iterative version, Tower of Hanoi problem.	06
3	Selection Techniques and String Algorithms: Selection by Sorting, Partition-based Selection Algorithm, Finding the Kth Smallest Elements in Sorted Order & their comparative analysis String Algorithms - Pattern matching in strings, Brute Force Method & their comparative analysis	06
4	Algorithm Design Techniques: Introduction to various types of classifications/design criteria and design techniques Greedy Technique - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - file merging problem	06
5	Divide-n-Conquer: Concept, Advantages & Disadvantages, Applications, Implementation using problems like - merge sort, Finding maximum and minimum, Strassen's Matrix Multiplication	06
6	Dynamic and Backtracking Programming: Dynamic Programming Concept, Advantages & Disadvantages, Applications, Implementation using problems like - Fibonacci series, Factorial of a number, Longest Common subsequence Backtracking Programming - Concept, Advantages & Disadvantages, Applications, Implementation using problems like N-Queen Problem	06

References -

Text Books:

- Necaise, Rance D., Data Structures and Algorithm Using Python, Wiley India Edition.
- Karumanchi, Narasimha, Data Structures and Algorithms Made Easy, CareerMonk Publications.
- Cormen, Thomas H., Introduction to Algorithms, PHI.

Reference Books:

- Levitin, Anany, Introduction to the Design and Analysis of Algorithms, Pearson.
- Sridhar, S., Design and Analysis of Algorithms, Oxford University Press.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC228	Course Name: Artificial Intelligence	3	-	-	3

Course Description:

This course introduces the fundamental concepts and techniques of Artificial Intelligence (AI) for solving real-world problems. It covers intelligent agents, problem-solving methods, knowledge-based systems, and various search strategies including uninformed, informed, adversarial search, and optimization techniques like genetic algorithms. The course also includes logical reasoning, inference, planning, and handling uncertainty using probabilistic and fuzzy approaches. Additionally, it provides an overview of major AI domains such as machine learning, computer vision, natural language processing, robotics, and neural networks, along with expert systems and ethical considerations. By the end, students will be able to analyze AI problems and apply suitable techniques effectively.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the characteristics of rational agents, the environments in which they operate, and the concepts of problem-solving agents.
2. Apply uninformed and heuristic search techniques to solve search-based problems.
3. Implement knowledge representation using propositional logic and predicate calculus for inference and reasoning.
4. Analyze planning problems and uncertainty using probabilistic reasoning and fuzzy sets.
5. Examine AI domains, their applications, and the legal and ethical issues associated with artificial intelligence.

Prerequisite:

Basic understanding of computer science concepts, including data structures and algorithms. Proficiency in minimum one programming language, such as Python.

Course Content

Unit No	Description	Hrs
1	Introduction to AI: What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of Agents.	06



2	Knowledge-Based Agents and Problem-solving: Knowledge-Based Agents: Introduction to Knowledge-Based Agents, The Wumpus World as an Example World. Problem-solving: Problem-solving agents.	06
3	Advanced Search Techniques: Uninformed Search: DFS, BFS, Iterative Deepening Search. Informed Search: Best First Search, A* search, AO* search.	06
4	Games, CSP and Evolutionary Techniques: Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning. Constraints and Constraint Satisfaction Problems (CSPs), Backtracking search for CSP. Evolutionary Search Techniques: Introduction to evolutionary algorithms, Genetic algorithms, Applications of evolutionary search in AI.	06
5	Logical Reasoning and Planning: Logic: Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting. Inference: Forward chaining, Backward chaining, Resolution, Truth maintenance systems. Introduction to Planning: Blocks World problem, Strips.	06
6	Uncertainty and Applications of AI: Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, Introduction to Fuzzy set theory. Domains in AI: Introduction to Machine Learning, Computer Vision, Robotics, Natural Language Processing, Deep Neural Networks, and their applications. Expert Systems: The architecture and role of expert systems include two case studies. Legal and Ethical Issues: Concerns related to AI.	06

References -

Text Books:

- M. C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company.
- Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers.
- Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning.
- Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company.

Reference Books:

- M. C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company.



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- M. C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Publishing House.
- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall.
- A. Van Hirtum and C. Kolski, Constraint Satisfaction Problems: Algorithms and Applications, Springer.
- Rajiv Chopra, Machine Learning and Machine Intelligence, Khanna Book Publishing Company.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC230	Course Name: Statistical Methods for Data Science (PE -I)	2	0	2	3

Course Description:

This course aims to teach students the essential principles and methods of data science and statistical analysis. It presents a complete review of data science components, tools, and model-building procedures, with a focus on using statistical approaches and data visualization to make educated decisions. Students will obtain a solid foundation in statistics, covering measures of central tendency, dispersion, and correlation, along with probability principles and hypothesis testing.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

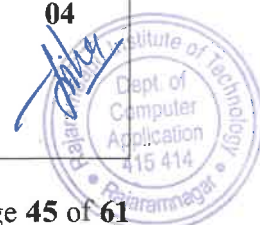
1. Explain Data Science fundamentals, key components, and data types.
2. Apply statistical measures and graphical techniques for data analysis.
3. Utilize probability concepts and hypothesis testing for decision-making.
4. Build regression models for data analysis using appropriate tools and techniques.
5. Evaluate data quality, predictive models, and big data analytics tools for data-driven insights.

Prerequisite:

Basic Mathematics, Programming knowledge, Databases and SQL, Basic proficiency in Excel.

Course Content

Unit No	Description	Hrs
1	Foundations of Data Science and Data Exploration: Introduction to Data Science, overview, Components, Model building process, Data types and its measures, Random Variables, its applications with exercise, Tools, Applications, Sources of data	04
2	Descriptive Statistics and Data Visualization: Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance, standard deviation, range), Measures of Skewness and Kurtosis - Graphical representation and its application, Measures of correlation coefficient and its analysis, Various graphical representation of data for analysis	04





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3	Probability and Statistical Inference: Concept of Probability and it's Applications, probability distributions, Central limit theorem for sampling variations, Confidence Interval computation and analysis. Basic concepts related to hypothesis testing	04
4	Regression Modeling and Predictive Analytics: Regression model using ordinary least squares, Coefficient of determination as strength of model, Prediction interval and confidence interval, Prerequisites to regression, Model building using regression	04
5	Model Evaluation and Data Preprocessing Techniques: Measures of accuracy, Model improvement techniques, listwise, pairwise deletion, Imputation techniques: Regression Imputation, Hot Deck, KNN imputation	04
6	Big Data Analytics and Data Science Tools: Data analysis using Excel, Overview of tools SQL, Hadoop, Hive, Weka, Tableau, Introduction of Hadoop Ecosystem (Pig, Hive and Hbase), Big data analysis	04

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below.

List of Experiment		
Expr. No	Description	Hrs
1	Explain the concept of Random Variables. Provide an example and a solution exercise on its application	02
2	Computing and Interpreting Measures of Central Tendency: Mean, Median, and Mode	02
3	Calculating and Analyzing Measures of Dispersion: Variance, Standard Deviation, and Range	02
4	Exploring Skewness and Kurtosis: Concepts, Calculations, and Data Interpretation	02
5	Visualizing Data: Creating and Comparing Bar Charts, Histograms, Pie Charts, and Box Plots	02
6	Measuring Relationship Strength: Calculating and Interpreting Correlation Coefficients	02
7	Demonstrating the Central Limit Theorem Through Simulation and Analysis	02
8	Constructing and Interpreting Confidence Intervals for Population Means	02





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9	Fundamentals of Hypothesis Testing: Formulation, Execution, and Result Interpretation	02
10	Performing Simple Linear Regression: Model Building, Residuals, and Prediction	02

References -

Text Books:

- James, Gareth; Witten, Daniela; Hastie, Trevor; and Tibshirani, Robert, An Introduction to Statistical Learning, Springer.
- Friedman, Jerome; Hastie, Trevor; and Tibshirani, Robert, The Elements of Statistical Learning, Springer.
- Spiegelhalter, David, The Art of Statistics: How to Learn from Data, Numeracy.
- Grus, Joel, Data Science from Scratch: First Principles with Python, O'Reilly Media.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC232	Course Name: Artificial Intelligence and Knowledge Representation (PE -I)	2	0	2	3

Course Description:

This course focuses on the fundamental concepts of knowledge representation, reasoning, and ontology in Artificial Intelligence. It covers logical foundations, various knowledge representation techniques such as frames, rules, and object-oriented models, and explores processes, constraint satisfaction, and context-based reasoning. The course also addresses uncertainty through fuzzy and nonmonotonic logic, along with knowledge acquisition, sharing, and integration across multiple paradigms, enabling students to model and analyze intelligent systems effectively.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Understand fundamental concepts of knowledge, logic, and ontology in AI.
2. Apply various knowledge representation techniques to model real-world problems.
3. Analyze processes, constraint satisfaction, and context-based reasoning methods.
4. Evaluate uncertainty handling methods and knowledge acquisition and sharing approaches.
5. Design knowledge-based models using ontologies, frames, rules, and context-based representations for intelligent systems.

Prerequisite:

Basic knowledge of programming (preferably Python), fundamental concepts of mathematics and logic, and an understanding of data structures and algorithms.

Course Content

Unit No	Description	Hrs
1	The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic, Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity	04
2	Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time	04



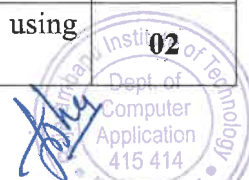


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3	Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation	04
4	Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction	04
5	Change Contexts: Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts	04
6	Knowledge Soup and Knowledge Acquisition and Sharing: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics, Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition	04

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below.

List of Experiment		
Expr. No	Description	Hrs
1	Implement basic propositional logic statements and evaluate their truth values using logical operators.	02
2	Write programs to represent knowledge using first-order predicate logic and perform simple inference.	02
3	Develop a simple ontology for a real-world domain (e.g., library or hospital) showing classes, objects, and relationships.	02
4	Design a frame structure to represent hierarchical knowledge (e.g., vehicles, animals).	02
5	Implement a rule-based system using IF-THEN rules for a simple problem (e.g., medical diagnosis or recommendation system).	02
6	Develop a program using object-oriented concepts to represent entities and relationships in a domain.	02
7	Solve a CSP problem (e.g., Map Coloring or N-Queens) using appropriate algorithms.	02





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8	Implement a simple context-based reasoning system demonstrating syntax and semantics of contexts.	02
9	Design a fuzzy logic-based system (e.g., temperature control or decision-making system).	02
10	Implement a simple nonmonotonic reasoning system to demonstrate how conclusions can change with the addition of new knowledge (e.g., default reasoning or assumption-based reasoning).	02

References -

Text Books:

- Sowa, John F., Knowledge Representation: Logical, Philosophical, and Computational Foundations, Thomson Learning.
- Brachman, Ronald J. and Levesque, Hector J., Knowledge Representation and Reasoning, Elsevier.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC234	Course Name: Fundamentals of Information Security (PE -I)	2	0	2	3

Course Description:

The course, Information Security, introduces the theoretical concepts of computer and information security. The course includes concepts of cryptographic algorithms, authentication systems, message authentication, hash function, threats and vulnerabilities network security, security audits and database security.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

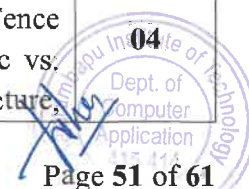
1. Differentiate key components of information, network, and computer security along with their strategic importance.
2. Identify potential security threats and vulnerabilities, and design appropriate countermeasures.
3. Apply classical and modern cryptographic techniques to secure data and analyze encryption algorithms.
4. Implement basic security solutions for networks, emails, and databases using standard security tools and practices.
5. Evaluate security mechanisms such as message authentication, hash functions, digital signatures, firewalls, VPNs, and intrusion detection systems for protecting information systems.

Prerequisite:

Introduction to operating system, Computer Network

Course Content

Unit No	Description	Hrs
1	Introduction to Information Security: Computer Security Concepts, Computer Security, Information Security, Network Security, Threats, Attacks and Assets, Security Requirements, Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy.	04
2	Cryptography: Classical Cryptosystems: Ceasar, Vigenère, Playfair, Rail Fence Ciphers, Modern Ciphers: Block vs. Stream Ciphers, Symmetric vs. Asymmetric Ciphers, Symmetric Encryption: Feistel Cipher Structure,	04



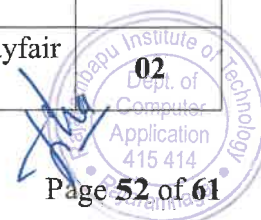


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	Data Encryption Standards (DES), Basic Concepts of Fields: Groups, Rings, Fields, Modular Arithmetic, Galois Fields, Polynomial Arithmetic, Advanced Encryption Standards (AES), Number Theory: Prime Numbers, Fermat's Theorem, Primality Testing: Miller- Rabin Algorithm, Euclidean Theorem, Extended Euclidean Theorem, Euler Totient Function, Asymmetric Encryption: Diffie-Helman Key Exchange, RSA Algorithm.	
3	Message Authentication and Hash Functions: Message Authentication, Hash Functions, and Message Digests: MD4 and MD5, Secure Hash Algorithms: SHA-1, HMAC, Digital Signatures.	04
4	Threats and vulnerabilities: Introduction, Types of Hackers, Hacktivism, Common Threats to the data, Vulnerability and Penetration testing and its tools, Malicious Codes, Back Doors, Spoofing, Sniffing, Spam, Social Engineering, Denial of Service and Distributed Denial of Service.	04
5	Network and email security: Introduction, Planning for Network Security, TCP/IP and OSI models, Firewalls and its types, VPNs, and Wireless security, Intrusion Detection and Prevention Systems and Other Security Tools, Email security and PGP.	04
6	Database Security: Introduction of Unit, Describe the structures and vulnerabilities of key databases for cyber security including SQL, Oracle and Mongo DB, Common database Vulnerabilities and Owasp top 10, SQL injection.	04

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below.

List of Experiment		
Expr. No	Description	Hrs
1	Write a program to study different security protocols like WEP/WPA2 PSK, 802.1x EAP security protocol and implement RC4 Algorithm.	02
2	Write a program to implement AES.	02
3	Write a program to perform Encryption / Decryption using Caesar cipher.	02
4	Write a program to perform Encryption / Decryption using Mono Alphabetic techniques.	02
5	Write a program to perform Encryption / Decryption using Playfair system.	02





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6	Write a program to perform Encryption / Decryption using Hill cipher Technique.	02
7	Write a program to perform Encryption / Decryption using the transposition technique.	02
8	Write a program to generate and verify message digests using MD5 and SHA-1 hash algorithms.	02
9	Write a program to implement RSA algorithm for Encryption and Decryption.	02
10	Write a program to study the steps of implementation of VPN using Packet Tracer.	02

References -

Text Books:

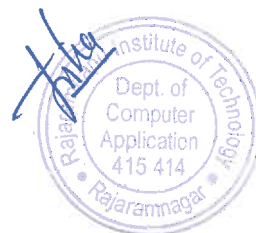
- Stallings, William and Brown, Lawrie, Computer Security: Principles and Practice, Pearson.
- Stallings, William, Cryptography and Network Security: Principles and Practice, Pearson.

Reference Books:

- Cryptography and Network Security, Farozan, Behrouz A.
- Data and Computer Communication, Pearson Education, Stallings William
- Cryptography and Network Security, S. Bose.

Web Resources:

- <https://archive.nptel.ac.in/courses/106/106/106106129/>
- https://onlinecourses.swayam2.ac.in/nou19_cs08
- <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks>
- <https://www.codecademy.com/learn/introduction-to-cybersecurity>





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC236	Course Name: Computer Networks Lab	-	-	4	2

Course Description:

This practical course provides hands-on experience in basic computer networking concepts and tools. Students will learn to use networking commands in Linux/Windows environments, configure IP addressing, and create simple LAN and wireless networks using Cisco Packet Tracer. The course also introduces students to network monitoring and packet analysis using Wireshark. Through these experiments, students will gain practical knowledge of network configuration, connectivity testing, and basic network troubleshooting.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

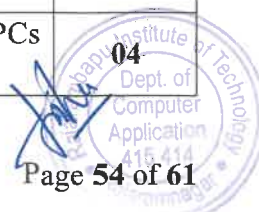
1. Analyze network connectivity using basic networking commands.
2. Configure LAN and wireless networks using networking tools such as Cisco Packet Tracer.
3. Verify communication between network devices by configuring static and dynamic IP addressing.
4. Analyze network packets using Wireshark to understand network protocols and traffic.
5. Evaluate network performance parameters such as delay, routing behavior, and packet transmission efficiency using diagnostic tools.

Prerequisite:

Basic knowledge of computer fundamentals and data communication concepts.

List of Experiment

Expr. No	Description	Hrs
1	Study basic networking commands using Linux Terminal / Windows CMD and observe the output of the following commands: ping, tracer/traceroute, netstat, arp, ipconfig, getmac, hostname, nslookup, pathping, systeminfo.	04
2	Configure IP addressing on two computers and test network connectivity using the ping command.	02
3	Using Cisco Packet Tracer, create a simple LAN with two PCs connected using appropriate cable and verify communication.	04





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4	Using Cisco Packet Tracer, create a network with one switch and multiple PCs and configure static IP addressing.	04
5	Configure Dynamic IP addressing using DHCP in a network with one server and multiple PCs in Packet Tracer.	04
6	Study different network cables (straight-through and crossover) and create networks accordingly in Packet Tracer.	04
7	Create a network with one server and two PCs and demonstrate basic client-server communication.	04
8	Create a wireless LAN using an access point and connect multiple PCs or mobile devices.	04
9	Configure and test Ethernet-based LAN connectivity using switch and multiple computers.	02
10	Capture and analyze network packets using Wireshark and identify protocols such as ICMP, TCP, UDP, HTTP, and FTP.	04
11	Demonstrate ARP protocol operation by observing ARP table entries using command line tools.	02
12	Study and analyze network performance parameters such as delay and packet transmission using tools like ping and traceroute.	02

References -

Text Books:

- Forouzan, Behrouz A., Data Communications and Networking, TMH.
- Tanenbaum, Andrew S., and Wetherall, David J., Computer Networks, Pearson Education.

Reference Books:

- Trivedi, Bhushan, Computer Networks, Oxford University Press.
- Stallings, William, Data and Computer Communications, PHI.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC238	Course Name: Artificial Intelligence Lab	-	-	4	2

Course Description:

This practical course provides hands-on experience in implementing key concepts of Artificial Intelligence, including search algorithms, problem-solving techniques, logical reasoning, and basic machine learning. Students will develop programs for AI algorithms, build simple intelligent systems such as expert systems and chatbots, and perform NLP and image classification tasks using tools like Python, NLTK, and TensorFlow/Keras.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

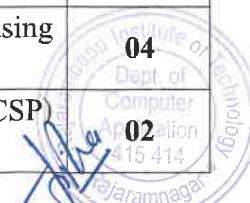
1. Apply uninformed and heuristic search algorithms to solve artificial intelligence problems.
2. Analyze constraint satisfaction problems using appropriate AI techniques.
3. Design rule-based systems for decision-making applications.
4. Implement optimization techniques and basic NLP concepts for real-world AI problems.
5. Evaluate AI solutions based on their efficiency, accuracy, and suitability for different problem domains.

Prerequisite:

Basic understanding of algorithms and data structures (e.g., trees, graphs, lists). Proficiency in Python programming, including libraries like NLTK for NLP tasks.

List of Experiment

Expr. No	Description	Hrs
1	Demonstrate basic problem-solving using Breadth-First Search on a simple grid.	02
2	Implement Depth-First Search (DFS) on a small graph.	02
3	Solve the Water Jug Problem using Breadth First Search (BFS).	02
4	Implement a Hill Climbing search to find the peak in a numeric dataset.	02
5	Apply the A* Search algorithm to find the shortest path in a 4x4 grid.	02
6	Implement the Minimax search algorithm for a two-player game using a game tree with 3 plies.	04
7	Solve the 4-Queens Problem as a Constraint Satisfaction Problem (CSP) using backtracking.	02





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8	Use constraint propagation to solve a Magic Square puzzle.	02
9	Apply optimization techniques to find the maximum value in a list.	02
10	Represent and evaluate propositional logic expressions.	02
11	Implement a basic rule-based expert system for weather classification.	02
12	Implement a basic AI agent with simple decision-making rules.	02
13	Implement a basic rule-based chatbot.	04
14	Using Python NLTK, perform the following Natural Language Processing (NLP) tasks for text content: a) Tokenizing b) Filtering Stop Words c) Stemming d) Part of Speech Tagging e) Chunking f) Named Entity Recognition (NER)	06
15	Perform image classification for a given dataset using CNN (TensorFlow/ Keras).	04

References -

Text Books:

- M. C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company.
- Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers.
- Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning.
- Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company.

Reference Books:

- M. C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company.
- M. C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Publishing House.





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC240	Course Name: Design Thinking and Innovation	1	1	-	2

Course Description:

This course introduces Design Thinking, covering its principles, history, and industry applications. It explores the Design Thinking Process, including empathy, ideation, and prototyping. Students will understand the difference between creativity and innovation and its role in organizations. The course includes Product Design Strategies, problem identification, and case studies. It also covers Business Applications of Design Thinking, including startups and strategic innovation. Lastly, it highlights Emerging Trends like AI integration, sustainability, and human-centered design.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Implement the fundamental concepts of design thinking.
2. Implement the core principles of design thinking and innovation.
3. Apply design thinking techniques to problem-solving in various sectors.
4. Analyze interdisciplinary approaches in design thinking.
5. Evaluate emerging trends and ethical considerations in design thinking, including AI, sustainability, and human-centered design.

Prerequisite:

Basic design knowledge, Creative thinking, Problem-solving skills, business awareness, and teamwork.

Course Content

Unit No	Description	Hrs
1	Introduction to Design Thinking: Elements and Principles of Design, Basics of Design: Dot, Line, Shape, Form as Fundamental Components, Principles of Design, History and Evolution of Design Thinking, Introduction to New Materials in Industry	04
2	Design Thinking Process: Steps in the Design Thinking Process: Empathize, Analyze, Ideate, Prototype, Application in Invention and Social Innovation, Tools of Design Thinking: Persona, Customer Journey Mapping, Brainstorming, Product Development	04





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3	Innovation: Understanding Innovation vs. Creativity, Role of Creativity and Innovation in Organizations, Transition from Creativity to Innovation, Teams for Innovation, Measuring the Impact of Creativity	04
4	Product Design: Problem Identification and Product Strategies, Product Value and Planning, Product Specifications and Case Studies, Innovation in Product Design.	04
5	Design Thinking in Business Processes: Application of Design Thinking in Business and Strategic, Innovation, Addressing Business Challenges: Growth, Change, Competition, Standardization, Design Thinking for Startups, Developing and Testing Business Models	04
6	Emerging Trends in Design Thinking & Innovation: Future of Design Thinking: Integration with AI, Big Data, and IoT, Sustainable Innovation: Eco-friendly and sustainable design approaches, Human-Centered Design: Advanced concepts in empathy-driven solutions, Ethical Considerations in Innovation: Responsible and inclusive design.	04

References -

Text Books:

- Brown, Tim, Change by Design, Harper Collins.
- Mootee, Idris, Design Thinking for Strategic Innovation, Adams Media.

Reference Books:

- Lee, David, Design Thinking in the Classroom, Ulysses Press.
- Shetty, Shrrutin N., Design the Future, Norton Press.
- Lidwell, William, Holden, Kritina & Butler, Jill, Universal Principles of Design, Rockport Publishers.
- Chesbrough, Henry, The Era of Open Innovation.

Web Resources:

- NPTEL Course on Design Thinking
- Swayam Online Course on Design Thinking
- NPTEL Course on Innovation





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Class: S.Y. BCA	Semester: IV	L	T	P	Credits
Course Code: BC242	Course Name: Massive Open Online Course (MOOCs)	-	-	-	1

Course Description:

Online courses offered through platforms like NPTEL, SWAYAM, and NASSCOM provide Bachelor of Computer Applications (BCA) students with valuable opportunities to advance their understanding of modern computing concepts and technologies. These courses cover key domains such as algorithms and data structures, software engineering, database systems, operating systems, computer networks, cybersecurity, cloud computing, and emerging fields like Artificial Intelligence, Machine Learning, and Data Science. By combining strong theoretical foundations with hands-on practical applications, they help students enhance problem-solving abilities, work with state-of-the-art tools, and prepare for real-world, industry-oriented challenges. The objective of such courses is to cultivate skills and mindsets that encourage continuous learning, adaptability to new technologies, and readiness to thrive in an ever-evolving tech landscape.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

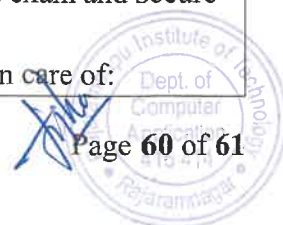
1. Explain fundamental concepts of computer science domains such as algorithms, operating systems, databases, networks, cybersecurity, and emerging technologies.
2. Analyze computational problems using logical reasoning and appropriate algorithmic and engineering approaches.
3. Develop software solutions using programming tools and modern technologies with proper testing and debugging practices.
4. Apply knowledge gained from online learning platforms to solve real-world, industry-oriented problems using appropriate tools and techniques.
5. Evaluate emerging technologies such as AI, ML, cloud computing, and data science for continuous professional development.

Prerequisite:

Basic understanding of computer fundamentals, programming concepts, and logical problem-solving skills.

Note:

1. The student will get the credits for the respective course under the following conditions. In the case of a course selected from NPTEL/SWAYAM/NASSCOM platforms, students have to compile the timely assignments, pass the exam and secure the certificate.
2. While selecting an online course, the following points must be taken care of:





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- a. Selected course must be approved by the Departmental Programme Committee (DPC).
- b. The duration of each online course must be at least FOUR weeks for NPTEL/SWAYAM & minimum 12 to 20 hours for NASSCOM.

References -

Web Resources:

- NPTEL (National Programme on Technology Enhanced Learning)
- <https://nptel.ac.in>
- SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)
- <https://swayam.gov.in>
- MOOCs on NASSCOM
- www.nasscom.in

