



RANI CHANNAMMA UNIVERSITY

BELAGAVI

**REVISED CURRICULUM FRAMEWORK FOR
UNDER GRADUATE COURSE**

**STRUCTURE & SYLLABUS OF BACHELOR OF COMPUTER
APPLICATION**

BCA

1ST TO 2ND Semesters

w.e.f.

Academic Year 2024-25 and Onwards

Submitted by

Chairman,
Board of Studies (UG),
Bachelor of Computer Science,

PROGRAM OUTCOMES:

By the end of the program the following outcomes will be achieved by the students:

- Discipline knowledge: Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
- Problem Solving: Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
- Design and Development of Solutions: Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
- Programming a Computer: Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
- Application Systems Knowledge: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
- Modern Tool Usage: Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
- Communication: Must have a reasonably good communication knowledge both in oral and writing.
- Project Management: Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.
- Ethics on Profession, Environment and Society: Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.

Revised Course Structure and Syllabus

I Semester BCA w.e.f 2024-25 and onwards									
Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory / Practical	Total	
Part I AECC	SEPBCAAEC 1.1	Language 1	4	-	3	20	80	100	3
	SEPBCAAEC 1.2	Language 2	4	-	3	20	80	100	3
Part II DSC	SEPBCAT1.3	Computer Concepts and C Programming	4	-	3	20	80	100	3
	SEPBCAT1.4	Database Management System	4	-	3	20	80	100	3
	SEPBCAT1.5(a) / SEPBCAT1.5(b)*	Accountancy / Mathematics-I	4	-	3	20	80	100	3
	SEPBCAPI.6	C Programming Lab	-	4	3	10	40	50	2
	SEPBCAPI.7	Database Management System Lab	-	4	3	10	40	50	2
	SEPBCAPI.8	Office Automation lab	-	4	3	10	40	50	2
Part III SEC	SEPBCAAEC 1.9	Compulsory 1 (Constitutional Values)	2	-	2	10	40	50	2
Total			22	12				700	23

Note- * BCADSC 1.5(a) – for students from Science Background / BCADSC 1.5(b)* for students from Non- Science Background

II Semester BCA w.e.f 2024-25 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks		Total	
						IA	Theory / Practical		
Part I AECC	SEPBCAAEC 2.1	Language 1	4	-	3	20	80	100	3
	SEPBCAAEC 2.2	Language 2	4	-	3	20	80	100	3
Part II DSC	SEPBCAT 2.3	Data Structures and Algorithms	4	-	3	20	80	100	3
	SEPBCAT 2.4	Numerical and Statistical Methods	4	-	3	20	80	100	3
	SEPBCAT 2.5	Object Oriented Programming Using Java	4	-	3	20	80	100	3
	SEPBCAP 2.6	Data Structures and Algorithms Lab	-	4	3	10	40	50	2
	SEPBCAP 2.7	Numerical and Statistical Methods Lab	-	4	3	10	40	50	2
	SEPBCAP 2.8	Object Oriented Programming Using Java Lab	-	4	3	10	40	50	2
Part III SEC	SEPBCAAEC 2.9	Compulsory 2 (Constitutional Values)	2	-	2	10	40	50	2
Total			22	12				700	23

Year	I	Course Code: SEPBCAT1.3	Credits	3
Semester	I	Course Title: Computer Concepts and C Programming	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Understand classification of computers, its features and parts, software and its types ○ Apply techniques of problem solving to design C code ○ Read, understand and trace the execution of programs written in C language ○ Apply programming control structures for a given problem to create C code ○ Understand derived datatypes and develop C code using arrays/ strings ○ Understand user defined functions and datatypes to develop C code 			

Unit No	Course Content	Hours
Unit-1	<p>Introduction: Computer, data processing, characteristic features of computers, Basic operations performed by computers, basic organization of computer system</p> <p>Number systems: Different types- decimal, binary, octal, and hexadecimal number systems, Conversion from decimal to binary and vice- versa</p> <p>Software: Software and its relationship with hardware, types of software, system software, application software, firmware, middleware,</p> <p>Computer languages: Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler</p>	10
Unit-2	<p>Steps for Problem Solving: Flowcharts, Algorithms; Examples of flow charts and algorithms- Largest of three numbers, reversing the digits of an integer, GCD of two integers, generating prime numbers, computing n Fibonacci numbers.</p> <p>Introduction to C Programming: Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C.</p> <p>C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants.</p>	10
Unit-3	<p>Input and output with C: Formatted I/O functions - printf and scanf, control strings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display single character and a string - getchar, putchar, gets and puts functions. Character handling library functions - toascii, toupper, tolower, isalpha, isnumeric</p> <p>C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators, Operator Precedence and Associativity; Evaluation of arithmetic expressions; Mathematical library functions in C using math.h; Type casting & conversion.</p>	8
Unit-4	<p>Control Structures: Decision making Statements - Simple if, if_else, nested if_else, else_if ladder, Switch Case, goto, break & continue statements; Looping Statements - Entry controlled and exit controlled statements, while, do-while, for loops, Nested loops.</p> <p>Strings: String constant and variables, Declaration and initialization of string, Input/output of string data.</p> <p>String Library Functions: strlen, strcat, strcmp, strcpy, strrev.</p>	10

Unit-5	<p>Arrays: Definition, types, initialization, processing an array, passing arrays to functions, Array of Strings.</p> <p>User defined functions: Definition, types of user defined functions, prototype, Local and global variables, passing parameters, recursion</p> <p>Structures & Union: Definition of Structure, declaring Structure, accessing Structure elements, array of Structure, Nesting of structure. Definition of Union, declaring and using Union, Difference between Structure & Union.</p>	10
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Text Books:

1. Fundamentals of Computers, E. Balaguruswamy (McGraw Hill)
2. Anil V. Choudhuri, The Art of Programming through Flowchart and Algorithms, Laxmi Pub.
3. E. Balaguruswamy: Programming in ANSI C (TMH)
4. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
5. V. Rajaraman: Programming in C (PHI –EEE)
6. P.B. Kottur: Programming in C (Sapna Book House)

References:

1. P. K. Sinha & Priti Sinha: Computer Fundamentals (BPB)
2. C: The Complete Reference, By Herbert Schildt.
3. Kernighan & Ritchie: The C Programming Language (PHI)
4. S. Byron Gottfried: Programming with C (TMH)
5. Yashwant Kanitkar: Let us C

Year	I	Course Code: SEPBCAT1.4	Credits	3
Semester	I	Course Title: Database Management System	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Explain the various database concepts and the need for database systems. ○ Identify and define database objects, and enforce integrity constraints on a database using DBMS. ○ Demonstrate a Data model and Schemas in RDBMS. ○ Identify entities and relationships and draw an ER-diagram for a given real-world problem. ○ Convert an ER diagram to a database schema and deduce it to the desired normal form. ○ Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation. 			

Unit No	Course Content	Hours
Unit-1	Introduction to Database System Concepts and Architecture Databases and Database Users, Characteristics of the Database Approach, Actors on the Scene, Advantages of Using a DBMS Data Models, Schemas and Instances, DBMS Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.	10
Unit-2	Data Modelling Using the Entity-Relationship Model Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions and Design Aspects.	10
Unit-3	Relational Data Model, Relational Constraints, and Relational Algebra Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Basic Relational Algebra Operations: SELECT, PROJECT, RENAME. Examples of simple Queries in Relational Algebra.	10
Unit-4	Normalization- Functional Dependencies, Transitive and Multivalued Dependencies, First Normal Form, Second Normal Form, Third Normal Form,	8
Unit-5	Introduction to SQL: SQL and its features, SQL Data types, DDL: Create tables (with constraints), Alter tables, DML: Insert, Update, Delete Operations, Queries: Simple Queries, select with WHERE clause, ORDER BY clause and aggregate functions, Using operators like BETWEEN, IN, ANY, ALL and computations in queries, Simple Queries using all clauses. More on SQL: Joins, types of joins, queries with GROUP BY clause, queries with HAVING clause, views and their relevance, creating and using views, simple example queries for joining tables and using GROUP BY and HAVING clause.	10

TextBooks:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015.
2. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.

References:

1. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
2. Introduction to Database System, C J Date, Pearson, 1999.
3. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002
4. McGraw Hill, 2002

Year	I	Course Code: SEPBCAT1.5(a)	Credits	3
Semester	I	Course Title: Accountancy	Hours	48
Course Pre-requisite, if any	Students should have studied Science in PU/12 th level			
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Understand accounting, branches of accounting and its role. ○ Know the concepts of accounting and accounting process. ○ Maintenance of different accounting books. ○ Preparation of final accounts. 			

Unit No	Course Content	Hours
Unit-1	Introduction to Accounting: Meaning of book-keeping, accounting and accountancy. Accounting – objectives, scope & functions. Book Keeping Vs Accounting. Users of accounting information. Systems of Accounting – Single entry system & Double entry system, differences. Branches of Accounting. Accounting equation. Important accounting terms.	10
Unit-2	Accounting Principles – Concepts & Conventions: Generally Accepted Accounting Principles, Accounting Policies, Principles vs Polices. Accounting cycle. Classification of Accounts – British System & American System. Rules of Accounting, i.e. Debit & Credit rules under British System & American System. Journal – meaning, features, format & journalising. Ledger – meaning, features, format, ledger posting, balancing a ledger account. Journal vs Ledger. Preparation of personal ledger account.	09
Unit-3	Subsidiary Books: Meaning, features & advantages. Types – Purchase Book, Purchase Returns Book, Sales Book, Sales Returns Book, Cash Book (Simple Cash Book & Three Column Cash Book) Meaning of terms – discount, cash discount, trade discount, invoice, debit note, credit note, contra entry, voucher, receipt, pass book, etc.	09
Unit-4	Bank Reconciliation Statement: Meaning & need. Reasons for difference between cash book balance and pass book balance. Preparation of BRS. Advantages.	10
Unit-5	Final Accounts: Meaning, need & objectives. Trial Balance – meaning, objectives, format & preparation. Meaning & objectives of preparation of Trading Account, Profit & Loss Account and Balance Sheet. Meaning of Gross Profit, Gross Loss, Net Profit, Net Loss, Depreciation, Bad Debts, Outstanding Expenses, Prepaid Expenses, Capital, and Assets & Liabilities. Simple problems on preparation of Trading Account, Profit & Loss Account and Balance Sheet [Sole Trading Concerns only]	10

Text books:

1. Book Keeping & Accountancy by M. B. Kadkol
2. Accountancy by B. S. Raman
3. Book Keeping & Accounting by V. A. Patil & J. S. Korlahalli

References:

1. Dr. R.K. Mittal & M.R. Bansal, Financial Accounting, VK Publications.
2. Anil Chowdhry, Fundamentals of Accounting & Financial Analysis, Pearson Education.
3. Maheshwari & Maheshwari, An Introduction to Accountancy, 11th Edition, Vikas Publishing House.
4. Jane Reimers, Financial accounting, Pearson Education
5. Rajni Preeti HiroSofat, Basic Accounting, PHI Additional Reading:
6. Accounting for management, Bhattacharya & Deaden, Paperback Edition, Vikas 1986
7. Financial Accounting (Part I and Part II), R.L Gupta & V.K Gupta
8. Maheshwari S.N., Principles of Management Accounting, Sultan Chand & Sons,
9. Accounting Principal, Antony & Reece, Sixth Edition

Year	I	Course Code: SEPBCAT1.5(b)	Credits	3
Semester	I	Course Title: Mathematics –I	Hours	48
Course Pre-requisite, if any	Students should have studied Commerce in PU/12 th level			
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ To perform basic arithmetic operations and roots on complex numbers. ○ Apprehend types of Sequences & Series and relationship between them. ○ Understand Expansion of Binomial Expression and coefficient, Pascal's triangle and find the any term in the expansion. ○ Explore the basic concepts of trigonometry, including sine, cosine, and tangent functions and Standard Angles, Allied Angles. ○ Understand the basic concepts of Distance Formulae, Section Formulae, Slope of a Line and Angle between Two Lines. Various Forms of Equations of a Line 			

Unit No	Course Content	Hours
Unit-1	Complex Numbers: Complex Numbers; Conjugate of a Complex Number; Modules of a Complex Number; Geometrical Representation of Complex Number; De Moivre's Theorem; nth Roots of a Complex Number.	10
Unit-2	Sequence And Series: Arithmetic Progression (A P), Arithmetic Mean (A M), Geometric Progression (G P), General Term of a G P, Sum of N Terms of a G P. Arithmetic and Geometric Series, Infinite G P and its Sum, Geometric Mean (G M) Relation Between A M and G M	10
Unit-3	Binomial Theorem: Statement of the Binomial Theorem For Positive Integral Indices, General And Middle Term in Binomial Expansion, Simple Applications. Quadratic Equations: Solution Of Quadratic Equations by Factor Method, Complete Square Method, And Discriminant Method, Relation Of The Roots.	10
Unit-4	Introduction To Trigonometry: Trigonometry Ratio's, Trigonometric Functions of Standard Angles, Allied Angles, Compound Angles, Multiple & Sub Multiple Angles, Transformation Formula	9
Unit-5	Co-Ordinate Geometry: Distance Formulae, Section Formulae, Shifting Of Origin. Slope of a Line And Angle Between Two Lines. Various Forms of Equations of A Line: Parallel To Axes, Point Slope Form, Slope-Intercept Form, Two-Point Form, Intercepts Forms And Normal Form, General Equation of a line. Equation of Family of Lines Passing Through The Point of Intersection of Two Lines. Distance of A Point From A Line.	9

Text Books

1. 11th & 12th NCERT Mathematics books.
2. B. S. Grewal, Elementary engineering mathematics, Khanna publishers

References:

1. S. L. Loney, M. A., the elements of coordinate geometry, scholarly publishing office, university of Michigan library
2. S. L. Loney, M. A., plane trigonometry, scholarly publishing office, university of Michigan library

Year	I	Course Code: SEPBCAPI.6	Credits	2
Semester	I	Course Title: C Programming Lab	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 10	Summative Assessment Marks: 40		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Get familiar with working in Linux environment using basic shell commands such as ls, cd, mv, mkdir, rm, cat, etc. ○ Write algorithms and design flowcharts to solve problems ○ Use vi/gedit/any terminal editor for writing C programs ○ Use Linux-Open Source OS for debugging and executing C programs using gcc/similar compiler available with Linux. 			

Lab Assignments (To be implemented using C Programming Language)

Part A

1. Write a program to read radius of a circle and to find and display area and circumference
2. Write a program to read Principal amount, Time and Rate and calculate Simple Interest.
3. Program to read three numbers and display the largest of the three.
4. Write a program to function as a basic calculator; it should ask the user to input what type of arithmetic operation he would like, and then ask for the numbers on which the operation should be performed. The calculator should then give the output of the operation. Use switch. Error message should be reported, if any attempt is made to divide by zero.
5. Write a program to find the roots of quadratic equation (Demonstration of else-if ladder)
6. Write a program to read marks scored by a student in n subjects and find and display the average of all marks
7. Write a program to demonstrate basic mathematical library functions defined in math.h
8. Write a program to find HCF (GCD) of two numbers.
9. Write a program that accepts a number 'n', and prints all prime numbers between 1 to n.
10. Write a program to read a number, find the sum of its digits, reverse the number and check if it is a palindrome. Display appropriate message.
11. Write a program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers. Display appropriate error messages.
12. Write a program to read percentage of marks and to display appropriate message specifying class obtained. (demonstration of Switch Case statement)
13. Write a program to read and concatenate two strings without using library function
14. Write a program to print sum of even numbers and sum of odd numbers from array of integers which are to be inputed.
15. Write a program to read a list of numbers, print it, then remove duplicate elements from the list and print the modified list. Use single dimensional Array

Part B

1. Write a program to swap(interchange) two numbers without using a temporary variable
2. Write a program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters using character functions
3. Write a program to read a string, reverse it, concatenate the original string with its reverse, and print length of the original string and the concatenated string using built in functions
4. Write a program to read a string and find the length of a string without using built in function
5. Write a program to generate and display first n values in the Fibonacci sequence using recursive function

6. Write a recursive function calculate factorial of a given integer, n.
7. Write a program to read elements in a square matrix, display it in the form of a matrix and find and print its trace
8. Write a program to read two matrices and perform addition and subtraction on them
9. Write a program to read, display and multiply two m x n matrices using functions.
10. Write a program to check and display if a number is prime by defining isprime() function
11. Write a program using functions that takes in three arguments - a start temperature (in Celsius), an end temperature (in Celsius) and a step size. Print out a table that goes from the start temperature to the end temperature, in steps of the step size; converting each Celsius to Fahrenheit.
12. Write a C program to create array of structure which stores Roll No, Name and Average marks of students. Accept n students data and print it in proper format.
13. Write a C program to illustrate difference between structure and union by defining emp_no , emp_name, salary as members and display the size of the defined structure

Year	I	Course Code: SEPBCAP1.7	Credits	2
Semester	I	Course Title: Database management System Lab	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 10	Summative Assessment Marks: 40		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Creation and Manipulation of Database ○ Execute a single line query and group functions. ○ Execute DDL DML, DCL and TCL commands ○ Implement the Nested Queries and Join operations in SQL ○ Create views for a particular table 			

Lab Assignments(To be implemented in SQL)

Case Study 1: (Select clause, Arithmetic Operators)

Database: Employee

1. Create the following tables with suitable constraints and insert tuples.

Table: Employee

Emp_Id	First_Name	Last_Name	Hire_Date	Address	City
1001	Raghav	Patel	11-May-06	83 first street	Belagavi
1002	Mohini	Rathi	25-Feb-08	842 Vine Ave	Athani
1012	Sham	Pujari	12-Sep-05	33 Elm St.	Mysore
1015	Kriti	Dev	19-Dec-06	11 Red Road	Belagavi
1016	Sarath	Sharma	22-Aug-07	440 MG Road	New Delhi
1020	Monika	Gupta	07-Jun-08	9 Bandra	Mumbai

Table : EmpSalary

Emp_Id	Salary	Benefits	Designation
1001	10000	3000	Manager
1002	8000	1200	Salesman
1012	20000	5000	Director
1015	6500	1300	Clerk
1016	6000	1000	Clerk
1020	8000	1200	Salesman

Write queries for the following

1. Display FIRSTNAME, LASTNAME, ADDRESS, and CITY of all employees living in PARIS.
2. Display the content of the employee table in descending order of FIRSTNAME
3. Select the FIRSTNAME and SALARY of the salesman
4. To display the FIRSTNAME, LASTNAME, AND TOTAL SALARY of all employees from the table EMPLOYEE and EMPSALARY. Where TOTAL SALARY is calculated as SALARY+BENEFITS
5. List the Names of employees, who are more than 1 year old in the organization
6. Count the number of distinct DESIGNATION from EMPSALARY
7. List the employees whose names have exactly 6 characters

8. Add new column PHONE_NO to EMPLOYEE and update the records
9. List employee names, who have joined before 15-Jun-08 and after 16-Jun-07
10. Generate Salary slip with Name, Salary, Benefits, HRA-50%, DA-30%, PF-12%, Calculate gross. Order the result in descending order of the gross.

Case Study 2: (group by, having clause) Database: Bank system

Create the following table and insert tuples with suitable constraints

Table: Account

Account_No	Cust_Name	Branch_ID
AE0012856	Reena	SB002
AE1185698	Akhil	SB001
AE1203996	Daniel	SB004
AE1225889	Roy	SB002
AE8532166	Sowparnika	SB003
AE8552266	Anil	SB003
AE1003996	Saathwik	SB004
AE1100996	Swarna	SB002

Table: Branch

Branch_ID	Branch_Name	Branch_City
SB001	Malleswaram	Bangalore
SB002	MG Road	Bangalroe
SB003	MG Road	Mysore
SB004	Jainagar	Mysore

Table: Depositor

Account_No	Branch_Id	Balance
AE0012856	SB002	12000
AE1203996	SB004	58900
AE8532166	SB003	40000
AE1225889	SB002	150000

Table: Loan

Account_No	Branch_Id	Balance
AE1185698	SB001	102000
AE8552266	SB003	40000
AE1003996	SB004	15000
AE1100996	SB002	100000

1. Display the Total Number of accounts present in each branch.
2. Display the Total Loan amount in each branch.
3. Display the Total deposited amount in each branch by descending order.
4. Display max , min loan amount present in each city.
5. Display average amount deposited in each branch, each city.
6. Display maximum of loan amount in each branch where the balance is more than 25000.
7. Display Total Number of accounts present in each city.
8. Display all customer details in ascending order of branch_id.
9. Update Balance to 26000 where account_no=AE1003996.
10. Display Customer Names with their branch Name

Case Study 3: (Logical, Relational Operators)

Database: Library

Create Following tables and insert tuples with suitable constraints

Table: Books

Book_Id	Book_Name	Author_Name	Publishers	Price	Type	Quantity
C0001	The Kloner and I	Lata Kappor	EPP	355	Novel	5
F0001	The Tears	William Hopkins	First Publ	650	Fiction	20
T0001	My First C++	Brain & Brooke	ERP	350	Text	10
T0002	C++ Brainwork"s	A.W.Rossaine	TDH	350	Text	15
F0002	Thunderbolts	Ana Roberts	First Publ.	750	Fiction	50

Table: Issued

Book_Id	Quantity_Issued
T0001	4
C0001	5
F0001	2
T0002	5
F0002	8

Write queries for the following

1. To show Book name, Author name and price of books of First Publ. publisher
2. Display Book id, Book name and publisher of books having quantity more than 8 and price less than 500
3. Select Book id, book name, author name of books which is published by other than ERP publishers and price between 300 to 700
4. Generate a Bill with Book_id, Book_name, Publisher, Price, Quantity, 4% of VAT "Total"
5. Display book details with book id's C0001, F0001, T0002, F0002 (Hint: use IN operator)
6. Display Book list other than, type Novel and Fiction
7. Display book details with the author name starting with letter "A"
8. Display book details with the author name starting with letter "T" and ending with "S"
9. Select Book_Id, Book_Name, Author Name, Quantity Issued where Books.Books_Id = Issued.Book_Id
10. List the book_name, Author_name, Price. In ascending order of Book_name and then in descending order of price

Case Study 4

Database: Subject

Create Following **table** and insert **tuples** with suitable constraints

Table - Physics

Regno	Name	Year	Combination
AJ00325	Ashwin	First	PCM
AJ00225	Swaroop	Second	PMCs
AJ00385	Sarika	Third	PME
AJ00388	Rupa	First	PMCs

Table – Computer Science

Regno	Name	Year	Combination
AJ00225	Swaroop	Second	PMCs
AJ00296	Tejas	Second	BCA
AJ00112	Geeta	First	BCA
AJ00388	Rupa	First	PMCs

Write queries for the following

1. Select all students from Physics and Computer Science
2. Select students common in Physics and Computer Science
3. Display all student details those are studying in the second year
4. Display students who are studying both Physics and computer science in the second year

5. Display the students studying only physics
6. Display the students studying only Computer Science
7. Select all students having PMCs combination
8. Select all students having a BCA combination
9. Select all students studying in the Third year
10. Rename table Computer Science to CS

Year	I	Course Code: SEPBCAPI.8	Credits	2
Semester	I	Course Title: Office Automation Lab	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 10	Summative Assessment Marks: 40		Duration of ESA: 03 hrs.	
Course Outcomes	At the end of the course, the students should be able to: <ul style="list-style-type: none"> Gain Knowledge about Word processor, Spreadsheets and Presentation 			

Assignments (To be Implemented using any Open Source Software)

Part A

- Word Processor assignment to demonstrate usage of Page Setup, Page Background and Paragraph option of Page Layout tab by writing the description about Computer and its characteristics.
- Word Processor assignment to demonstrate Bullets and Numbering, Headers and footers.
- Word Processor assignment to demonstrate usage of tables and encryption by preparing the time table.
- Word Processor assignment to design a pamphlet for the advertisement of your college features by making use of Picture ,ClipArt , Shapes and WordArt options.
- Word Processor assignment to demonstrate usage of mail merge by creating a letter to invite your parents for the annual day event. Prepare at least 5 letters.
- Create a power-point presentation with minimum 5 slides and demonstrate the following.
 - Layout option
 - Insertion of date, time and slide numbers
 - Insertion of Symbols
- Create a power-point presentation with minimum 5 slides and demonstrate the following.
 - Themes
 - Transitions
 - Animation
- Create a power-point presentation with minimum 5 slides and demonstrate the following.
 - Rehearse Timings
 - Narrations
 - Slide Sorter

Part B

- Spread sheet assignment to create a pay slip to generate salary of employee with the following details.

EMP NO	BASIC	DA	HRA	GROSS	PF	Net Salary
--------	-------	----	-----	-------	----	------------

- Spread sheet Assignment to create SSLC results of 10 students and demonstrate charts. Use the following details SNO, NAME, KAN, HIND, ENG, MAT, SCI, SOC, TOTAL, AVG, MIN, MAX, RESULT, and GRADE.
- Spread sheet assignment to generate bill and to demonstrate various statistical functions with the following details GRAIN ITEM, UNITS (KG), PRICE, AMOUNT, GRADE.

4. Demonstrate the following in Spread sheet as directed
 - a. Create a notepad file as per the following fields:
Sl.no. name Sub1 Sub2 Sub3 Sub4 Sub5 total % grade
 - b. Import this notepad file into Spread sheet using „data from text option.
 - c. Calculate total marks obtained and percentage.
 - d. Grade is calculated as,
 - i. If %>=90, then grade A
 - ii. If %>=80 and <90, then grade B
 - iii. If %>=70 and <80, then grade C
 - iv. If %>=60 and <70, then grade D
 - v. If %<60, then grade F

5. Demonstrate various levels of Sorting and Filtering methods of Data by using the following details.
Slno ItemName Rate Quantity Amount Discount (10%) Final Amount

6. Demonstrate conditional formatting in spread sheet as directed by referring the below example.
 - a. Create an attendance spread sheet for minimum 10 students.
 - b. Mark P for present and A for absent for respective dates.
 - c. Apply formula to calculate “No. of classes attended” and “Attendance Percentage” of every student.
 - d. Apply conditional formatting to highlight a student if “Attendance Percentage” is less than 75%.

USN	Name	Date 1	Date 2	-	Date N	No. of Classes Attended	Attendance Percentage
123	XYZ	P	A	P	P	3	75%
456	ABC	P	A	A	P	2	50%

7. Demonstrate Data validation in the spread sheet as directed and calculate Net Salary.

a) Create 10 records with following fields.

Emp No	Emp Name	Gender	Designation	DOB	Age	Mobile No	PAN NO	Experience	Basic Salary	Bonus	Deduction	Net Salary
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- b) Create drop down for Designation column with the values: Manager, Supervisor, Senior Manager.
- c) Validate length of Mobile NO and PAN NO.
- d) Validate positive values for Experience and Basic Salary.
- e) Calculate Age based on DOB.
- d) Calculate Bonus as per the following conditions:
 - i. If Experience >=10 years , then Bonus is 10000
 - ii. If Experience >=7 years , and < 10 years then Bonus is 7000
 - iii. If Experience >=4 years, and < 7 years then Bonus is 5000
 - iv. If Experience >=1 years and <4 years then Bonus is 2500
- e) Calculate 5% Deduction on Basic Salary.

SEMESTER II

Year	I	Course Code: SEPBCAT2.3	Credits	3
Semester	II	Course Title: Data Structures and Algorithms	Hours	48
Course Pre-requisite, if any	Knowledge of C Programming			
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ○ Design the algorithm to analyse the problem ○ Differentiate between iteration and recursion and apply recursive definition for problem solving ○ Apply various types of searching and sorting techniques on arrays ○ Evaluate the applications of stacks, queues, linked lists and tree 			

Unit No	Course Content	Hours
Unit-1	<p>Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures.</p> <p>Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers</p> <p>Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - malloc, calloc, realloc and free.</p>	10
Unit-2	<p>Recursion: Definition, Types of recursions, Recursion Technique Examples - GCD, Binomial coefficient nCr, Towers of Hanoi. Comparison between iterative and recursive functions.</p> <p>File Management in C: Defining, declaring a file, Opening & Closing File, Input & Output Operations on Files, File error handling functions.</p>	10
Unit-3	<p>Sorting and Searching: Representation of linear arrays in memory, Traversing linear arrays; Inserting and deleting elements;</p> <p>Sorting: Selection sort, Bubble sort, Quick sort, Merge sort, Insertion sort</p> <p>Searching: Sequential Search, Binary search; Iterative and Recursive searching.</p>	10
Unit-4	<p>Stacks: Definition and Representation of stacks; Operations on stacks – Push, Pop; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls.</p> <p>Queues: Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues.</p>	9
Unit-5	<p>Linked list: Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly linked list, Circular linked list Doubly Circular Linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion;</p>	9

	Trees: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree. Traversal of binary tree; preorder, in order and post order traversal.	
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Text Books:

1. Ellis Horowitz and SartajSahni: Fundamentals of Data Structures
2. Tanenbaum: Data structures using C (Pearson Education)

References:

1. Y. Kanitkar: Data Structures Using C(BPB)
2. Kottur: Data Structure Using C
3. Padma Reddy: Data Structure Using C

Year	I	Course Code: SEPBCAT2.4	Credits	3
Semester	II	Course Title: Numerical and Statistical Methods	Hours	48
Course Pre-requisite, if any				
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03 hrs.	
Course Outcomes		<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ○ Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton – Raphson and fixed-point iteration methods. ○ Solve system of linear equations numerically using direct and iterative methods ○ Develop a framework for estimating and predicting the different sample of data for handling the uncertainties. ○ Understand the various approaches dealing the data using theory of probability 		

Unit No	Course Content	Hours
Unit-1	Introduction and solutions of algebraic and transcendent equations, methods of finding solution of non- linear equations- Bisection method, False Position method, Secant method, Fixed point iteration method and Newton-Raphson method. General discussion on convergence of these methods (No Mathematical derivations)	10
Unit-2	Introduction and methods of solving of solving system of linear equations - Gauss elimination method, Gauss- Jordan, LU Decomposition method and Gauss-Seidal iteration method, Eigen values and Eigen vectors of a square matrix.	10
Unit-3	Origin and development, Definition, Importance and scope of business Statistics, Meaning and definition of data, Methods of data collection. Types of data proportions, ratios and rates; building, cleaning and administering databases in SPSS. Significance of diagrams and graphs, Types of diagrams – one dimensional or Bar Diagrams, Two dimensional or area diagrams, pictograms and cartograms. Graphs of frequency distribution-Histogram, frequency polygon, Frequency curve, gives or cumulative frequency curves.	10
Unit-4	Definition of averages, objectives of averages, requisites of ideal averages. Types of averages- A mean, median, Mode, Harmonic mean, Geometric Mean – Definition computation, merits and demerits, Application in Business. Definition and properties of Ideal Measure of dispersion, Absolute and Relative Measures of dispersion- Range and co-efficient of range, Quartile and co-efficient of Q.D., Average Deviation(AD) and co-efficient of A.D., Standard Deviation and co-efficient of S.D. and co-efficient of variation.	9
Unit-5	Properties of Probability, Equally likely event, mutually exclusive, Independent and Conditional Probability. Types of Probability Distributions - Bernoulli, Binomial, Poisson, fitting a Binomial and Poisson distribution, Normal distribution and problems.	9

Text Books:

1. S.S.Sastri, Introductory Methods of Numerical Analysis, PHI(NewDelhi)2001.
2. Balaguruswamy E, (1988), Computer Oriented Statistical and Numerical Method, Macmillan India Ltd.
3. Medhi J.1992,Statistical Methods (An Introductory Text),New Age International.
4. Business Statistics by-J K Sharma, Pearson Publication.

References:

1. M.K.Jain, S.R.K.Iyenger and R.K.Jain, Numerical Method for Scientific and Engineering Computation, Wiley Eastern (1998).
2. V.RajaRaman Computer oriented numerical methods, PHI Publication
3. Gupta S.C. and Kapoor V.K. 2005 Fundamentals of Mathematical Statistics, S.Chand and Sons, New Delhi.
4. Gupta S.C. and Kapoor V.K.2005 Fundamentals of Applied Statistics, S.Chand and Sons, New Delhi.

Year	I	Course Code: SEPBCAT2.5	Credits	3
Semester	II	Course Title: OOPS Using Java	Hours	48
Course Pre-requisite, if any				
Formative Assessment Marks: 20	Summative Assessment Marks: 80		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ○ Understand the features of Java and different tools available in Java Environment. ○ Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done. ○ Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance ○ Demonstrate programs based on arrays and strings. ○ Demonstrate programs based on interfaces and threads. ○ Explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Languages. 			

Unit No	Course Content	Hours
Unit-1	Concept - Object, classes, abstraction, encapsulation, inheritance, polymorphism .History of Java, features of Java, Java Environment - JDK, API, Java Runtime environment, JVM, Java program structure, Identifiers and Keywords, Data types and typecasting, Variables, operators, Java coding conventions, Expressions, Control structures, Decision making statements, Arrays and its methods, command line arguments.	10
Unit-2	Java classes, Define class with instance variables and methods, Object creation, Accessing member of class, argument passing, Constructors, Method overloading, constructor overloading, Static data, Static methods, Static blocks, This keyword, Garbage collection & finalize() method, Arrays.	10
Unit-3	String –String Class, String Buffer Class, Inheritance: super class & subclass, types of inheritance, super keyword, method overriding, abstract method and classes, final keyword, dynamic method dispatch.	9
Unit-4	Interfaces: Defining interfaces, Implementing interfaces, accessing interface variables; Packages: Java API Packages, Using System Packages, Creating packages, Accessing a package, Importing classes Modifiers & access control (Default, public, private and protected) Exception handling: Types of Exceptions, try, catch, finally, throw, throws keywords, creating your own exception, multiple catch statements.	10
Unit-5	Java Input Output: Java IO package, File Class, Byte/Character Stream, Buffered reader / writer, File reader / writer; Multithreading: Multithreading concept, Java thread model, Main thread, Creating a thread, Creating multiple threads, thread priorities.	9

Year	I	Course Code: SEPBCAP2.6	Credits	2
Semester	II	Course Title: Data Structures Lab	Hours	48
Course Pre-requisite, if any				
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03 hrs.	
Course Outcomes		<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ○ Design the algorithm to analyse the problem ○ Differentiate between iteration and recursion and apply recursive definition for problem solving ○ Apply various types of searching and sorting techniques on arrays ○ Evaluate the applications of stacks, queues, linked lists and tree 		

Lab Assignments	
Part A:	
<ol style="list-style-type: none"> 1. Program to implement dynamic array, find smallest and largest element of the array. 2. Program to find GCD using recursive function 3. Program to generate binomial coefficient using recursive function. 4. Program to generate n Fibonacci numbers using recursive function. 5. Program to implement Towers of Hanoi using recursion. 6. Write a program that takes a file as an argument and counts the total number of lines. Lines are defined as ending with a newline character. 7. Program to search an element using linear search technique. 8. Program to search an element using binary search technique. 9. Program to create a text file and count the characters present in it. 10. Program to copy the contents of one text file to another text file. 	
Part B:	
<ol style="list-style-type: none"> 1. Program to sort the given list using selection sort technique. 2. Program to sort the given list using bubble sort technique. 3. Program to sort the given list using insertion sort technique. 4. Program to sort the given list using quick sort technique. 5. Program to sort the given list using merge sort technique. 6. Program to implement Stack. 7. Program to convert an infix expression to postfix. 8. Program to implement simple queue. 9. Program to implement linear linked list. 10. Program to implement a binary tree and traverse in pre-order 	

Year	I	Course Code: SEPBCAP2.7	Credits	2
Semester	II	Course Title: Numerical and Statistical Methods Lab	Hours	48
Course Pre-requisite, if any	NA			
Formative Assessment Marks: 10	Summative Assessment Marks: 40		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ○ Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton – Raphson and fixed-point iteration methods. ○ Solve system of linear equations numerically using direct and iterative methods ○ Develop a framework for estimating and predicting the different sample of data for handling the uncertainties. ○ Understand the various approaches dealing the data using theory of probability 			

Lab Assignments

(Part A must be implemented using C Language and Part B using SPSS)

Part A

1. Write a program to check whether the given matrix is singular or not.
2. Write a program to find roots of an equation $f(x)=0$ using Bisection method.
3. Write a program to find roots of an equation $f(x)=0$ using Regula-Falsi method.
4. Write a program to find roots of an equation $f(x)=0$ using Newton-Raphson method.
5. Write a program to solve the system equation $Ax=b$ using Gauss Elimination method.
6. Write a program to solve the system of equation $Ax=b$ using Gauss Seidel method.

Part B:

1. Open a new dataset in SPSS
 - Create a nominal variable called `cat_dog` that has a width of 3 with 0 decimal places. The label should be "Do you like cats or dogs better?" The values should be 1 for cats and 2 for dogs (or vice-versa). Do not worry about missing data codes.
 - Create a scale variable called `neatness` that has a width of 8 with 3 decimal places. The label should be "Eric Cartman's Neatness Scale(higher=neater)". There will be no value labels.
 - Enter data for the following cases
 - Case 1 prefers cats and has a neatness of 4
 - Case 2 prefers dogs and has a neatness of 3
 - Case 3 prefers dogs and has a neatness of 7
 - Case 4 prefers dogs and has a neatness of 2
 - Case 5 prefers cats and has a neatness of 5
 - Case 6 prefers cats and has a neatness of 1
 - Case 7 prefers cats and has a neatness of 3
 - Case 8 prefers dogs and has a neatness of 6
 - Change the neatness of the second case from 3 to 6, like you would if you discovered a data entry error.

2. Create a dataset in SPSS for the following data:

Group	Gender	Hw1	Hw2	Hw3
expt	Male	92	84	93
expt	Female	77	84	85
expt	Male	87	86	81
expt	Female	89	90	93
expt	Male	64	73	78
control	Female	81	84	93
control	Male	83	90	91
control	Female	84	88	86
control	Male	82	80	78
control	Female	96	91	88

- Using the Frequencies option, find the mean, median, mode, quartiles, 95th percentile, variance, standard deviation, minimum, and maximum of Hw1, Hw2, and Hw3.
- Using the Descriptive option, find the means and standard deviations of Hw1, Hw2 and Hw3.
- Using the Compare Means - Means procedure, find the mean son Hw1, Hw2 and Hw3 for everyone for the experimental group, for the control group, for men, for women, and for all combinations of gender and group.

3. A researcher has created a data table showing the anthropometrical measurements of tribal subjects under each of the four social categories, namely GM, OBC, SC and ST as shown in table.

GM			
Gender	HT	WT	Biceps
1	137.8	30.5	5.50
2	130.2	29.5	5.65
2	135.6	29.0	5.15
2	137.8	30.0	5.25
1	131.5	30.5	4.95
1	132.8	31.5	5.65
1	139.8	30.5	5.50
1	136.7	30.0	5.65
1	138.6	30.5	5.15
1	139.5	30.5	5.25

SC			
Gender	HT	WT	Biceps
2	132.4	25.0	4.37
1	133.5	24.5	4.95
1	130.6	25.5	4.65
1	132.5	26.5	4.45
1	130.6	26.0	6.48
2	132.4	25.5	5.01
1	130.5	25.0	4.37
1	132.4	24.5	4.95
2	133.5	25.5	4.65
2	130.6	26.5	4.45

OBC			
Gender	HT	WT	Biceps
1	124.4	23.5	4.61
2	125.5	23.0	4.52
1	126.3	24.0	4.45
2	128.0	23.5	4.39
1	129.0	25.0	4.37
2	130.0	22.0	4.69
1	129.5	23.5	4.61
1	130.0	23.0	4.52
2	126.0	24.0	4.45
2	128.5	23.5	4.39

ST			
Gender	HT	WT	Biceps
1	124.5	20.5	3.54
1	125.8	21.0	3.55
1	123.5	20.5	3.95
1	124.8	22.0	4.05
1	122.5	21.5	3.55
1	122.8	22.0	3.54
1	122.5	22.5	3.55
1	121.5	21.5	3.95
1	124.5	20.5	4.05
2	125.8	21.0	3.55

- Create a data file in SPSS (The Data in SPSS has to be entered with category1=GM,2=OBC,3=SC and 4=ST. The codes for Gender are 1=Male and 2=

Female).

- Generate central tendency and measures of dispersion output using the descriptives command in SPSS for the variables Height, Weight and Biceps.
- Generate two-way cross table Gender versus Category.

4. The marks obtained by 50 students of a class in mathematics are given below.

32,42,41,51,41,30,39,18,48,53,54,32,31,46,15,37,32,56,42,48,38,26,50,40,38,42,35,22,62,51,44,21,45,31,37,41,44,18,37,47,38,41,30,52,52,60,42,38,38,34.

- Create a data file in SPSS.
- Generate a frequency table.
- Draw the Histogram.
- Generate central tendency output using the frequencies command in SPSS.
- Generate central tendency output using the descriptives command in SPSS.
- Generate central tendency output using the explore command in SPSS.

5. The number of blood donations in the years 1995 and 2000 in various blood groups are as follows

Year	O	A	B	AB
1995	1154	526	775	155
2000	700	1125	1280	560

Create a data file in SPSS and hence represent the data by multiple bar diagram.

6. Fitting the Binomial & Poisson probability distribution for the following data using SPSS

X	0	1	2	3
F	36	40	22	2

Year	I	Course Code: SEPBCAP2.8	Credits	2
Semester	II	Course Title: Object Oriented Programming using Java - Lab	Hours	48
Course Pre-requisite, if any	Programming Language concepts			
Formative Assessment Marks: 10	Summative Assessment Marks: 40		Duration of ESA: 03 hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> ○ Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done. ○ Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance ○ Demonstrate programs based on arrays and strings. ○ Demonstrate programs based on interfaces and threads, exception handling. 			

Lab Assignments(to be implemented using Netbeans/eclipse or any other Open Source IDE)
<p>Part A:</p> <ol style="list-style-type: none"> 1. Program to demonstrate relational operators in Java. 2. Program to display largest of 3 numbers by assigning values to variables. 3. Write a Java program to calculate area and circumference of circle. Accept radius using command line arguments. 4. Program to perform arithmetic operations using switch case statement. 5. Program to display factorial of numbers from 1 to 10. 6. Program to sort numbers stored in an array. 7. Program to define a class Rectangle with data members length, breadth and member functions to calculate area and perimeter. 8. Program to demonstrate constructor overloading concept. 9. Program to demonstrate method overloading. 10. Program to demonstrate static variables and methods. <p>Part B:</p> <ol style="list-style-type: none"> 1. Program to demonstrate single inheritance. 2. Write a Java Program to implement inheritance and demonstrate use of method overriding. 3. Program to demonstrate multilevel inheritance. Show the usage of super(). 4. Write a program to demonstrate use of user defined package by importing the package and access the members of classes contained in the package. 5. Write a java program to demonstrate at least 5 methods of String class. 6. Write a java program to demonstrate the methods of StringBuffer class. 7. Write a program to demonstrate use of implementing interfaces. 8. Write a java program to implement exception handling using multiple catch statements. Also include code to identify the significance of finally block in handling exceptions. 9. Illustrate creation of thread by extending Thread class. 10. Illustrate creation of thread by implementing Runnable interface.

Scheme of Evaluation
Semester End Exam Question Paper Pattern

Duration of the examination: 3hour

Max. Marks: 80

Section A

Answer any TEN Questions from the following, each carries 2 marks:

[10X2=20]

1. -----
2. -----
3. -----
4. -----
5. -----
6. -----
7. -----
8. -----
9. -----
10. -----
11. -----
12. -----

Section B

Answer any FOUR from the following questions each carries 5 marks.

[4X5=20]

13. -----
14. -----
15. -----
16. -----
17. -----

Section C

Answer any FOUR from the following questions each carries 10 marks.
(The Question may consists two sub-questions)

[4X10=40]

18. -----
19. -----
20. -----
21. -----
22. -----

CIA for Practical	
Assessment Type	Marks
Test1	10
Total	10 Marks

Semester End Examination Scheme of Evaluation for Lab Examination

Assessment Criteria	Marks
Writing of 2 Programs (Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva Voice	05
Total	40 Marks

Instructions:

1. Certified Journal is mandatory for appearing in the Lab examination.
2. Students shall be given two programming assignments taking into consideration the duration of the time allotted to students for writing, typing and executing the programs.

CIA for Theory	
Assessment Type	Marks
Test 1 / Seminar / Activity	10
Test 2 / Seminar / Activity	10
Total	20 Marks

Note: Guidelines given by the university from time-to-time shall be followed for IA.



RANI CHANNAMMA UNIVERSITY

BELAGAVI

THE COURSE STRUCTURE AND SYLLABUS OF UNDERGRADUATE

B.C.A PROGRAMME

w.e.f.

Academic Year 2024-25 and Onwards Under

State Education Policy (SEP)

Submitted by
Prof. Shivanand Gornale
Chairman,
Board of Studies (UG),
Computer Science,
Rani Channamma University, Belagavi.

III Semester BCA w.e.f 2025-26 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks		Total	
						IA	Theory/ Practical		
Part I AECC	SEPBCAAECT 3.1	Language 1	4	-	3	20	80	100	3
	SEPBCAAECT 3.2	Language 2	4	-	3	20	80	100	3
Part II DSC	SEPBCADSCT3.3	Python Programming	4	-	3	20	80	100	3
	SEPBCADSCT 3.4	Advanced Java programming	4	-	3	20	80	100	3
	SEPBCADSCT 3.5	Operating System	4	-	3	20	80	100	3
	SEPBCADSCP 3.6	Python Programming - Lab	-	4	3	10	40	50	2
	SEPBCADSCP 3.7	Advanced Java Programming - Lab	-	4	3	10	40	50	2
	SEPBCADSCP 3.8	Operating System - Lab	-	4	3	10	40	50	2
Part III SEC	SEPBCASECT 3.9#	Compulsory (C)	2	-	2	10	40	50	2
Part IV Elective	SEPBCASECT 3.10* (Elective-I)	Open Source Tools(OST)	2	-	2	10	40	50	2
		Internet Of Things(IOT)							
Total			22	12				700	25

AECC : Ability Enhancement Compulsory Courses, DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses, C- Compulsory Course

Note :

1. For the SEPBCASECT 3.9 the semester-end examination will consist of multiple-choice questions.
2. For the SEPBCASECT 3.10 Elective subject, the semester-end examination will consist of multiple-choice questions. Two electives are offered, and students are required to choose only one. The college must ensure that a minimum of 20 students are enrolled in each elective.

Prof. Shivanand Gornale
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Prof. Basavaraj Padmasali
Dean,
Faculty of Science & Technology
RCUB, Belagavi

IV Semester BCA w.e.f 2025-26 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks		Total	
						IA	Theory/ Practical		
Part I AECC	SEPBCAAECT 4.1	Language 1	4	-	3	20	80	100	3
	SEPBCAAECT 4.2	Language 2	4	-	3	20	80	100	3
Part II DSC	SEPBCADSCT 4.3	Design & Analysis of Algorithms	4	-	3	20	80	100	3
	SEPBCADSCT 4.4	Web Programming	4	-	3	20	80	100	3
	SEPBCADSCT 4.5	Computer Networks	4	-	3	20	80	100	3
	SEPBCADSCP 4.6	Design & Analysis of Algorithms - Lab	-	4	3	10	40	50	2
	SEPBCADSCP 4.7	Web Programming – Lab	-	4	3	10	40	50	2
	SEPBCADSCP 4.8	Computer Networks – Lab	-	4	3	10	40	50	2
Part III SEC (Skill)	SEPBCASECT 4.9	Practical Knowledge/Skill : User Interface And User Experience (UI/UX)	2	-	2	10	40	50	2
Part IV Elective	SEPBCASECT 4.10* (Elective-II)	Personality Development	2	-	2	10	40	50	2
		Employability Skills							
Total			24	12				750	25

AECC : Ability Enhancement Compulsory Courses, DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses

Note : *

- For the SEPBCASECT 4.9 the semester-end examination will consist of multiple-choice questions.
- For the SEPBCASECT 4.10 Elective subject, the semester-end examination will consist of multiple-choice questions. Two electives are offered, and students are required to choose only one. The college must ensure that a minimum of 20 students are enrolled in each elective.

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RCUB, Belagavi

Year	II	Course Code: SEPBCADSCT 3.3	Credits	03
Semester	III	Course Title: Python Programming (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After completing this course satisfactorily, a student will be able to:</p> <ul style="list-style-type: none"> • Setup Python to develop simple applications • Understand the basic concepts in Python Programming, Learn how to write, debug and execute Python programs. • Understand and demonstrate the use of advanced data types such as tuples, dictionaries and lists, Tuples and Sets. • Design solutions for problems using object-oriented concepts in Python • Use and apply the different Python Libraries for GUI Interface, Data Analysis and Data Visualization. • Extend the knowledge of python programming to build successful career in software development. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Python: Working with python, Variables, expressions, and statements, accepting user input. Conditional execution. Nested conditionals, Iteration, Function Basics Built-in Functions. Recursion, Scope Global, Local variables. Modules: Creating and importing modules importing all or specific classes from module.			10
UNIT II	Functions : Declaring and calling User defined functions, Parameters and default arguments. Lambda-- functions as objects, map() function, Strings, indexing. Slicing. Lists, Dictionaries and Tuples. Files: Opening the file-modes: read, write, append. Reading from and writing to a file, closing, deleting a file.			10
UNIT III	Exceptions : Exceptions in Python, Handling Exceptions: try block, except block, else block, finally block. Raising an exception, User defined exception. Object-Oriented Programming : Classes defining classes with init() and methods. creating objects, class variables and instance variables, Inheritance super() function.			09
UNIT IV	Regular Expressions : Concept of regular expression, meta characters, using match() function, search() , findall() , sub() and split() functions. GUI Programming in Python (using Tkinter): Introduction to GUI library. Layout management with pack , grid and place . Widgets with their attributes: Frame , Label , Button , Checkbutton , Radiobutton . Entry . Listbox . Text . Events and bindings. Drawing on canvas (line, oval, rectangle. arc.).			11
UNIT V	Database connectivity in Python : Installing mysql connector. Accessing connector module. Using connect , cursor . execute & close functions, Executing different types of SQL statements. Executing transactions. Network Programming .			08

Recommended Learning Resources

Text Books:

1. Introduction to Computing and Problem Solving Using Python, E Balaguruswamy, McGrawHill, First Edition
2. Advance Core Python Programming, Meenu Kohli, 2021, BPB Publications

Reference Books:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, 2015, Green Tea Press. Freely available online @ <https://www.greenteapress.com/thinkpython/thinkCSPy.pdf>
2. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python
3. Programming Language, Fabio Nelli, 2015, Apress®
4. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, 2012, Prentice Hall
5. Automate the Boring Stuff, Al Sweigart, 2015, No Starch Press, Inc.
6. Data Structures and Program Design Using Python, D Malhotra et al., 2021, Mercury Learning and Information LLC
7. <http://www.ibiblio.org/g2swap/byteofpython/read/>
8. <https://docs.python.org/3/tutorial/index.html>

Year	II	Course Code: SEPBCADSCT 3.4	Credits	03
Semester	III	Course Title: Advanced Java programming (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <ul style="list-style-type: none"> • Develop GUI-based desktop applications using Swing • Understand event handling in Java. • Create dynamic web pages using JSP. • Implement JDBC for database operations. • Build network-based applications using Sockets 			
Unit No.	Course Content			Hours
UNIT I	Event Handling: Event, Event Source, Event Classes, Event Listener interface, Examples, Handling Windows Events, Adapter Classes, Inner classes.			08
UNIT II	Swing: Introduction to JFC (Java Foundation Classes), Swing, Swing Features, JComponent, JApplet, JFrame, JPanel, JTextField, JButtons, JCheckBox and JRadioButton, JComboBox, JScrollPane, JList.			10
UNIT III	JDBC Architecture: Introduction to JDBC, Java and JDBC, JDBC VS ODBC, JDBC DRIVER MODEL, JDBC Driver Types, Types of Driver Managers, JDBC Connection process, Statement object, preparedStatement object, operations on Resultset (Read, insert, update and delete), transaction processing, Metadata, Resultset Metadata, Data types.			12
UNIT IV	Introduction to JSP and Its Lifecycle, JSP Directives: page, include, taglib, JSP Scripting Elements: Declarations, Scriptlets, Expressions, JSP Implicit Objects: request, response, session, application, out, config, JSP Standard Actions: jsp:include , jsp:forward , jsp:useBean , JSP with JDBC for Database Connectivity. Introduction to Java Beans			10
UNIT V	Networking Basics, InetAddress, TCP/IP Client-Server Socket, URL Connection, HTTPURL Connection, Datagram, Introduction To EJB, Types of EJB.			08
Recommended Learning Resources				
Text Books:				
<ol style="list-style-type: none"> 1. Jim Keogh, J2EE: The complete Reference, McGrawHill 2. Herbert Schildt, The Java 2 : Complete Reference, Fourth edition, TMH 3. https://docs.oracle.com/javase/tutorial/ 				

Reference Books:

1. H. M. Deitel, P. J. Deitel, Java: how to program, 5th edition, Prentice Hall ofIndia.
2. Y. Daniel Liang, Introduction to Java programming, 9thEdition, Pearson education.
3. Cay S Horstmann, Fary Cornell, Core Java 2, Volume – I&II, Sun MicrosystemsPress

Year	II	Course Code: SEPBCADSCT 3.5	Credits	03
Semester	III	Course Title: Operating System (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Explain the fundamentals of the operating system. • Comprehend multithreaded programming, process management, process synchronization, memory management and storage management. • Compare the performance of Scheduling Algorithms • Identify the features of I/O and File handling methods. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Operating Systems: Basics of operating system - Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; OS Services; System Calls, Types of system call; Operating System Structure.			08
UNIT II	Process Management: Process Concept - Process Definition, Process State, Process Control Block, Context Switching; Inter process communication (IPC) - Definition, IPC Models - Shared memory and Message passing; Thread - Definition, Advantages, Types of threads, Multithreading Models. CPU Scheduling criteria, CPU Scheduling Algorithms (FCFS, SJF, Priority, RR).			10
UNIT III	Process Synchronization: Introduction, Race Conditions, Critical Section Problem and Peterson's Solution; Semaphores, The Producer Consumer Problem; Dining Philosophers Problem. Deadlocks: Definition, System Model; Deadlocks Characterization, Resource Allocation graph; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance, Bankers Algorithm with problem; Deadlock Detection; and Recovery from Deadlock.			10
UNIT IV	Memory Management: Logical and Physical Address Space; Swapping; Contiguous Memory Allocation, Fragmentation - Internal, External and compaction; Paging; Segmentation; Segmentation with Paging. Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms (FIFO, LRU, and Optimal)			10
UNIT V	I/O Management: I/O Devices and I/O Functions, Disk Structure, Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK) File Management: File Concepts - Attributes, Operations and Types of Files; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management			10

Recommended Learning Resources

Text Books:

1. Operating System Concepts, Silberschatz' et al., 10th Edition, Wiley, 2018.
2. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.

Reference Books:

1. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
2. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
3. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
4. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

Year	II	Course Code: SEPBCADSCP 3.6		Credits	02
Semester	III	Course Title: Python Programming - Lab			
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40		Duration of ESA: 03hrs.	
<p>Practice Programs:</p> <ol style="list-style-type: none"> 1. Python program to solve the Fibonacci sequence using recursion. 2. Python function to check whether a number is perfect or not. 3. Python program to converting an Integer to a String in any base. 4. Python program that uses List Comprehension to perform any 3 of the following tasks. <ol style="list-style-type: none"> a. Create an output list which contains only the even numbers from the input list. b. Create an output list which contains squares of all the numbers from 1 to 9. c. Create an output list which extracts all the numbers from an input string. 5. Python program to count the number of lines in a text file. 6. Python program to copy the contents of a file to another file. 7. Python GUI program to draw various shapes on Canvas. 					
Part A					
<ol style="list-style-type: none"> 1. Python function to calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument. 2. Python function that takes a list and returns a new list with unique elements of the first list. 3. Python program of recursion list sum. 4. Python program to get the sum of digits of a non-negative integer. 5. Python program to demonstrate any 5 string and List operations. 6. Create an output tuple that converts the words to uppercase from the input tuple of words. 7. Python program to demonstrate any 5 operations performed on dictionary. 8. Python program to create a module Calculation.py that contains functions to perform basic arithmetic operations. Demonstrate importing the module. 					
Part B					
<ol style="list-style-type: none"> 1. Python program to demonstrate modification of an existing table data from MySQL database. 2. Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle. 3. Python class named Rectangle constructed by a length and width and a method which will compute the area and perimeter of rectangle. Inherit a class Box that contains additional method volume. Override the perimeter method to compute perimeter of a Box. 4. Python program to show use of Regular expressions with match(), search(), findall(), sub() and split(). 5. python program to demonstrate Exception handling using 'try', 'except', 'finally' and 'else block. 6. Python program to read a file line by line store it into an array. 7. Python GUI program to design Student Registration Form using any 5 widgets. 					

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCADSCP 3.7		Credits	02
Semester	III	Course Title: Advanced Java Programming - Lab			
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40		Duration of ESA: 03hrs.	
Practice Programs: <ol style="list-style-type: none"> 1. Design GUI-based applications using Swing components 2. Demonstrate database connectivity (JDBC) for performing operations on relational databases. 3. Apply JSP and JavaBeans to build dynamic web applications 4. Implement client-server communication using TCP/IP sockets in Java networking applications. 5. Write a JSP program to display date and time. 					
Part A					
<ol style="list-style-type: none"> 1. Java program to implement mouse events like mouse pressed, mouse released and mouse moved by means of adapter classes. 2. Java program to implement keyboard events. 3. Java program to illustrate basic calculator using grid layout manager. 4. Design a ice-cream menu form that displays 4 flavors. Display the flavors selected by the user. 5. Java program to demonstrate the use of JRadioButton. 6. Java program to demonstrate the use of JCheckbox. 7. Java program that loads names and phone numbers from a database file. It takes a name as input and prints the phone number. 8. Java program that connects to a database using JDBC. Demonstrate insertion and modification of table data. 					
Part B					
<ol style="list-style-type: none"> 1. JSP program to create a sample order form containing the fields Item, Price, Quantity, Total Price. 2. JSP program to create a login system that maintains user session data. 3. JSP program to create Currency Converter application. (Allow users to select currencies for conversion using options) 4. JSP program for Email validation by accessing e-mail information from database. 5. JSP program to create Admission form. Store admission details in database. 6. JSP program to create Registration Form. Store and display details using Java Beans. 7. Java program to establish client server communication using TCP/IP socket. 8. Java Program to find the IP address of a given website specified by the user.. 					

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCADSCP 3.8	Credits	02
Semester	III	Course Title: Operating System - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

1. C program to simulate OPR page replacement algorithm.
2. C program to simulate SCAN disk scheduling algorithm.
3. Shell Script to find the factorial of a given number.
4. Shell Script to display date, time, user details, contents of the current directory and the rights of the files in current directory.

Part A (Using C Programming)

1. C program to simulate producer-consumer using semaphores.
2. C program to simulate FCFS CPU Scheduling algorithm to find turnaround time & waiting time.
3. C program to simulate SJF CPU Scheduling algorithm to find turnaround time & waiting time.
4. C program to simulate Priority CPU Scheduling algorithm to find turnaround time & waiting time.
5. C program to simulate RR CPU Scheduling algorithm to find turnaround time & waiting time.
6. C program to simulate Bankers Algorithm for Deadlock Avoidance.
7. C program to simulate FIFO page replacement algorithm.
8. C program to simulate LRU page replacement algorithm.

Part B (Unix Shell Programming)

1. Shell script to generate mark-sheet of a student by reading five subject marks, calculate and display total marks, percentage and Class obtained by the student.
2. Shell script that display first n Fibonacci numbers as output.
3. Shell script to read n numbers as command arguments and sort them in descending order.
4. Shell script to read 2 filenames and find which file has a greater number of words (line/characters).
5. Shell script to find which file is older.
6. Shell script to check entered string is palindrome or not.
7. Shell script to perform basic arithmetic operations (use case statement).
8. Shell script to determine whether a given file exists or not, file name is supplied as command line argument block.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCASECT 3.9		Credits	02
Semester	III	Course Title: Compulsory		Hours	30
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.		
Course Outcomes					
Unit No.	Course Content				Hours
To be provided by university					
Recommended Learning Resources					

Year	II	Course Code: SEPBCASECT 3.10 (Elective I)	Credits	02
Semester	III	Course Title: Open Source Tools (OST)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves Use appropriate open source tools based on the nature of the problem Write code and compile different open-source software. 			
Unit No.	Course Content			Hours
UNIT I	Open Source Software's : Introduction to Open sources, Need of Open Sources, Open Source, Principles, Standard Requirements, Advantages of Open Sources, Free Software – FOSS, Licenses – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues, Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU			10
UNIT II	Programming Tools and Techniques : Usage of design Tools like Argo UML or equivalent, Version Control Systems like Git or equivalent, Bug Tracking Systems (Trac, BugZilla), BootStrap.			10
UNIT III	Case Studies : Apache, Berkeley Software Distribution, Mozilla (Firefox), Wikipedia, Joomla, GNU Compiler Collection, Libre Office.			10
Recommended Learning Resources				
Text Books:				
1. KailashVadera, Bhavyesh Gandhi, “Open Source Technology”, Laxmi Publications Pvt. Ltd 2012, 1st Edition.				
Reference Books:				
1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2007.				

Year	II	Course Code: SEPBCASECT 3.10(Elective I)	Credits	02
Semester	III	Course Title: Internet of Things (IOT)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the foundational concepts of IoT • Analyze the role of IoT in various domains. • Understand the IoT devices and their role in the IoT ecosystem • Understand IoT design methodologies for system development. 			
Unit No.	Course Content			Hours
UNIT I	Introduction of Internet of Things: Definition and characteristics of IOT, Physical design of IOT: Things in IOT, IOT Protocols, Logical Design of IOT: IOT Functional Blocks, IOT Communication Models, IOT Communication APIs, IOT Enabling Technologies, IOT Templates: IOT level-1, level-2, level-3, level-4, level-5 and level-6			10
UNIT II	Domain Specific IOTs and M2M: Introduction: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry and Health & Lifestyle, Introduction to M2M, M2M, difference between IOT and M2M, Software Defined Networking (SDN), Network Function Virtualization (NFV) for IOT			10
UNIT III	IOT Physical Device and Endpoints: What is an IOT Device, Basic building blocks of an IOT, Exemplary Device: Raspberry Pi Interfaces, Programming Raspberry Pi with Python. Case study Illustrating IOT Design: Smart Lighting, Home intrusion Detection, Smart parking, Weather Reporting Bot, Air Pollution Monitoring, forest fire Detection			10
Recommended Learning Resources				
Reference Books: <ol style="list-style-type: none"> 1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015 2. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit2). 3. Jan Ho" ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014. 4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer,2011. 5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O"Reilly Media,2011 				

Year	II	Course Code: SEPBCADSCT 4.3	Credits	03
Semester	IV	Course Title: Design & Analysis of Algorithms (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamental concepts of algorithms and their complexity, including time and space complexity, • Design algorithms for solving various types of problems using various algorithm design techniques • Analyze and compare the time and space complexity of algorithms with other algorithmic techniques. • Evaluate the performance of various algorithm design techniques • Apply various algorithm design to real-world problems and evaluate their effectiveness and efficiency in solving them. 			
Unit No.	Course Content			Hours
UNIT I	<p>Introduction: What is an Algorithm? Performance Analysis – Space Complexity, Time Complexity, Worst-case, Best-case and Average-case efficiencies.</p> <p>Asymptotic Notations: Introduction, O-notation, Ω-notation, θ-notation</p>			09
UNIT II	<p>Divide-and-Conquer: Introduction, Strassen's Matrix Multiplication, Finding Max Min, Topological Sorting, Analysis of Binary Search Algorithm</p> <p>Decrease and Conquer: Introduction, Sorting by Counting, String matching using Horspool Algorithm</p>			09
UNIT III	<p>Greedy Technique: Introduction, Knapsack Problem, Minimum Cost Spanning Tree - Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Path - Dijkstra's Algorithm, Job sequencing with deadlines</p>			10
UNIT IV	<p>Dynamic Programming: General Method, Multistage graphs, Warshall's Algorithm, Travelling Salesman Problem</p>			10
UNIT V	<p>Basic Traversal and Search Techniques: Binary Tree traversals and related properties, Depth First Search, Breadth First Search</p> <p>Backtracking Techniques: N-Queens problem, sum of subsets problem, Hamiltonian Cycles</p>			10
Recommended Learning Resources				
Text Books:				
<ol style="list-style-type: none"> 1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009, Pearson 2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press. 3. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, 4. Clifford Stein, 3rd Edition, PHI. 				
Reference Books:				
<ol style="list-style-type: none"> 1. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education) 2. Design and Analysis of Algorithms, Dr. S. Nandagopalan 				

3. Weblinks and Video Lectures (e-Resources):

- i. <http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html>
- ii. <https://nptel.ac.in/courses/106/101/106101060/>
- iii. <http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html> <http://cse01-iiith.vlabs.ac.in/>
- iv. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>

Year	II	Course Code: SEPBCADSCT 4.4	Credits	03
Semester	IV	Course Title: Web Programming (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand the basics of world wide web and web design principles. • To understand the need and be able to develop HTML/XHTML and CSS pages with valid structure as well as content. • Understand the importance XML in web development. • Understand and be able to develop JavaScript code to access the DOM structure of web document and object properties. • To develop dynamic web pages with usage of server-side scripting PHP. 			
Unit No.	Course Content			Hours
UNIT I	<p>The World Wide Web: Introduction to world wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Applications, HTTP, HTTPS. Websites – Home Pages: Web Site Development ; stages of building Web Sites , Web Content Authoring, Web Graphics Design, Web Programming. Scripting languages, Applications of scripting, How scripting languages differ from non-scripting languages, Types of scripting languages.</p>			08
UNIT II	<p>HTML: Origins and evolution of HTML and XHTML, Basics of HTML, HTML Tags and attributes, Meta tags, Character entities, hyperlink, lists, tables, images, forms, divs, frames.</p> <p>CSS- Introduction, Levels of style sheets, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and <div> tags.</p>			10
UNIT III	<p>XML: Introduction, Meaning, significance and usage.</p> <p>JavaScript: Overview of JavaScript, Object Oriented and JavaScript, General Syntactic characteristics, Primitives, operations and expressions, Screen output and keyboard input, Control statements, Object creation and modification.</p>			10
UNIT IV	<p>Arrays, Functions, Constructor Element access in JavaScript, Event and event Handling , Handling events from body elements, Handling events from button elements, Handling events from Textbox and password elements.</p>			10
UNIT V	<p>Server side scripting: Server-side web scripting, PHP : PHP uses, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors / problems.</p>			10

Recommended Learning Resources

Text Books:

1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill
2. Chris Bates, "Web Programming: Building Internet Applications", 3rd Edition Wiley 2009
3. Eric Freeman, "Head First HTML with CSS and XHTML", O'Reilly,2006.
4. David Flanagan, "JavaScript, The Definitive Guide", 6th Edition, O'Reilly2011.
5. PHP for the Web: Visual Quick Start Guide, 4th Edition, Peachpit Press
6. S SGornale&Basavanna M, ""Web Programming for Beginners", ISBN: 978-93-5213-363-5, Shroff Publisher & Distributors PVT Ltd, Mumbai-2016

Reference Books:

1. Internet & World Wide Web – How to Program – Deitel & Deitel – Fourth edition
2. Steven M. Schafer, HTML, CSS, JavaScript, Perl, Python and PHP - Web standards Programmer's Referencell, Wiley Publishing, Inc.
3. W3Schools: PHP (<http://www.w3schools.com/php/>)
4. PHP Language Reference (<http://php.net/manual/en/langref.php>)
5. W3Schools: JavaScript(<https://www.w3schools.com/js/default.asp>)

Year	II	Course Code: SEPBCADSCT 4.5		Credits	03
Semester	IV	Course Title: Computer Networks (Theory)		Hours	48
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.		
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data. • Apply the basics of data communication and various types of computer networks in real world applications. • Compare the different layers of protocols. • Evaluate the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI. • Understand basic routing algorithms. 				
Unit No.	Course Content			Hours	
UNIT I	Introduction: Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI reference model, The TCP/IP reference model.			08	
UNIT II	The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching - message switching, circuit switching, packet switching. Multiplexing - FDM, TDM. Modulation: ASK, PSK , FSK.			10	
UNIT III	The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction-Hamming code, Elementary data link protocols: Unrestricted simplex protocol, simplex stops and waits protocol. Sliding window protocols - sliding window go back n, selective repeat protocols.			10	
UNIT IV	The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, Hop by Hop choke packets. Network layer in the Internet- IPV4, IP Addresses.			10	
UNIT V	The Transport Layer and Application Layer: Elements of Transport service, TCP-service model, TCP protocol, TCP Segment Header, TCP Connection Establishment, Connection Release, TCP sliding Window, TCP timer Management, TCP Congestion control. Application Layer: DNS- Namespace, Name servers; E-Mail- Architecture and Services World Wide Web.			10	

Recommended Learning Resources

Text Books:

1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw
2. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
3. William Stallings, Data and Computer Communications, 7th Edition, PHI.

Reference Books:

1. W. Stalling, Wireless Communication and Networks, Pearson Education.
2. Brijendra Singh, Data Communication and Computer Networks, PHI.

Year	II	Course Code: SEPBCADSCP 4.6	Credits	02
Semester	IV	Course Title: Design & Analysis of Algorithms - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Program to perform heap sort.
- Program to perform Bubble sort.
- Program to perform Quick sort.
- Program to find Maximum and Minimum of the given set of integer values.

Part A (To be implemented using C programming / JAVA Programming)

1. Program to perform Knapsack Problem using Greedy Solution
2. Program to find minimum and maximum value in an array using divide and conquer.
3. Program that implements Strassen's Matrix Multiplication.
4. Program that implements Prim's algorithm to generate minimum cost spanning Tree.
5. Program that implements Kruskal's algorithm to generate minimum cost spanning tree.
6. Program to perform Travelling Salesman Problem
7. Program to implement Warshall's algorithm
8. Program to implement Sorting by Counting Algorithm

Part B (To be implemented using C programming / JAVA Programming)

1. Program that accepts the vertices and edges for a graph and stores it as an adjacency matrix.
2. program to implement function to print In-Degree, Out-Degree and to display that adjacency matrix.
3. Program to implement backtracking algorithm for solving problems like N queens
4. Program to implement the backtracking algorithm for the sum of subsets problem
5. Program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
6. Program to implement the DFS algorithm for a graph.
7. Program to implement the BFS algorithm for a graph.
8. Program to implement Dijkstra's Algorithm.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCADSCP 4.7	Credits	02
Semester	IV	Course Title: Web Programming - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Design a webpage to demonstrate different hyperlinks tags.
- Design a webpage to demonstrate nested ordered list.
- Design a webpage for college time table using table tags.
- Write a JS program to accept user data using forms and display it with greeting message.
- Write a PHP program to display prime numbers in given range.

Part A

1. Design a webpage to build a resume using different tags.
2. Design a webpage to create registration form using forms tag.
3. Design a personal webpage to showcase different font properties in CSS.
4. Design a webpage containing paragraphs which showcases span and div tags.
5. Design a webpage to demonstrate custom list using list properties in CSS.
6. Design a webpage to create recipe card using box model in CSS.
7. Design a webpage to add two background images using grading effect in CSS.

Part B

1. JS program to demonstrate keyboard events.
2. JS program to demonstrate switch statement.
3. JS program to demonstrate functions.
4. JS program to demonstrate constructors.
5. PHP program to implement simple calculator operations.
6. PHP program to demonstrate string functions.
7. PHP program to demonstrate different array manipulation function.
8. PHP program to demonstrate message passing mechanism between pages.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCADSCP 4.8	Credits	02
Semester	IV	Course Title: Computer Networks - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Write a program to implement a basic client-server application using TCP/IP socket programming.
- Write a program to implement a file transfer system between a client and a server.
- Create a simple "ping" program that sends ICMP Echo Request packets to a target and waits for a response.
- Create a simple chat application using the UDP protocol for communication.

Part A (To be implemented using Java)

1. Java Program to find the IP address of a given website specified by the user.
2. Java Program to implement FTP using TCP bulk transfer.
3. Java to implement a GoBack-N ARQ(Automatic Repeat Request) protocol.
4. Java Program to implement simplex Stop-and-Wait protocol.
5. Java program for simulation of error detection code (CRC).
6. Java program to implement Simple Client-Server Communication (TCP) where: The server listens for connections on a port. The client connects and sends a simple text message (e.g., "Hello, Server!"). The server responds with an acknowledgment (e.g., "Hi, Client!").
7. Java client-server program that enables file transfer.
8. Java program to find the shortest path between vertices using bellman-ford algorithm.
9. Java program for congestion control using leaky bucket algorithm.
10. Java program to implement UDP Connection-Less Service using standard ports.

Part B (To be implemented using NS-2 Simulator)

1. TCL Script for connecting two nodes and sending packets in wired network.
2. TCL Script for given STAR topology using SFQ on queue at intermediate node & use different colors for packet originated from different nodes.
3. TCL Script for given RING topology in wired network using For loop & making topology dynamic.
4. TCL Script in wired network for the given topology using TCP connection and sending data through the node.
5. TCL Script in wired network for the given topology using UDP connection and sending data through node.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	II	Course Code: SEPBCASECT 4.9 (Skill)	Credits	02
Semester	IV	Course Title: User Interface And User Experience (UI/UX)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> Understand UI/UX fundamentals, design thinking principles, and global standards for intuitive user interfaces. Conduct user research, gather metadata, and create user personas to enhance UX design. Utilize design tools like Figma and Balsamiq for wireframing, prototyping, and responsive UI design. Apply color psychology, typography, and layout techniques to improve readability and user engagement. Develop interactive prototypes, link pages, and create high-fidelity wireframes for application design. 			
Unit No.	Course Content			Hours
UNIT I	<p>UI/UX Fundamentals and Design Thinking: Requirement Gathering: Understanding Business and User needs, Gathering Functional and Non-functional requirements. UI Guidelines, Intuitive UI: Principles of Intuitive Design, Cognitive Load Reduction, Usability Heuristics, Navigation and Information Architecture. Global Standards of UI</p> <p>Design Thinking: Understanding the Design Thinking Process Using Real-Life Examples, Design Thinking Steps: Empathy, Define, Ideate, Test, Prototype and Validation</p>			08
UNIT II	<p>UX and User Persona: Understand the user, User metadata gathering, User Interview, Stakeholder Interview</p> <p>Figma & Balsamiq: Basic Tools in Figma: Introduction to Figma Interface, Components and variants, prototyping features. Layout and Frames: Grid and Layout Design, Auto Layout Features. UI Components: Buttons, Forms, Navigation Bars, UI Design Systems. Mobile Responsiveness: Designing for multiple screen sizes, media queries and adaptive layouts. Wireframing and UI Design: Low-fidelity vs High-fidelity wireframes, converting wireframes into UI designs. Color psychology. Typography: Choosing the right font, readability and legibility, font pairing techniques</p>			12
UNIT III	<p>Designing an application: App Idea Generation: Ideation Techniques, concept validation. Requirement Analysis: Business Requirements vs User Needs, feature prioritization. Lo-Fi & Hi-Fi Wireframing: creating Low-Fidelity wireframes for concept testing, High-Fidelity wireframes for final design. Prototype and Linkings: Interactive prototyping in Figma, Linking Pages and Components for Navigation</p>			10

Recommended Learning Resources

Reference Books:

1. "About Face: The Essentials of Interaction Design" – Alan Cooper
2. "Lean UX: Applying Lean Principles to Improve User Experience"
3. Designing and Prototyping Interfaces with Figma: Learn essential UX/UI design principles by creating interactive prototypes for mobile, tablet, and desktop By Fabio Staiano
4. Balsamiq Wireframes Quickstart Guide By Scott Farnello

Year	II	Course Code: SEPBCASECT 4.10 (Elective II)	Credits	02
Semester	IV	Course Title: Personality Development	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the Concept of Personality • Build Confidence and Self-Esteem • Develop Emotional Intelligence and self Concept • Analyze the determinants of Personality 			
Unit No.	Course Content			Hours
UNIT I	<p>Meaning and definition of personality : Personality development as a process, Importance of pass, Importance of personality development , Theories of Personality, Psychological theory (Signed Freud), Phenomenological theory (CarRogers) Cognitive theory (George A Kelly) A trait factor – Analytic approach(Raymond B. Cattel), Psychosocial development theory(Erickson).</p>			10
UNIT II	<p>Determinants of Personality: Physical, intellectual, Emotional, social, educational familial.</p>			10
UNIT III	<p>The self-Concept: Individual as a self-sculptor, process of perception cognition and their impact , Learning process, What is attitude, The process of attitude formation.</p>			10
Recommended Learning Resources				
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Cloninger, susan C,(2000) Theories of personality, prentice Hall London. 2. Hurloack, Elizabeth B(?) Personality Development. 3. Kagan Jerome (1969), Personality Development , Harcourt Brace, New york. 4. Kundu C.L.(1989) Personality Development , Sterling Bangalore. 5. Personality Development and communication skills, Mulgund&Kenchappanavar, Srhishtiprakashana 				

Year	II	Course Code: SEPBCASECT 4.10 (Elective II)	Credits	02
Semester	IV	Course Title: Employability Skills	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> To fostering positive employee relation and engagement through clear and timely internal communication. To understanding and adhering to ethical principles in communication practices. 			
Unit No.	Course Content			Hours
UNIT I	<p>Introduction: Meaning, Definition, Process, Elements of Communication, types of communication, Principle of effective Communication, Methods of Communication, Forms of Communication, Evolution and scope of communication , Objectives of Communication - Information ,Advice, order & Instruction, Persuasion, Motivation Education, Warning & Boosting the Morale of Employees.</p>			08
UNIT II	<p>Methods: Verbal vs Non-verbal communication, Characteristics of verbal communication ,Characteristics of Non-verbal communication, Business Etiquette Modes : telephone & SMS communication ,Facsimile communication (Fax) computers & E-communication ,video & satellite conferencing, Group discussion, interviews, Presentation, The art of listening, phone Etiquette, Grapevine.</p>			10
UNIT III	<p>Written Communication: Needs, functions, component & Layout of Business letters, Drafting of letters - Enquiry Letter, complaints & follow-up Letters, claims, Adjustments, Promotional leaflets and fliers consumer grievance Letter. Application for Employment and Resume, Notice , Agenda , Memo and E-mail Etiquette. Interview-Meaning, types, strategies for success in interview. Importance of business ethics: Ethical principles in Communication: honesty, transparency, fairness, accountability, corporate social responsibility (CSR) & its impact on communication.</p>			12
Recommended Learning Resources				
<p>Reference Books:</p> <ol style="list-style-type: none"> Balan , K.R. and Rayudu C.S (1996) Effective Communication , Beacon New Delhi Bangh , LSue, Fryar, Maridell and Thomas David A. (1998) How to Write First Class Business Correspondence , N.T.C. Publishing Group USA. Bhargva and Bharagav a91971) Company Notices , Meetings and Regulations 				

V Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory/ Practical	Total	
Part I DSC#	SEPBCADSCT 5.1	Software Engineering	4	-	3	20	80	100	3
	SEPBCADSCT 5.2	Web Content Management	4	-	3	20	80	100	3
	SEPBCADSCT 5.3	Cyber Security	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 5.4	Data Analytics with R	4	-	3	20	80	100	3
	SEPBCASPET 5.5	C# using .NET Framework	4	-	3	20	80	100	3
	SEPBCASPET 5.6	Full Stack Development	4	-	3	20	80	100	3
	SEPBCASPEP 5.7	Data Analytics with R - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.8	C# using .NET Framework - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.9	Full Stack Development - Lab	-	4	3	10	40	50	2
Part III SEC Skill	SEPBCASECT 5.10	Practical Knowledge / Skill Gaming And Animation	2	-	2	10	40	50	2
Total			26	12				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses SPEC : Specialization.

Note : For the SEPBCASECT 5.10 the semester-end examination will consist of multiple-choice questions.

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VI Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory/ Practical	Total	
Part I DSC#	SEPBCADSCT 6.1	Data Warehousing and Mining	4	-	3	20	80	100	3
	SEPBCADSCT6.2	Cloud Computing	4	-	3	20	80	100	3
	SEPBCADSCT6.3	Mobile Application Development	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 6.4	Artificial Intelligence & Machine Learning	4	-	3	20	80	100	3
	SEPBCASPEP 6.5	Artificial Intelligence & Machine Learning Lab	-	4	3	10	40	50	2
	SEPBCASPEP 6.6	Project work	-	12	3	60	240	300	10
Part II SEC	SEPBCASECT 6.7	Digital Marketing	2	-	2	10	40	50	2
Total			18	14				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses, SPEC : Specialization.

Note : For the SEPBCASECT 6.7 the semester-end examination will consist of multiple-choice questions.

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Year	III	Course Code: SEPBCADSCT 5.1	Credits	03
Semester	V	Course Title: Software Engineering (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamentals of Software Engineering. • Analyze and compare various SDLC models. • Learn techniques for gathering and documenting functional and non-functional requirements. • Understand the principles of good software design. • Evaluate software testing methodologies. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Software Engineering: Defining Software, Software Application Domains, Software Engineering Layers, Software Myths. Process Models: The Waterfall Model, Incremental process model, Evolutionary Process Model – Prototyping and The Spiral model.			10
UNIT II	Software Requirement: Functional and non-functional requirement, Software requirements document, requirements specification. Requirements Engineering Process: Requirements elicitation and analysis, requirements validation, Requirements management. System Models: Behavioral models, Object Models.			10
UNIT III	Design Engineering: Design Concepts, Architectural Styles, Architectural Design. Modeling Component-level design: designing class –based components, conducting component-level design. User Interface Design: Golden rules, User interface analysis and design			10
UNIT IV	Testing Strategies: A strategic approach to software testing, Validation testing, System testing. Testing Conventional Applications: White-Box Testing (Basis Path Testing), Black Box Testing (Equivalence Partitioning, Boundary Values Analysis).			08
UNIT V	Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM plan. Software Quality Assurance: Software Reviews, Formal technical Reviews, Statistical Software quality Assurance, Software reliability.			10

Recommended Learning Resources

Text Books:

1. Ian Somerville, Software Engineering, 9th Edition, Pearson Publication Ltd. 2011
2. Roger Pressman, Software Engineering – A practitioner's approach 6th edition McGraw Hill 2010.

Reference Books:

1. Carlo Ghejgietal, Fundamentals of software – engineering, Pearson Education.
2. Panakaj Jalote, An Integrated approach to software engineering – Narosa Publishing house.

Year	III	Course Code: SEPBCADSCT 5.2	Credits	03
Semester	V	Course Title: Web Content Management (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand content development basics; • Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting • Host websites and develop content for social media platforms such as wiki and blog • Understand e-publications and virtual reality • Use of e-learning platform Moodle and CMS applications Drupal and Joomla 			
Unit No.	Course Content			Hours
UNIT I	Web Content Development and Management: Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing			10
UNIT II	Web Hosting and Managing Multimedia Content: Creating and Maintaining a Wiki Site. Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques, Multilingual Content Development.			10
UNIT III	Planning and Developing Dynamic Web Content Sites: Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site			10
UNIT IV	E- Publication Concept: E- Pub Tools, Simulation and Virtual Reality Applications, Creating 2D and 3D Animations. Introduction to Moodle, Creating a New Course and Uploading,			10
UNIT V	Create and Add Assessment: Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal			08
Recommended Learning Resources				
Text Books:				
<ol style="list-style-type: none"> 1. Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker. 2. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko. 3. Moodle for Learning Management System (LMS): A Practical and Visual Guidebook of Administrator and Instructor for Distance Education Paperback – October 12, 2020 by James Koo 4. Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia 				
Reference Books:				
<ol style="list-style-type: none"> 1. https://onlinecourses.swayam2.ac.in/cec20_lb09/preview 				

Year	III	Course Code: SEPBCADSCT 5.3	Credits	03
Semester	V	Course Title: Cyber Security (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand cyber-crime, its origin and cyber security privacy issues • To understand various types of cyber-attacks and cyber-crimes • Analyze the threats and risks within context of the cyber security • Evaluate the defensive techniques against these attacks • Understand cyber security act and laws 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime.			09
UNIT II	Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones.			10
UNIT III	Tools and Methods Used in Cyberline: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft) Cybercrimes and Cybersecurity:			10
UNIT IV	Understanding Computer Forensics: Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, The Security/Privacy Threats, Forensics Auditing, Anti Forensics			10

UNIT V	The Legal Perspectives: Why do we need Cyberlaw: The Indian Context, The Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment. Cybercrime and the Indian ITA 2000, A global Perspective on cybercrime.	09
Recommended Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81-265-21791, 2011, First Edition (Reprinted 2018) 		
Reference Books:		
<ol style="list-style-type: none"> 1. Kenneth J. Knapp, Cyber Security & Global Information Assurance Information Science 		

Year	III	Course Code: SEPBCASPET 5.4	Credits	03
Semester	V	Course Title: Data Analytics with R (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand Data analytics, its types and its applications. • Gain knowledge of R programming fundamental concepts like variables, data types, operators. • Apply the basics in R programming in terms of functions, loops, decision making and data structure. • Design various experiments based on graphs and charts for data visualization in R programming. • Analyze of statistical computations for data analytics. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Data Analytics : Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.			09
UNIT II	R Programming Structures: Overview of R programming, Variables and Data Types, Operators. Control Statements, Looping, Vectors, Arrays, Matrices, List and Data Frames. User defined Functions. Built in Functions: Math Functions, Statistical functions, String functions.			10
UNIT III	Basic Statistics : Mean, Median and Mode, Variance and Standard Deviation, Descriptive Analysis, Normal Distribution, T test, Analysis of Variance (ANOVA) Test: One Way & Two Way ANOVA, Regression: Linear and Multiple Linear Regression, Logistic Regression. Time Series Analysis.			10
UNIT IV	Data Preparation : Datasets, Importing and Exporting files, Accessing Databases, Data Cleaning and Transformation.			10
UNIT V	Data handling and Visualization using R: Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts.			09

Recommended Learning Resources

Text Books:

1. “Big Data Fundamentals” Thomas Erl, Wajid Khattak, and Paul Buhler:: Concepts, Drivers and techniques , Pearson, Latest Edition
2. “R for Everyone”, Jared P Lander, Pearson Education 2017, Latest Edition.
3. R Programming: An Approach to Data Analytics, G. Sudhamathy and C. Jothi Venkateswaran, MJP Publishers, 2019.
4. “Beginning R: An Introduction to Statistical Programming”-Larry Pace, Latest Edition”.

Reference Books:

1. “Introductory Statistics with R”, P Dalgaard, Second edition.
2. “Beginning R-The statistical Programming language”, Mark Gardner, John Wiley & Sons 2012, Latest Edition.
3. “An Introduction to R” , Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16). URL: <https://cran.rproject.org/doc/manuals/r-release/R-intro.pdf>

Year	III	Course Code: SEPBCASPET 5.5	Credits	03
Semester	V	Course Title: C# using .NET Framework (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language. • Interpret and Develop Interfaces for real-time applications. • Build custom collections and generics in C#. • Design and develop GUI based applications in C#. 			
Unit No.	Course Content			Hours
UNIT I	C# Language fundamentals: Introducing the Building Blocks of the .NET Platform(CLR, CTS and CLS). Anatomy of C# program. The System. Environment Class. The System. Console Class, Understanding Value Types and Reference Types, The System Data types, Operators, Decision Constructs, Iteration Constructors, The System.String data types, String Builder, .NET Array Types, Defining Classes and Creating objects, Pillars of OOP, C#'s Inheritance Support, C#'s Polymorphic Support, Understanding C# Partial types, Understanding Boxing and Unboxing Operations.			12
UNIT II	Object Life time and Exception handling: Understanding Object Lifetime classes, Objects and References, the basics of Object Lifetime, System.GC typr, Building Finalizable Objects, Building Disposable Objects, Ode to Errors, Bugs and Exceptions, The Role of .NET Exception Handling, throwing generic exceptions, catching exceptions, Configuring the state of an exception, System – Level Exception, Application - Level Exception, Processing Multiple Exception, Generic catch statements, Inner exceptions, Finally Block.			12
UNIT III	Interfaces, Collections, Delegates & Events: Defining Interfaces in C#, Implementing an Interface in C#, Contrasting Interfaces to Abstract Base Classes, Collections: Introducing Collections, Benefits of Collection Classes, Understanding and using commonly used collections, Interfaces of the System.Collections Namespace, .NET Delegate type, defeining a Delegate in C#, System.Delegate Base Classes, Delegate examples, C# Events.			08
UNIT IV	GUI using Windows Forms and Database Programming: Controls- TextBox, label, Button, checkbox, radiobutton, listbox, combobox, Datetime picker, Common properties. methods and events, menus, context menus. Menustrip, Graphics and GDI, SDI and MDI, Dialog boxes; Database Programming Understanding the Role of Managed Provider and ADO.NET Objects Connecting to Database. Performing Insert, Update and Delete Operations, Executing Select Statements.			08

<p style="text-align: center;">UNIT V</p>	<p>Understanding .NET Assemblies and file handling: Assemblies-The Role of NET Assemblies, Understanding the format of .NET Assemblies, single file assembly, multifile assembly. Private and Shared Assemblies; File handling: The System IO Namespace, Directory (Info) and File (Info) types, Working with Directory Info, Directory Type, File Info, File Type Classes, Abstract Stream Class, Stream Writers and Stream Readers, String Writers and String Readers, Binary Writers and Binary Readers.</p>	<p style="text-align: center;">08</p>
<p>Recommended Learning Resources</p>		
<p>Text Books:</p>		
<ol style="list-style-type: none"> 1. Andrew Troelsen: Pro C# with .NET 3.0, Special Edition aPress, India, 2007. 2. E. Balagurusamy: Programming in C#. 5th Reprint, Tata McGraw Hill.2004. 3. Herbert Schildt: The Complete Reference C#, Tata McGraw Hill, 2004 		
<p>Reference Books:</p>		
<ol style="list-style-type: none"> 1. C# 2008 programming cogent learning solutions Inc. DreamtechPress. 2. C#2008 Programming covers .net 3.5 Black Book Beginners Edition cogent learning solutions Inc. DreamtechPress. 		

Year	III	Course Code: SEPBCASPET 5.6	Credits	03
Semester	V	Course Title: Full Stack Development (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Design dynamic and interactive web pages and websites. • Run PHP scripts on the server and retrieve results. • Handle databases like MySQL using PHP in Website • Develop applications using object oriented concepts. • Implement advanced web security and Data Optimization techniques. 			
Unit No.	Course Content			Hours
UNIT I	Fundamentals of PHP and Web Development: Introduction to Web Development (Frontend, Backend, Full-Stack), Understanding Client-Server Architecture & HTTP Protocol, Setting up Local Server (XAMPP, WAMP, LAMP), Basics of PHP: Syntax, Variables, Data Types, Control Structures (if-else, switch, loops), Functions in PHP (User-defined , String & Math Built-in)			09
UNIT II	Advanced PHP Concepts: String Manipulation & Regular Expressions, PHP Arrays (Indexed, Associative, Multidimensional), Form Handling with PHP (GET, POST), PHP File Handling (Read, Write, Append, Delete), PHP Sessions & Cookies Management, Error Handling & Exception Handling in PHP, Working with Date & Time Functions			09
UNIT III	MySQL Database & PHP Integration: Introduction to Databases & MySQL, Setting up MySQL with PHP, Database Design & Normalization Concepts, MySQL Commands (DDL, DML, DCL), Connecting PHP with MySQL using MySQLi , CRUD Operations (Create, Read, Update, Delete), Advanced SQL Queries (Joins, Subqueries, Indexing), Working with Stored Procedures & Triggers, Importing & Exporting Data (CSV, JSON, XML), Sending Emails using PHP (PHPMailer)			10
UNIT IV	Object-Oriented Programming (OOP) in PHP: Classes & Objects, Inheritance, Polymorphism, Encapsulation, Static Methods & Properties Password Hashing & Encryption (bcrypt, Argon2), Preventing SQL Injection, XSS, CSRF Attacks, Secure File Upload Handling (Image Uploading), Integrating Third-Party APIs (Payment Gateway, SMS, Email)			09

<p style="text-align: center;">UNIT V</p>	<p>Advanced Web Security & Performance Optimization: User Authentication & Authorization - Role-Based Access Control (RBAC), API Authentication (JWT, OAuth), PHP Performance Optimization: Optimizing PHP Code for Speed & Efficiency, Reducing Memory Usage, Using Opcode Caching (APCu, OPcache), Profiling PHP Code (Xdebug, Blackfire). Database Optimization Techniques : Query Optimization & Indexing, Using Connection Pooling & Persistent Connections, Caching Database Queries. Working with Web Services & APIs : Consuming RESTful APIs in PHP, Creating APIs with PHP</p>	<p style="text-align: center;">11</p>
<p>Recommended Learning Resources</p>		
<p>Text Books:</p>		
<ol style="list-style-type: none"> 1. PHP A Beginner's Guide, VIKRAM VASWANI, Tata McGraw-Hill, 2008. 2. The PHP Complete Reference, Steven Holzner –Tata McGraw-Hill Edition, 2010 3. Spring into PHP5, Steven Holzer, Tata McGraw Hill Edition, 2005 		
<p>Reference Books:</p>		
<ol style="list-style-type: none"> 1. "PHP and MySQL Web Development" – Luke Welling & Laura Thomson 2. "PHP Objects, Patterns, and Practice" – M. Papantonio & M. Schumacher 3. "The Joy of PHP: A Beginner's Guide" – Alan Forbes 4. "Modern PHP: New Features and Good Practices" – Josh Lockhart 5. "Laravel: Up & Running" – Matt Stauffer 		

Year	III	Course Code: SEPBCASPEP 5.7	Credits	02
Semester	V	Course Title: Data Analytics with R - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- R Program to find Factorial of given number using recursion.
- R program for finding stationary distribution of markov chains.
- R Program for implementing Quick Sort for Binary Search.
- R Program Generate random numbers from Standard Distribution.
- R Program to check Prime numbers.
- R Program to check Leap year.

Part A

1. R program to illustrate with if-else statement and how does it operate on vectors of variable length.
2. R program illustrate with for loop and stop on condition, to print the error message.
3. R Program to implement T-Test for Anova.
4. R Program Compute mean values for vector aggregates defined by factors tapply and sapply.
5. R program to implement different string manipulation functions.
6. R Program illustrate Reading & Writing Files.
7. R program for any visual representation of an object with creating graphs using graphic functions also demonstrate the legends: Plot(),Hist(),Linechart(),Pie(),Boxplot(),Scatterplots()..

Part B

1. R program for with any dataset containing data frame objects, and employ manipulating and analyzing data.
2. Program to create an application of Linear Regression in multivariate context for predictive purpose.
3. R Program to Find Mean, Mode, Median, Variance and Standard Deviation.
4. R program that performs data cleaning and transformation effectively using a sample dataset. (It covers handling missing values, removing duplicates, renaming columns, filtering, sorting, and adding new columns.)
5. Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.
 - a) Find the total number rows & columns
 - b) Find the maximum salary
 - c) Retrieve the details of the employee with maximum salary
 - d) Retrieve all the employees working in the IT Department.
 - e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv"
6. R program to create a matrix using vectors and perform following operations.
 - a) Find transpose of a matrix ii) Find row and column sum of matrix
 - b) Find row and column index of maximum and minimum value in the given matrix.
 - c) Find sum of principal diagonal elements.
7. R program to create a Data Frame with following details and do the following operations.

itemCode	itemCategory	itemPrice
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

- a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
 - b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
 - c) Create another Data Frame called “item-details” with three different fields itemCode, ItemQtyonHand and ItemReorderLvl and merge the two frames.
8. R program to perform time series analysis on the monthly airline passenger dataset (AirPassengers) from 1949 to 1960. The program should:
- a) Visualize the time series data.
 - b) Decompose the time series into trend, seasonal, and residual components.
 - c) Build a forecasting model using the ARIMA (AutoRegressive Integrated Moving Average) model.
 - d) Predict the next 12 months' passenger traffic

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 5.8		Credits	02
Semester	V	Course Title: C# using .NET Framework - Lab			
Course Pre-requisites, if any			NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40		Duration of ESA: 03hrs.	

Practice Programs:

- Create an application to simulate the working of Font Dialog box using list boxes, label and button controls.
- Program to insert the data in the database having fields such as Roll No, Name, Age and ContactNo using Execute-Non Query.
- Program to input Roll No and display the corresponding student details using database.
- Program to implement Stream Reader and Stream Writer classes.

Part A

1. C# program to show the machine details like machine name, Operating System, Version, Physical Memory and calculate the time since the Last Boot Up. (Hint: Use System.Environment Class)
2. C# Sharp program to calculate roots of Quadratic Equation
3. Program in C# Sharp to count a total number of alphabets, digits and special characters in a string
4. Program in C# Sharp to create a function to calculate the sum of the individual digits of a given number.
5. Draw a square with sides 100 pixels in length. Then inscribe a circle of radius 50 inside the square. Position the square and the inscribed circle in the middle of the screen
6. Program to implement multilevel inheritance.
7. Program to demonstrate System exception.

Part B

1. Object oriented program to demonstrate bank transaction. Include methods for amount deposit, amount withdrawal and display.
2. Program that inputs the coordinates of three mouse clicks from the user and then draws a triangle in the output window using those three points.
3. Demonstrate operator overloading two complex numbers.
4. Program to demonstrate Application exception.
5. Demonstrate Dialog box (Modal and Modeless).
6. Program to demonstrate Directory Info and File Info.
7. Program in C# Sharp to create Menu and menu items.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 5.9	Credits	02
Semester	V	Course Title: Full Stack Development - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Write a program to display current date and time in different formats
- Write a program to create a simple calculator using basic php logic and forms
- Write a PHP script to write content to a file and then read it back
- Write a PHP script to send email using PHP (SMTP, PHPMailer)

Part A

1. PHP program to demonstrate variables, constants, and different data types.
2. Program that takes user input and determines if the number is prime using functions.
3. Program to read and write data to a text file using PHP.
4. PHP script that validates an email ID using regex and performs string operations.
5. Build a simple login form that captures user input using both GET and POST methods.
6. PHP application that implements login functionality using sessions and cookies.
7. Program that demonstrates the use of try-catch blocks and custom exceptions in PHP.
8. PHP script to connect with MySQL and perform Create, Read, Update, and Delete (CRUD) operations.

Part B

1. PHP application that uses Joins, Subqueries, and Prepared Statements for secure database queries.
2. Program to export MySQL data into a CSV file and import data from a JSON file.
3. PHP program using Classes, Objects, Inheritance, and Encapsulation.
4. Develop a user login & registration system with password hashing using bcrypt/Argon2.
5. PHP script to upload images securely with validation and file size restrictions.
6. Build a REST API that allows users to fetch, add, update, and delete records from a MySQL database.
7. PHP program that sends emails using PHPMailer with SMTP authentication.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASECT 5.10	Credits	02
Semester	V	Course Title: Gaming And Animation (Theory)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the basics of Animation and Animation properties in HTML and CSS • Create and apply various effects to animation slides • Understand basics of gaming • Design games, using HTML and JavaScript 			
Unit No.	Course Content			Hours
UNIT I	<p>Introduction: What is an Animation?, HTML5 – SVG ,Viewing SVG Files , SVG Circle , Rectangle, SVG Line SVG Ellipse ,SVG Polygon ,SVG Polyline ,SVG Gradients SVG StarThe Start and End States , Interpolation , Animations in HTML, All About CSS Animations, Creating a Simple Animation ,CSS Animation Property , Reusing Keyframes , Declaring Multiple Animations, Wrap-up, All About CSS Transitions, Adding a Transition ,Looking at Transitions in Detail , The Longhand Properties , Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions, The transition End Even</p>			10
UNIT II	<p>Sliding Background Effect on Link Hover , Overview of How This Works , How this Effect Really Works, Creating a Sweet Content Slider , Overview of How It Works , The Code,The<BLINK>Tag Shall Live On , Re-creating the Blink Effect , Overview of How It Works, Simple Text Fade and Scale Animation , The ExampleMove Element to Click Position , The Example , The Full Code , How This All WorksHover Effects Using Animations , What This Looks Like , Hovering, CSS Animations, and Handoffs</p>			10
UNIT III	<p>Animations Created in Code, Why Animate Using JavaScript, Breaking Down a JavaScript Animation , Looking at a Real Example , Going a Little More CrazyMeetrequest AnimationFrame, Meet request Animation Frame ,Using It Another Example ,Your Frame Rate ,Stopping your request Animation Frame LoopVendor Prefixes in JavaScript , Meet the Vendor Prefixes in JavaScript , Dealing with Vendor Prefixes, Animating What You Draw, How This Is All Going to Work , Actually Drawing and Animating on a Canvas , Animating Your Circle. Game IntroGame, CanvasGame, ComponentsGame, ControllersGame, ObstaclesGame, ScoreGame, ImagesGame, SoundGame, GravityGame, BouncingGame, RotationGame, Movement</p>			10
Recommended Learning Resources				
Reference Books:				
<ol style="list-style-type: none"> 1. Animation in HTML, CSS, and JavaScript ByKirupaChinnathambi 2. https://www.tutorialspoint.com/html5/index.htm 3. Gaming Section last unit :https://www.w3schools.com/graphics/game_intro.asp 4. https://cloudinary.com/blog/creating_html5_animations 				

Year	III	Course Code: SEPBCADSCT 6.1	Credits	03
Semester	VI	Course Title: Data Warehousing and Mining (Theory)	Hours	48
Course Pre-requisites, if any		Basics of HTML, CSS, Java Script		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Introduction to general issues of Data Warehouse and Data Mining. • Understanding of the different architectures and mining techniques • The role and functions of Data Warehouse and Data Mining • Explain the stages and process different data mining techniques. • Learn mining and warehouse techniques through the use of different tools 			
Unit No.	Course Content			Hours
UNIT I	<p>Data Warehouse: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction Transformation-Loading, Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact Less-Facts, OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.</p>			10
UNIT II	<p>Data Mining: Motivation for Data Mining, Data Mining Functionalities, Knowledge Discovery Process, Data Mining Techniques, Issues and applications; Data Objects and attribute types, Statistical description of data, Data Preprocessing: Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.</p>			08
UNIT III	<p>Data Cube Technology: Efficient method for data cube computation, Cube materialization (Introduction to Full cube, Iceberg cube, Closed cube, Shell cube), General strategies for cube computation, Attribute oriented induction for data characterization. Mining Frequent Patterns: Frequent patterns, Market basket analysis, Frequent itemsets, closed itemsets, association rules, Types of association rule (Single dimensional, multidimensional, multilevel, quantitative), Finding frequent itemset (Apriori algorithm, FP growth), Generating association rules from frequent itemset, Limitation and improving Apriori, From Association Mining to Correlation Analysis.</p>			10
UNIT IV	<p>Classification And Prediction : Definition (Classification, Prediction), Learning and testing of classification, Classification by decision tree induction, ID3 as attribute selection algorithm, Bayesian classification, Laplace smoothing, Classification by backpropagation, Rule based classifier (Decision tree to rules, rule coverage and accuracy, efficient of rule simplification), Support vector machine, Evaluating accuracy (precision, recall, f-measure), Issues in classification.</p>			10

UNIT V	<p>Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms. Mining Spatial, Multimedia, Text And Web Data : Spatial data mining, Spatial data cube, Mining spatial association, Multimedia data mining, Similarity search in multimedia data, Mining association in multimedia data, An introduction to text mining, natural language processing and information extraction, Web mining (Web content mining, Web structure mining, Web usage mining)</p>	10
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Recommended Learning Resources

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei“Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

Reference Books:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Introduction to Data Mining, 2nd ed. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar. Pearson Publisher, 2019.

Year	III	Course Code: SEPBCADSCT 6.2		Credits	03
Semester	VI	Course Title: Cloud Computing (Theory)		Hours	48
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.		
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. • Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost. • Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing. • Analyze various cloud programming models and apply them to solve problems on the cloud. 				
Unit No.	Course Content			Hours	
UNIT I	Introduction: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Applications of Cloud Computing; Trends in Cloud Computing; Leading , Challenges Ahead, Historical Developments, Different Computing Paradigms: Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Platform Service Providers.			10	
UNIT II	Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models: Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Virtualization- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization,			10	
UNIT III	Cloud Applications: Moving Applications to the Cloud –Microsoft Cloud Services Google Cloud Applications –Amazon Cloud Services –Cloud Applications			08	
UNIT IV	Cloud Computing At Work: Software as a service-overview, driving forces, company offerings, industries, software plus services- overview, mobile device integration, Providers, Microsoft Online.			10	
UNIT V	Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud) Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications: CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.			10	

Recommended Learning Resources

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing- Foundations and Applications Programming", Elsevier, 2013
2. Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3. Cloud Computing A practical Approach, Anthony T Velte, Toby J Velte, Ph.D. Robert Elsenpeter, McGraw Hill Education(India) Private Limited.
4. K Chandrashekar: "Essentials of Cloud Computing", CRC Press, 2015
5. A.Srinivasan and J.Suresh, "Cloud Computing –A Practical Approach for Learning and Implementation", Pearson India Publications

Reference Books:

1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

Year	III	Course Code: SEPBCADSCT 6.3	Credits	03
Semester	VI	Course Title: Mobile Application Development (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Being able to build cross platform mobile application development. • Understand the basics of the Dart programming language. • Learn the fundamentals of Flutter widgets. • Learn how to design and build user interfaces with Flutter. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Mobile Applications : Development, Flutter Introduction: Features of Flutter Advantages of Flutter and Disadvantages of Flutter, Flutter SDK, Android Studio and Creating Simple Hello world Application with flutter, Hot Reload Feature, Basic Flutter Application Structure, Creating Simple Flutter App using Online Sandboxes like FlutLab.io			10
UNIT II	Dart Programming Language Basics: Variable declaration and initialization, Constants and final values, Data Types: Numeric values, Strings, Boolean Types, Operators, Flow Control constructs: if and switch statements, looping statements. Lists and Maps. Object oriented Programming in Dart: Defining Classes, Instance Variables and Methods. Named parameters, Arrow functions Constructors, Subclasses.			10
UNIT III	Introduction to Widgets: Widgets, Gestures, Concept of State, Layers Widget Build Visualization, Platform Specific Widgets, Layout Widgets: Types of Layout Widgets, MaterialApp, Scaffold, Center, Row, Column, Expanded, Align, Container, Padding and Text Widgets, Button, Image and Icon Widgets.			10
UNIT IV	Introduction to Gestures and State management: Tap, Double Tap, Long Press, VerticalDrag, Horizontal Drag and Pan. Dialogs, Flutter State Management: Ephemeral State Management, Application State, Navigation and Routing. Stateful Widgets: Input, Checkbox, Radio, Date and Time pickers and ListView			10
UNIT V	Introduction to Dart Packages and Database Concepts: Types of Packages and using Dart Package, Database Concepts: SQLite, SQLiteDbProvider object and its methods			08

Recommended Learning Resources

Text Books:

1. Beginning Android Programming with Android Studio, 4th Edition
Jerome DiMarzio ISBN: 978-1-119-41933- April 2017-Wiley.464 pages
2. Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK
By Author Frank Zammett.

Reference Books:

1. https://www.tutorialspoint.com/flutter/flutter_tutorial.pdf
2. <https://flutlab.io/>
3. <https://zapp.run/>
4. <https://www.geeksforgeeks.org/android-tutorial.>

Year	III	Course Code: SEPBCASPET 6.4	Credits	03
Semester	VI	Course Title: Artificial Intelligence & Machine Learning (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand problems solved by AI, types of intelligent agents • Understand the nature of environment of agents • Application of informed and uninformed searching techniques • Evaluate techniques used for knowledge representation • Analyze supervised and unsupervised machine learning algorithms 			
Unit No.	Course Content			Hours
UNIT I	<p>Introduction: What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, History of AI, intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.</p>			10
UNIT II	<p>Searching: Searching for solutions: uniformed search strategies – Breadth first search, depth first Search. Informed (Heuristic) Search Strategies, Heuristic Functions Heuristic search techniques: A* Search, AO* search Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis Game Playing-Adversarial search, Games, mini-max algorithm</p>			10
UNIT III	<p>Knowledge representation and Logic Programming: Representations and mappings, Approaches to knowledge representation, First order logic, predicate logic, Inference in Predicate Logic, semantic nets- frames and inheritance.</p>			08
UNIT IV	<p>Introduction to machine learning: Basics of machine learning - Human Learning - Define machine learning - -Applications of machine learning-List the Tools used for machine learning- Advantages and disadvantages of machine learning. Types of machine learning – Supervised Learning, unsupervised, reinforcement Supervised learning : Regression models: Simple Linear Regression, multiple linear Regression. K-Nearest-Neighbors (KNN), Logistic Regression, Support Vector Machines (SVM) Classification Model-Classification learning Steps - Classification Algorithms - Naive Bayes Classifier, Decision tree - Applications of supervised learning</p>			12
UNIT V	<p>Unsupervised learning: Different types of clustering techniques – clustering Algorithms - K-Means Clustering, Hierarchical clustering algorithms - Agglomerative Clustering, Association Algorithm - Apriori algorithm - Applications of Unsupervised learning</p>			08

Recommended Learning Resources

Text Books:

1. Elaine Rich, Kevin Knight, Shivashanka B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition. 2013
2. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
3. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.

Reference Books:

1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Year	III	Course Code: SEPBCASPEP 6.5	Credits	02
Semester	VI	Course Title: Artificial Intelligence & Machine Learning - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Creation and loading different datasets in Python.
- Program to compute Mean, Mode, Median, Variance and Standard deviation using datasets.
- Program to implement minimax algorithm for an application
- Program to analyze students' scores based on study hours using regression.

Part A

1. Program to implement Breadth-First Search(BFS) algorithm.
2. Program to illustrate Depth-First Search (DFS) algorithm.
3. Program to describe A* algorithm.
4. Program to enforce Hill climbing algorithm.
5. Program to perform Tic Tac Toe algorithm.
6. Program to Implement and evaluate a simple linear regression model.
7. Program to Implement a KNN classifier.

Part B

1. Program to execute NaiveBayes algorithm
2. Program to perform decision tree algorithm
3. Program to Implement and visualize K-means clustering.
4. Program to carry out SVM for classification.
5. Program to demonstrate K-means clustering.
6. Program to describe Agglomerative clustering.
7. program to fulfill Apriori algorithm

Note : Programs to be implemented using Python Programming Language

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 6.6	Credits	10
Semester	VI	Course Title: Project work		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 60		Summative Assessment Marks: 240	Duration of ESA: 03hrs.	

Objective:

The objective of the BCA project work is to develop a quality software solution by following the software engineering principles and practices. During the development of the project the students shall implement all the stages of the software development life cycle (SDLC).

This Lab will enable students to demonstrate their practical and theoretical skills gained during five semesters of study in BCA Programme

Part A

Instructions

- The students are required to carry out the project in a group of two or three students under the guidance of course teacher.
- Project work problem statement shall be identified by the students with the help of the course teachers and students shall submit the synopsis/project proposal of the same during the second week of the commencement of VI semester BCA course.
- During project development, students are expected to define a project problem, do requirements analysis, systems design, software development, apply testing strategies and do documentation with an overall emphasis on the development of a robust, efficient and reliable software systems.
- No change in the title of the project work shall be allowed after 3rd week of the commencement of VI semester BCA course.
- The project development process has to be consistent and should follow standards identified by the guide monitoring the project work.
- There is no restriction on use of hardware and software for carrying out the project work except that ready application packages are not allowed.
- The students have to submit the individual dissertation of the project work carried out in one hard copy along with soft copy written on compact disc.

Project Dissertation Details:

- The standard procedure for documenting the project work shall be followed. However, while writing is in progress, students shall get each chapter evaluated by to their supervisor for necessary feedback, especially on technical content. Note that the quality of the dissertation is more important than its number of pages.
- The dissertation text (defined as everything except title page, table of contents, references and appendices) should be around 50-70 A4 pages. The length (dissertation text together with appendices) of the dissertation should be less than 100pages.

The students are advised to follow the following typing recommendations

Contents of the dissertation:

Preface: Title page, certificate, student declaration page, abstract, acknowledgement page, contents, list of figures, list of tables, and list of acronyms.

Main chapters:

- **Introduction:** The motivation for the project should be argued here. Then a brief introduction to the project should be provided indicating its objectives and scope. Finally, a paragraph containing an outline of the remaining chapters (starting with Chapter 2) is recommended.
- **Analysis:** information on the existing system should be provided-The students can incorporate different types of diagrams to describe the processes and functionalities of the existing system. The candidate should review software of the proposed system. An analysis of the requirements should

also be provided in this chapter. For example, the requirements of the system could be listed. A specification of the number of users, the frequency of use, and the jobs of the users could be provided. Functional requirements covering system functionality expected by the users should be addressed. Include a section to the end of the analysis chapter to describe the selected methodology.

- **Design:** In this chapter the student should consider different competing design strategies (alternative solutions) for his system. The different strategies may involve the way of development (developing from scratch, using open-source components, etc.), the development platform (stand-alone personal computer, client-server environment, etc.), choice of system software (Windows, Linux, etc.). The candidate should compare how the project requirements are satisfied through each alternative. The design of the proposed system should be another major section of this chapter. The candidate should describe the design of the system referring to different types of diagrams/models; for example, if no object oriented methodology has been selected then include use case diagrams, use case narratives, activity diagrams, and entity relationship diagrams, and if object oriented methodology has been selected then include use case diagrams and use case narratives, class diagrams, sequence diagrams. User interface design is the next major section of this chapter. The candidates should describe the design considerations for designing user interfaces of the system and justify the design decisions that were made. Layouts of relevant interfaces should be included in order to clarify the design decisions taken.
- **Implementation:** This chapter should describe the implementation of the system. For example, it should identify and explain all major code and module structures. Include a diagram to depict and describe the interaction between modules of the system. Also, the implementation environment (hardware and software), any existing code that was reused by the candidate, development tools used, and any platform dependence must be discussed. Appropriate technical documentation may be included as appendices to the dissertation if they are expected to be useful for the reader. Note that a list of selected code will appear in appendix and the code used in this chapter should be presented for the purpose of explaining the implementation aspects of selected important code. This code should be presented as a code segment.
- **Evaluation:** A comprehensive test plan that was used to verify and validate the system should be provided. Evidence should be provided of using a wide range of test data. Evidence should be produced to show that all aspects of the system have been tested and specification has been met. Description of the effects of various kinds of errors and the required system behavior upon occurrence of an error should be included. The candidate should report the test results in text in a table in this chapter and include detailed actual test results (in screen shots) in an appendix of the dissertation.
- **Conclusion:** This chapter will conclude the dissertation with a critical evaluation of the system and suggestions for any future work. The evaluation should include a critical discussion and assessment of results of project. This chapter should also identify any deficiencies in the final product and highlight how improvements could be made
- **References:** The details of the references are provided in References section of the dissertation. You should include any web links too.
- **Appendices:** - System Documentation-Provide program installation, compilation and execution details.; Design Documentation- Any design documentation that is not critical to be included in the main text (Chapter 3) but could still be of interest to a reader can be added to the appendices. These could be for example design diagrams (e.g., data flow, entity relationship, database schema and UML) that have not been included in the main text; User Documentation-User documentation may cover all aspects of the system, with appropriate screen shots and explanations; Management Reports- In addition to producing day to day transaction reports (e.g. a payroll system should produce an individual pay sheet, coin analysis to make cash payments, EPF report etc.) a system must produce summarized reports for the management (e.g. monthly, quarterly payments made by

organization, employees, overtime Hrs by employee, etc.). These reports will be included here; -
Code Listing; Glossary and Index

Note: Project guidelines shall be notified by the Department at the end of V semester BCA course. The documentation guideline to document the project work in the form of dissertation shall be notified to the students well in advance during VI semester BCA course.

Year	III	Course Code: SEPBCASECT 6.7	Credits	02
Semester	VI	Course Title: Digital Marketing (Theory)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamental concepts and principles of digital marketing. • Develop practical skills to implement various digital marketing strategies and techniques. • Analyze and evaluate the effectiveness of digital marketing campaigns. • Apply critical thinking and problem-solving skills to real-world digital marketing scenarios. • Create comprehensive digital marketing plans and strategies. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms .Digital Marketing Strategy and Planning: Developing a digital marketing strategy, Budgeting and resource allocation.			10
UNIT II	Social Media Marketing: Campaign planning and execution, Social media platforms and their features, Creating and optimizing social media profiles Content creation and distribution: Content Creation, Content promotion and amplification. Email Marketing: Introduction to email marketing, Building an email list, Email automation and segmentation			10
UNIT III	Mobile Marketing: Mobile marketing overview, Mobile app marketing, Location-based marketing Search Engine Optimization: Introduction to SEO, Abstraction of SEO, Types of SEO. Analytics and Reporting: Steps and Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization			10
Recommended Learning Resources				
Reference Books: <ol style="list-style-type: none"> 1. Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kingsnorth. 2. "Email Marketing Rules: How to Wear a White Hat, Shoot Straight, and Win Hearts" by Chad S. White 3. "Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi 4. "Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles 5. "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik 				

Scheme of Evaluation
Semester End Exam Question Paper Pattern

Duration of the examination: 3hour Max. Marks: 80

Section A

Answer any TEN Questions from the following, each carries 2 marks: [10X2=20]

1. -----
2. -----
3. -----
4. -----
5. -----
6. -----
7. -----
8. -----
9. -----
10. -----
11. -----
12. -----

Section B

Answer any FOUR from the following questions each carries 5 marks. [4X5=20]

13. -----
14. -----
15. -----
16. -----
17. -----

Section C

Answer any FOUR from the following questions each carries 10 marks. [4X10=40]
(The Question may consists two sub-questions)

18. -----
19. -----
20. -----
21. -----
22. -----

CIA for Practical	
Assessment Type	Marks
Test1	10
Total	10 Marks

Semester End Examination Scheme of Evaluation for Lab Examination

Assessment Criteria	Marks
Writing of 2 Programs (Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva Voice	05
Total 40 Marks	40 Marks

Instructions:

1. Certified Journal is mandatory for appearing in the Lab examination.
2. Students shall be given two programming assignments taking into consideration the duration of the time allotted to students for writing, typing and executing the programs.

CIA for Theory	
Assessment Type	Marks
Test 1 / Seminar / Activity	10
Test 2 / Seminar / Activity	10
Total	20 Marks

Note: Guidelines given by the university from time-to-time shall be followed for IA.

CIA for Project Work	
Assessment Type	Marks
First Internal Assessment	30
Second Internal Assessment	30
Total	60 Marks

First Internal Assessment

Max.Marks: 30

Time: 20 minutes

Students shall present the details of the project work carried out that includes the following

- Synopsis contents
- Problem identification and proposed solution
- SAD, SRS
- Database Design
- Functions

PowerPoint slides shall be used by the students to present the work carried out.

Second Internal Assessment

Max. Marks: 30

Time: 30minutes

Students shall present the details of the project work carried out that includes the following

- Coding details
- Forms and reports
- Demo of the application developed

Note: IA marks shall be assigned by the concerned guide monitoring the project work of the students.

Semester End Examination Scheme of Evaluation for Project Work.

Assessment Criteria	Marks
Dissertation/Project Report evaluation	100
Presentation/Demo of the application developed : (navigation of the application, features incorporated, data validation, UI, reports, etc.)	100
Viva Voice	40
Total	240 Marks

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RANI CHANNAMMA UNIVERSITY

BELAGAVI

THE COURSE STRUCTURE AND SYLLABUS OF UNDERGRADUATE

B.C.A PROGRAMME

w.e.f.

Academic Year 2026-27 and Onwards Under

State Education Policy (SEP)

Submitted by
Prof. Parashuram Bannigidad
Chairman,
Board of Studies (UG),
Computer Science,
Rani Channamma University, Belagavi.

V Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks		Total	
						IA	Theory/ Practical		
Part I DSC#	SEPBCADSCT 5.1	Software Engineering	4	-	3	20	80	100	3
	SEPBCADSCT 5.2	Web Content Management	4	-	3	20	80	100	3
	SEPBCADSCT 5.3	Cyber Security	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 5.4	Data Analytics with R	4	-	3	20	80	100	3
	SEPBCASPET 5.5	C# using .NET Framework	4	-	3	20	80	100	3
	SEPBCASPET 5.6	Full Stack Development	4	-	3	20	80	100	3
	SEPBCASPEP 5.7	Data Analytics with R - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.8	C# using .NET Framework - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.9	Full Stack Development - Lab	-	4	3	10	40	50	2
Part III SEC Skill	SEPBCASECT 5.10	Practical Knowledge / Skill Gaming And Animation	2	-	2	10	40	50	2
Total			26	12				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses SPEC : Specialization.

Note : For the SEPBCASECT 5.10 the semester-end examination will consist of multiple-choice questions.

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VI Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory/ Practical	Total	
Part I DSC#	SEPBCADSCT 6.1	Data Warehousing and Mining	4	-	3	20	80	100	3
	SEPBCADSCT6.2	Cloud Computing	4	-	3	20	80	100	3
	SEPBCADSCT6.3	Mobile Application Development	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 6.4	Artificial Intelligence & Machine Learning	4	-	3	20	80	100	3
	SEPBCASPEP 6.5	Artificial Intelligence & Machine Learning Lab	-	4	3	10	40	50	2
	SEPBCASPEP 6.6	Project work	-	12	3	60	240	300	10
Part II SEC	SEPBCASECT 6.7	Digital Marketing	2	-	2	10	40	50	2
Total			18	14				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses, SPEC : Specialization.

Note : For the SEPBCASECT 6.7 the semester-end examination will consist of multiple-choice questions.

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Year	III	Course Code: SEPBCADSCT 5.1	Credits	03
Semester	V	Course Title: Software Engineering (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamentals of Software Engineering. • Analyze and compare various SDLC models. • Learn techniques for gathering and documenting functional and non-functional requirements. • Understand the principles of good software design. • Evaluate software testing methodologies. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Software Engineering: Defining Software, Software Application Domains, Software Engineering Layers, Software Myths. Process Models: The Waterfall Model, Incremental process model, Evolutionary Process Model – Prototyping and The Spiral model.			10
UNIT II	Software Requirement: Functional and non-functional requirement, Software requirements document, requirements specification. Requirements Engineering Process: Requirements elicitation and analysis, requirements validation, Requirements management. System Models: Behavioral models, Object Models.			10
UNIT III	Design Engineering: Design Concepts, Architectural Styles, Architectural Design. Modeling Component-level design: designing class –based components, conducting component-level design. User Interface Design: Golden rules, User interface analysis and design			10
UNIT IV	Testing Strategies: A strategic approach to software testing, Validation testing, System testing. Testing Conventional Applications: White-Box Testing (Basis Path Testing), Black Box Testing (Equivalence Partitioning, Boundary Values Analysis).			08
UNIT V	Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM plan. Software Quality Assurance: Software Reviews, Formal technical Reviews, Statistical Software quality Assurance, Software reliability.			10

Recommended Learning Resources

Text Books:

1. Ian Somerville, Software Engineering, 9th Edition, Pearson Publication Ltd. 2011
2. Roger Pressman, Software Engineering – A practitioner's approach 6th edition McGraw Hill 2010.

Reference Books:

1. Carlo Ghejgietal, Fundamentals of software – engineering, Pearson Education.
2. Panakaj Jalote, An Integrated approach to software engineering – Narosa Publishing house.

Year	III	Course Code: SEPBCADSCT 5.2	Credits	03
Semester	V	Course Title: Web Content Management (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand content development basics; • Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting • Host websites and develop content for social media platforms such as wiki and blog • Understand e-publications and virtual reality • Use of e-learning platform Moodle and CMS applications Drupal and Joomla 			
Unit No.	Course Content			Hours
UNIT I	Web Content Development and Management: Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing			10
UNIT II	Web Hosting and Managing Multimedia Content: Creating and Maintaining a Wiki Site. Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques, Multilingual Content Development.			10
UNIT III	Planning and Developing Dynamic Web Content Sites: Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site			10
UNIT IV	E- Publication Concept: E- Pub Tools, Simulation and Virtual Reality Applications, Creating 2D and 3D Animations. Introduction to Moodle, Creating a New Course and Uploading,			10
UNIT V	Create and Add Assessment: Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal			08
Recommended Learning Resources				
Text Books:				
<ol style="list-style-type: none"> 1. Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker. 2. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko. 3. Moodle for Learning Management System (LMS): A Practical and Visual Guidebook of Administrator and Instructor for Distance Education Paperback – October 12, 2020 by James Koo 4. Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia 				
Reference Books:				
<ol style="list-style-type: none"> 1. https://onlinecourses.swayam2.ac.in/cec20_lb09/preview 				

Year	III	Course Code: SEPBCADSCT 5.3	Credits	03
Semester	V	Course Title: Cyber Security (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand cyber-crime, its origin and cyber security privacy issues • To understand various types of cyber-attacks and cyber-crimes • Analyze the threats and risks within context of the cyber security • Evaluate the defensive techniques against these attacks • Understand cyber security act and laws 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime.			09
UNIT II	Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones.			10
UNIT III	Tools and Methods Used in Cyberline: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft) Cybercrimes and Cybersecurity:			10
UNIT IV	Understanding Computer Forensics: Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, The Security/Privacy Threats, Forensics Auditing, Anti Forensics			10

UNIT V	The Legal Perspectives: Why do we need Cyberlaw: The Indian Context, The Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment. Cybercrime and the Indian ITA 2000, A global Perspective on cybercrime.	09
Recommended Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81-265-21791, 2011, First Edition (Reprinted 2018) 		
Reference Books:		
<ol style="list-style-type: none"> 1. Kenneth J. Knapp, Cyber Security & Global Information Assurance Information Science 		

Year	III	Course Code: SEPBCASPET 5.4	Credits	03
Semester	V	Course Title: Data Analytics with R (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand Data analytics, its types and its applications. • Gain knowledge of R programming fundamental concepts like variables, data types, operators. • Apply the basics in R programming in terms of functions, loops, decision making and data structure. • Design various experiments based on graphs and charts for data visualization in R programming. • Analyze of statistical computations for data analytics. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Data Analytics : Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics.			09
UNIT II	R Programming Structures: Overview of R programming, Variables and Data Types, Operators. Control Statements, Looping, Vectors, Arrays, Matrices, List and Data Frames. User defined Functions. Built in Functions: Math Functions, Statistical functions, String functions.			10
UNIT III	Basic Statistics : Mean, Median and Mode, Variance and Standard Deviation, Descriptive Analysis, Normal Distribution, T test, Analysis of Variance (ANOVA) Test: One Way & Two Way ANOVA, Regression: Linear and Multiple Linear Regression, Logistic Regression. Time Series Analysis.			10
UNIT IV	Data Preparation : Datasets, Importing and Exporting files, Accessing Databases, Data Cleaning and Transformation.			10
UNIT V	Data handling and Visualization using R: Reading and getting data into R (External Data): Using CSV files, XML files, Web Data, JSON files, Databases, Excel files. Working with R Charts and Graphs: Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts.			09

Recommended Learning Resources

Text Books:

1. “Big Data Fundamentals” Thomas Erl, Wajid Khattak, and Paul Buhler:: Concepts, Drivers and techniques , Pearson, Latest Edition
2. “R for Everyone”, Jared P Lander, Pearson Education 2017, Latest Edition.
3. R Programming: An Approach to Data Analytics, G. Sudhamathy and C. Jothi Venkateswaran, MJP Publishers, 2019.
4. “Beginning R: An Introduction to Statistical Programming”-Larry Pace, Latest Edition”.

Reference Books:

1. “Introductory Statistics with R”, P Dalgaard, Second edition.
2. “Beginning R-The statistical Programming language”, Mark Gardner, John Wiley & Sons 2012, Latest Edition.
3. “An Introduction to R” , Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16). URL: <https://cran.rproject.org/doc/manuals/r-release/R-intro.pdf>

Year	III	Course Code: SEPBCASPET 5.5	Credits	03
Semester	V	Course Title: C# using .NET Framework (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language. • Interpret and Develop Interfaces for real-time applications. • Build custom collections and generics in C#. • Design and develop GUI based applications in C#. 			
Unit No.	Course Content			Hours
UNIT I	<p>C# Language fundamentals: Introducing the Building Blocks of the .NET Platform(CLR, CTS and CLS). Anatomy of C# program. The System. Environment Class. The System. Console Class, Understanding Value Types and Reference Types, The System Data types, Operators, Decision Constructs, Iteration Constructors, The System.String data types, String Builder, .NET Array Types, Defining Classes and Creating objects, Pillars of OOP, C#'s Inheritance Support, C#'s Polymorphic Support, Understanding C# Partial types, Understanding Boxing and Unboxing Operations.</p>			12
UNIT II	<p>Object Life time and Exception handling: Understanding Object Lifetime classes, Objects and References, the basics of Object Lifetime, System.GC typr, Building Finalizable Objects, Building Disposable Objects, Ode to Errors, Bugs and Exceptions, The Role of .NET Exception Handling, throwing generic exceptions, catching exceptions, Configuring the state of an exception, System – Level Exception, Application - Level Exception, Processing Multiple Exception, Generic catch statements, Inner exceptions, Finally Block.</p>			12
UNIT III	<p>Interfaces, Collections, Delegates & Events: Defining Interfaces in C#, Implementing an Interface in C#, Contrasting Interfaces to Abstract Base Classes, Collections: Introducing Collections, Benefits of Collection Classes, Understanding and using commonly used collections, Interfaces of the System.Collections Namespace, .NET Delegate type, defeining a Delegate in C#, System.Delegate Base Classes, Delegate examples, C# Events.</p>			08
UNIT IV	<p>GUI using Windows Forms and Database Programming: Controls- TextBox, label, Button, checkbox, radiobutton, listbox, combobox, Datetime picker, Common properties. methods and events, menus, context menus. Menustrip, Graphics and GDI, SDI and MDI, Dialog boxes; Database Programming Understanding the Role of Managed Provider and ADO.NET Objects Connecting to Database. Performing Insert, Update and Delete Operations, Executing Select Statements.</p>			08

<p style="text-align: center;">UNIT V</p>	<p>Understanding .NET Assemblies and file handling: Assemblies-The Role of NET Assemblies, Understanding the format of .NET Assemblies, single file assembly, multifile assembly. Private and Shared Assemblies; File handling: The System IO Namespace, Directory (Info) and File (Info) types, Working with Directory Info, Directory Type, File Info, File Type Classes, Abstract Stream Class, Stream Writers and Stream Readers, String Writers and String Readers, Binary Writers and Binary Readers.</p>	<p style="text-align: center;">08</p>
<p>Recommended Learning Resources</p>		
<p>Text Books:</p>		
<ol style="list-style-type: none"> 1. Andrew Troelsen: Pro C# with .NET 3.0, Special Edition aPress, India, 2007. 2. E. Balagurusamy: Programming in C#. 5th Reprint, Tata McGraw Hill.2004. 3. Herbert Schildt: The Complete Reference C#, Tata McGraw Hill, 2004 		
<p>Reference Books:</p>		
<ol style="list-style-type: none"> 1. C# 2008 programming cogent learning solutions Inc. DreamtechPress. 2. C#2008 Programming covers .net 3.5 Black Book Beginners Edition cogent learning solutions Inc. DreamtechPress. 		

Year	III	Course Code: SEPBCASPET 5.6	Credits	03
Semester	V	Course Title: Full Stack Development (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Design dynamic and interactive web pages and websites. • Run PHP scripts on the server and retrieve results. • Handle databases like MySQL using PHP in Website • Develop applications using object oriented concepts. • Implement advanced web security and Data Optimization techniques. 			
Unit No.	Course Content			Hours
UNIT I	Fundamentals of PHP and Web Development: Introduction to Web Development (Frontend, Backend, Full-Stack), Understanding Client-Server Architecture & HTTP Protocol, Setting up Local Server (XAMPP, WAMP, LAMP), Basics of PHP: Syntax, Variables, Data Types, Control Structures (if-else, switch, loops), Functions in PHP (User-defined , String & Math Built-in)			09
UNIT II	Advanced PHP Concepts: String Manipulation & Regular Expressions, PHP Arrays (Indexed, Associative, Multidimensional), Form Handling with PHP (GET, POST), PHP File Handling (Read, Write, Append, Delete), PHP Sessions & Cookies Management, Error Handling & Exception Handling in PHP, Working with Date & Time Functions			09
UNIT III	MySQL Database & PHP Integration: Introduction to Databases & MySQL, Setting up MySQL with PHP, Database Design & Normalization Concepts, MySQL Commands (DDL, DML, DCL), Connecting PHP with MySQL using MySQLi , CRUD Operations (Create, Read, Update, Delete), Advanced SQL Queries (Joins, Subqueries, Indexing), Working with Stored Procedures & Triggers, Importing & Exporting Data (CSV, JSON, XML), Sending Emails using PHP (PHPMailer)			10
UNIT IV	Object-Oriented Programming (OOP) in PHP: Classes & Objects, Inheritance, Polymorphism, Encapsulation, Static Methods & Properties Password Hashing & Encryption (bcrypt, Argon2), Preventing SQL Injection, XSS, CSRF Attacks, Secure File Upload Handling (Image Uploading), Integrating Third-Party APIs (Payment Gateway, SMS, Email)			09

UNIT V	Advanced Web Security & Performance Optimization: User Authentication & Authorization - Role-Based Access Control (RBAC), API Authentication (JWT, OAuth), PHP Performance Optimization: Optimizing PHP Code for Speed & Efficiency, Reducing Memory Usage, Using Opcode Caching (APCu, OPcache), Profiling PHP Code (Xdebug, Blackfire). Database Optimization Techniques : Query Optimization & Indexing, Using Connection Pooling & Persistent Connections, Caching Database Queries. Working with Web Services & APIs : Consuming RESTful APIs in PHP, Creating APIs with PHP	11
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Recommended Learning Resources

Text Books:

1. PHP A Beginner's Guide, VIKRAM VASWANI, Tata McGraw-Hill, 2008.
2. The PHP Complete Reference, Steven Holzner –Tata McGraw-Hill Edition, 2010
3. Spring into PHP5, Steven Holzer, Tata McGraw Hill Edition, 2005

Reference Books:

1. "PHP and MySQL Web Development" – Luke Welling & Laura Thomson
2. "PHP Objects, Patterns, and Practice" – M. Papantonio & M. Schumacher
3. "The Joy of PHP: A Beginner's Guide" – Alan Forbes
4. "Modern PHP: New Features and Good Practices" – Josh Lockhart
5. "Laravel: Up & Running" – Matt Stauffer

Year	III	Course Code: SEPBCASPEP 5.7		Credits	02
Semester	V	Course Title: Data Analytics with R - Lab			
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.		
Practice Programs:					
<ul style="list-style-type: none"> • R Program to find Factorial of given number using recursion. • R program for finding stationary distribution of markov chains. • R Program for implementing Quick Sort for Binary Search. • R Program Generate random numbers from Standard Distribution. • R Program to check Prime numbers. • R Program to check Leap year. 					
Part A					
<ol style="list-style-type: none"> 1. R program to Illustrate with if-else statement and how does it operate on vectors of variable length. 2. R program Illustrate with for loop and stop on condition, to print the error message. 3. R Program to implement T-Test for Anova. 4. R Program Compute mean values for vector aggregates defined by factors tapply and sapply. 5. R program to implement different string manipulation functions. 6. R Program Illustrate Reading & Writing Files. 7. R program for any visual representation of an object with creating graphs using graphic functions also demonstrate the legends: Plot(),Hist(),Linechart(),Pie(),Boxplot(),Scatterplots().. 					
Part B					
<ol style="list-style-type: none"> 1. R program for with any dataset containing data frame objects, and employ manipulating and analyzing data. 2. Program to create an application of Linear Regression in multivariate context for predictive purpose. 3. R Program to Find Mean, Mode , Median , Variance and Standard Deviation. 4. R program that performs data cleaning and transformation effectively using a sample dataset. (It covers handling missing values, removing duplicates, renaming columns, filtering, sorting, and adding new columns.) 5. Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis. <ol style="list-style-type: none"> a) Find the total number rows & columns b) Find the maximum salary c) Retrieve the details of the employee with maximum salary d) Retrieve all the employees working in the IT Department. e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file “output.csv” 6. R program to create a matrix using vectors and perform following operations. <ol style="list-style-type: none"> a) Find transpose of a matrix ii) Find row and column sum of matrix b) Find row and column index of maximum and minimum value in the given matrix. c) Find sum of principal diagonal elements. 7. R program to create a Data Frame with following details and do the following operations. 					

itemCode	itemCategory	itemPrice
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

- a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
 - b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
 - c) Create another Data Frame called “item-details” with three different fields itemCode, ItemQtyonHand and ItemReorderLvl and merge the two frames.
- 8.** R program to perform time series analysis on the monthly airline passenger dataset (AirPassengers) from 1949 to 1960. The program should:
- a) Visualize the time series data.
 - b) Decompose the time series into trend, seasonal, and residual components.
 - c) Build a forecasting model using the ARIMA (AutoRegressive Integrated Moving Average) model.
 - d) Predict the next 12 months' passenger traffic

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 5.8		Credits	02
Semester	V	Course Title: C# using .NET Framework - Lab			
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.		

Practice Programs:

- Create an application to simulate the working of Font Dialog box using list boxes, label and button controls.
- Program to insert the data in the database having fields such as Roll No, Name, Age and ContactNo using Execute-Non Query.
- Program to input Roll No and display the corresponding student details using database.
- Program to implement Stream Reader and Stream Writer classes.

Part A

1. C# program to show the machine details like machine name, Operating System, Version, Physical Memory and calculate the time since the Last Boot Up. (Hint: Use System.Environment Class)
2. C# Sharp program to calculate roots of Quadratic Equation
3. Program in C# Sharp to count a total number of alphabets, digits and special characters in a string
4. Program in C# Sharp to create a function to calculate the sum of the individual digits of a given number.
5. Draw a square with sides 100 pixels in length. Then inscribe a circle of radius 50 inside the square. Position the square and the inscribed circle in the middle of the screen
6. Program to implement multilevel inheritance.
7. Program to demonstrate System exception.

Part B

1. Object oriented program to demonstrate bank transaction. Include methods for amount deposit, amount withdrawal and display.
2. Program that inputs the coordinates of three mouse clicks from the user and then draws a triangle in the output window using those three points.
3. Demonstrate operator overloading two complex numbers.
4. Program to demonstrate Application exception.
5. Demonstrate Dialog box (Modal and Modeless).
6. Program to demonstrate Directory Info and File Info.
7. Program in C# Sharp to create Menu and menu items.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 5.9		Credits	02
Semester	V	Course Title: Full Stack Development - Lab			
Course Pre-requisites, if any			NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40		Duration of ESA: 03hrs.	

Practice Programs:

- Write a program to display current date and time in different formats
- Write a program to create a simple calculator using basic php logic and forms
- Write a PHP script to write content to a file and then read it back
- Write a PHP script to send email using PHP (SMTP, PHPMailer)

Part A

1. PHP program to demonstrate variables, constants, and different data types.
2. Program that takes user input and determines if the number is prime using functions.
3. Program to read and write data to a text file using PHP.
4. PHP script that validates an email ID using regex and performs string operations.
5. Build a simple login form that captures user input using both GET and POST methods.
6. PHP application that implements login functionality using sessions and cookies.
7. Program that demonstrates the use of try-catch blocks and custom exceptions in PHP.
8. PHP script to connect with MySQL and perform Create, Read, Update, and Delete (CRUD) operations.

Part B

1. PHP application that uses Joins, Subqueries, and Prepared Statements for secure database queries.
2. Program to export MySQL data into a CSV file and import data from a JSON file.
3. PHP program using Classes, Objects, Inheritance, and Encapsulation.
4. Develop a user login & registration system with password hashing using bcrypt/Argon2.
5. PHP script to upload images securely with validation and file size restrictions.
6. Build a REST API that allows users to fetch, add, update, and delete records from a MySQL database.
7. PHP program that sends emails using PHPMailer with SMTP authentication.

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASECT 5.10	Credits	02
Semester	V	Course Title: Gaming And Animation (Theory)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the basics of Animation and Animation properties in HTML and CSS • Create and apply various effects to animation slides • Understand basics of gaming • Design games, using HTML and JavaScript 			
Unit No.	Course Content			Hours
UNIT I	<p>Introduction: What is an Animation?, HTML5 – SVG ,Viewing SVG Files , SVG Circle , Rectangle, SVG Line SVG Ellipse ,SVG Polygon ,SVG Polyline ,SVG Gradients SVG StarThe Start and End States , Interpolation , Animations in HTML, All About CSS Animations, Creating a Simple Animation ,CSS Animation Property , Reusing Keyframes , Declaring Multiple Animations, Wrap-up, All About CSS Transitions, Adding a Transition ,Looking at Transitions in Detail , The Longhand Properties , Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions, The transition End Even</p>			10
UNIT II	<p>Sliding Background Effect on Link Hover , Overview of How This Works , How this Effect Really Works, Creating a Sweet Content Slider , Overview of How It Works , The Code,The<BLINK>Tag Shall Live On , Re-creating the Blink Effect , Overview of How It Works, Simple Text Fade and Scale Animation , The ExampleMove Element to Click Position , The Example , The Full Code , How This All WorksHover Effects Using Animations , What This Looks Like , Hovering, CSS Animations, and Handoffs</p>			10
UNIT III	<p>Animations Created in Code, Why Animate Using JavaScript, Breaking Down a JavaScript Animation , Looking at a Real Example , Going a Little More CrazyMeetrequest AnimationFrame, Meet request Animation Frame ,Using It Another Example ,Your Frame Rate ,Stopping your request Animation Frame LoopVendor Prefixes in JavaScript , Meet the Vendor Prefixes in JavaScript , Dealing with Vendor Prefixes, Animating What You Draw, How This Is All Going to Work , Actually Drawing and Animating on a Canvas , Animating Your Circle. Game IntroGame, CanvasGame, ComponentsGame, ControllersGame, ObstaclesGame, ScoreGame, ImagesGame, SoundGame, GravityGame, BouncingGame, RotationGame, Movement</p>			10
Recommended Learning Resources				
Reference Books:				
<ol style="list-style-type: none"> 1. Animation in HTML, CSS, and JavaScript ByKirupaChinnathambi 2. https://www.tutorialspoint.com/html5/index.htm 3. Gaming Section last unit :https://www.w3schools.com/graphics/game_intro.asp 4. https://cloudinary.com/blog/creating_html5_animations 				

Scheme of Evaluation
Semester End Exam Question Paper Pattern

Duration of the examination: 3hour Max. Marks: 80

Section A

Answer any TEN Questions from the following, each carries 2 marks: [10X2=20]

1. -----
2. -----
3. -----
4. -----
5. -----
6. -----
7. -----
8. -----
9. -----
10. -----
11. -----
12. -----

Section B

Answer any FOUR from the following questions each carries 5 marks. [4X5=20]

13. -----
14. -----
15. -----
16. -----
17. -----

Section C

Answer any FOUR from the following questions each carries 10 marks. [4X10=40]
(The Question may consists two sub-questions)

18. -----
19. -----
20. -----
21. -----
22. -----

CIA for Practical	
Assessment Type	Marks
Test1	10
Total	10 Marks

Semester End Examination Scheme of Evaluation for Lab Examination

Assessment Criteria	Marks
Writing of 2 Programs (Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva Voice	05
Total 40 Marks	40 Marks

Instructions:

1. Certified Journal is mandatory for appearing in the Lab examination.
2. Students shall be given two programming assignments taking into consideration the duration of the time allotted to students for writing, typing and executing the programs.

CIA for Theory	
Assessment Type	Marks
Test 1 / Seminar / Activity	10
Test 2 / Seminar / Activity	10
Total	20 Marks

Note: Guidelines given by the university from time-to-time shall be followed for IA.

CIA for Project Work	
Assessment Type	Marks
First Internal Assessment	30
Second Internal Assessment	30
Total	60 Marks

First Internal Assessment

Max.Marks: 30

Time: 20 minutes

Students shall present the details of the project work carried out that includes the following

- Synopsis contents
- Problem identification and proposed solution
- SAD, SRS
- Database Design
- Functions

PowerPoint slides shall be used by the students to present the work carried out.

Second Internal Assessment

Max. Marks: 30

Time: 30minutes

Students shall present the details of the project work carried out that includes the following

- Coding details
- Forms and reports
- Demo of the application developed

Note: IA marks shall be assigned by the concerned guide monitoring the project work of the students.

Semester End Examination Scheme of Evaluation for Project Work.

Assessment Criteria	Marks
Dissertation/Project Report evaluation	100
Presentation/Demo of the application developed : (navigation of the application, features incorporated, data validation, UI, reports, etc.)	100
Viva Voice	40
Total	240 Marks



RANI CHANNAMMA UNIVERSITY

BELAGAVI

THE COURSE STRUCTURE AND SYLLABUS OF UNDERGRADUATE

B.C.A PROGRAMME

w.e.f.

Academic Year 2026-27 and Onwards Under

State Education Policy (SEP)

Submitted by
Prof. Parashuram Bannigidad
Chairman,
Board of Studies (UG),
Computer Science,
Rani Channamma University, Belagavi.

V Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory/ Practical	Total	
Part I DSC#	SEPBCADSCT 5.1	Software Engineering	4	-	3	20	80	100	3
	SEPBCADSCT 5.2	Web Content Management	4	-	3	20	80	100	3
	SEPBCADSCT 5.3	Cyber Security	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 5.4	Data Analytics with R	4	-	3	20	80	100	3
	SEPBCASPET 5.5	C# using .NET Framework	4	-	3	20	80	100	3
	SEPBCASPET 5.6	Full Stack Development	4	-	3	20	80	100	3
	SEPBCASPEP 5.7	Data Analytics with R - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.8	C# using .NET Framework - Lab	-	4	3	10	40	50	2
	SEPBCASPEP 5.9	Full Stack Development - Lab	-	4	3	10	40	50	2
Part III SEC Skill	SEPBCASECT 5.10	Practical Knowledge / Skill Gaming And Animation	2	-	2	10	40	50	2
Total			26	12				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses SPEC : Specialization.

Note : For the SEPBCASECT 5.10 the semester-end examination will consist of multiple-choice questions.

VI Semester BCA w.e.f 2026-27 and onwards

Part	Course Code	Subject Name	Teaching Hrs / week	Practical Hrs / week	Examination				Credits
					Exam Duration Hrs	Marks			
						IA	Theory/ Practical	Total	
Part I DSC#	SEPBCADSCT 6.1	Data Warehousing and Mining	4	-	3	20	80	100	3
	SEPBCADSCT6.2	Cloud Computing	4	-	3	20	80	100	3
	SEPBCADSCT6.3	Mobile Application Development	4	-	3	20	80	100	3
Part II SPEC*	SEPBCASPET 6.4	Artificial Intelligence & Machine Learning	4	-	3	20	80	100	3
	SEPBCASPEP 6.5	Artificial Intelligence & Machine Learning Lab	-	4	3	10	40	50	2
	SEPBCASPEP 6.6	Project work	-	12	3	60	240	300	10
Part II SEC	SEPBCASECT 6.7	Digital Marketing	2	-	2	10	40	50	2
Total			18	14				800	26

DSC : Discipline Specific Courses, SEC : Skill Enhancement Courses, SPEC : Specialization.

Note : For the SEPBCASECT 6.7 the semester-end examination will consist of multiple-choice questions.

Prof. Parashuram Bannigidad
Chairman BOS(UG),
Department of Computer Science,
RCUB, Belagavi

Prof. Vishwanath B. Awati
Dean,
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RCUB, Belagavi

Year	III	Course Code: SEPBCADSCT 6.1	Credits	03
Semester	VI	Course Title: Data Warehousing and Mining (Theory)	Hours	48
Course Pre-requisites, if any		Basics of HTML, CSS, Java Script		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Introduction to general issues of Data Warehouse and Data Mining. • Understanding of the different architectures and mining techniques • The role and functions of Data Warehouse and Data Mining • Explain the stages and process different data mining techniques. • Learn mining and warehouse techniques through the use of different tools 			
Unit No.	Course Content			Hours
UNIT I	<p>Data Warehouse: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction Transformation-Loading, Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact Less-Facts, OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.</p>			10
UNIT II	<p>Data Mining: Motivation for Data Mining, Data Mining Functionalities, Knowledge Discovery Process, Data Mining Techniques, Issues and applications; Data Objects and attribute types, Statistical description of data, Data Preprocessing: Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.</p>			08
UNIT III	<p>Data Cube Technology: Efficient method for data cube computation, Cube materialization (Introduction to Full cube, Iceberg cube, Closed cube, Shell cube), General strategies for cube computation, Attribute oriented induction for data characterization. Mining Frequent Patterns: Frequent patterns, Market basket analysis, Frequent itemsets, closed itemsets, association rules, Types of association rule (Single dimensional, multidimensional, multilevel, quantitative), Finding frequent itemset (Apriori algorithm, FP growth), Generating association rules from frequent itemset, Limitation and improving Apriori, From Association Mining to Correlation Analysis.</p>			10
UNIT IV	<p>Classification And Prediction : Definition (Classification, Prediction), Learning and testing of classification, Classification by decision tree induction, ID3 as attribute selection algorithm, Bayesian classification, Laplace smoothing, Classification by backpropagation, Rule based classifier (Decision tree to rules, rule coverage and accuracy, efficient of rule simplification), Support vector machine, Evaluating accuracy (precision, recall, f-measure), Issues in classification.</p>			10

<p style="text-align: center;">UNIT V</p>	<p>Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms. Mining Spatial, Multimedia, Text And Web Data : Spatial data mining, Spatial data cube, Mining spatial association, Multimedia data mining, Similarity search in multimedia data, Mining association in multimedia data, An introduction to text mining, natural language processing and information extraction, Web mining (Web content mining, Web structure mining, Web usage mining)</p>	<p style="text-align: center;">10</p>
<p>Recommended Learning Resources</p>		
<p>Text Books:</p>		
<p>1. Jiawei Han, Micheline Kamber and Jian Pei“Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.</p>		
<p>Reference Books:</p>		
<p>1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.</p> <p>2. Introduction to Data Mining, 2nd ed. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar. Pearson Publisher, 2019.</p>		

Year	III	Course Code: SEPBCADSCT 6.2	Credits	03
Semester	VI	Course Title: Cloud Computing (Theory)	Hours	48
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.	
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. • Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost. • Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing. • Analyze various cloud programming models and apply them to solve problems on the cloud. 			
Unit No.	Course Content			Hours
UNIT I	Introduction: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Applications of Cloud Computing; Trends in Cloud Computing; Leading , Challenges Ahead, Historical Developments, Different Computing Paradigms: Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Platform Service Providers.			10
UNIT II	Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models: Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Virtualization- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization,			10
UNIT III	Cloud Applications: Moving Applications to the Cloud –Microsoft Cloud Services Google Cloud Applications –Amazon Cloud Services –Cloud Applications			08
UNIT IV	Cloud Computing At Work: Software as a service-overview, driving forces, company offerings, industries, software plus services- overview, mobile device integration, Providers, Microsoft Online.			10
UNIT V	Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud) Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications: CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.			10

Recommended Learning Resources

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing- Foundations and Applications Programming", Elsevier, 2013
2. Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3. Cloud Computing A practical Approach, Anthony T Velte, Toby J Velte, Ph.D. Robert Elsenpeter, McGraw Hill Education(India) Private Limited.
4. K Chandrashekar: "Essentials of Cloud Computing", CRC Press, 2015
5. A.Srinivasan and J.Suresh, "Cloud Computing –A Practical Approach for Learning and Implementation", Pearson India Publications

Reference Books:

1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

Year	III	Course Code: SEPBCADSCT 6.3		Credits	03
Semester	VI	Course Title: Mobile Application Development (Theory)		Hours	48
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.		
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Being able to build cross platform mobile application development. • Understand the basics of the Dart programming language. • Learn the fundamentals of Flutter widgets. • Learn how to design and build user interfaces with Flutter. 				
Unit No.	Course Content			Hours	
UNIT I	Introduction to Mobile Applications : Development, Flutter Introduction: Features of Flutter Advantages of Flutter and Disadvantages of Flutter, Flutter SDK, Android Studio and Creating Simple Hello world Application with flutter, Hot Reload Feature, Basic Flutter Application Structure, Creating Simple Flutter App using Online Sandboxes like FlutLab.io			10	
UNIT II	Dart Programming Language Basics: Variable declaration and initialization, Constants and final values, Data Types: Numeric values, Strings, Boolean Types, Operators, Flow Control constructs: if and switch statements, looping statements. Lists and Maps. Object oriented Programming in Dart: Defining Classes, Instance Variables and Methods. Named parameters, Arrow functions Constructors, Subclasses.			10	
UNIT III	Introduction to Widgets: Widgets, Gestures, Concept of State, Layers Widget Build Visualization, Platform Specific Widgets, Layout Widgets: Types of Layout Widgets, MaterialApp, Scaffold, Center, Row, Column, Expanded, Align, Container, Padding and Text Widgets, Button, Image and Icon Widgets.			10	
UNIT IV	Introduction to Gestures and State management: Tap, Double Tap, Long Press, VerticalDrag, Horizontal Drag and Pan. Dialogs, Flutter State Management: Ephemeral State Management, Application State, Navigation and Routing. Stateful Widgets: Input, Checkbox, Radio, Date and Time pickers and ListView			10	
UNIT V	Introduction to Dart Packages and Database Concepts: Types of Packages and using Dart Package, Database Concepts: SQLite, SQLiteDbProvider object and its methods			08	

Recommended Learning Resources

Text Books:

1. Beginning Android Programming with Android Studio, 4th Edition
Jerome DiMarzio ISBN: 978-1-119-41933- April 2017-Wiley.464 pages
2. Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK
By Author Frank Zammett.

Reference Books:

1. https://www.tutorialspoint.com/flutter/flutter_tutorial.pdf
2. <https://flutlab.io/>
3. <https://zapp.run/>
4. <https://www.geeksforgeeks.org/android-tutorial.>

Year	III	Course Code: SEPBCASPET 6.4		Credits	03
Semester	VI	Course Title: Artificial Intelligence & Machine Learning (Theory)		Hours	48
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 20		Summative Assessment Marks: 80	Duration of ESA: 03hrs.		
Course Outcomes	<p>After the successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • Understand problems solved by AI, types of intelligent agents • Understand the nature of environment of agents • Application of informed and uninformed searching techniques • Evaluate techniques used for knowledge representation • Analyze supervised and unsupervised machine learning algorithms 				
Unit No.	Course Content			Hours	
UNIT I	<p>Introduction: What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, History of AI, intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.</p>			10	
UNIT II	<p>Searching: Searching for solutions: uniformed search strategies – Breadth first search, depth first Search. Informed (Heuristic) Search Strategies, Heuristic Functions Heuristic search techniques: A* Search, AO* search Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis Game Playing-Adversarial search, Games, mini-max algorithm</p>			10	
UNIT III	<p>Knowledge representation and Logic Programming: Representations and mappings, Approaches to knowledge representation, First order logic, predicate logic, Inference in Predicate Logic, semantic nets- frames and inheritance.</p>			08	
UNIT IV	<p>Introduction to machine learning: Basics of machine learning - Human Learning - Define machine learning - -Applications of machine learning-List the Tools used for machine learning- Advantages and disadvantages of machine learning. Types of machine learning – Supervised Learning, unsupervised, reinforcement Supervised learning : Regression models: Simple Linear Regression, multiple linear Regression. K-Nearest-Neighbors (KNN), Logistic Regression, Support Vector Machines (SVM) Classification Model-Classification learning Steps - Classification Algorithms - Naive Bayes Classifier, Decision tree - Applications of supervised learning</p>			12	
UNIT V	<p>Unsupervised learning: Different types of clustering techniques – clustering Algorithms - K-Means Clustering, Hierarchical clustering algorithms - Agglomerative Clustering, Association Algorithm - Apriori algorithm - Applications of Unsupervised learning</p>			08	

Recommended Learning Resources

Text Books:

1. Elaine Rich, Kevin Knight, Shivashanka B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition. 2013
2. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
3. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.

Reference Books:

1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Year	III	Course Code: SEPBCASPEP 6.5	Credits	02
Semester	VI	Course Title: Artificial Intelligence & Machine Learning - Lab		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 03hrs.	

Practice Programs:

- Creation and loading different datasets in Python.
- Program to compute Mean, Mode, Median, Variance and Standard deviation using datasets.
- Program to implement minimax algorithm for an application
- Program to analyze students' scores based on study hours using regression.

Part A

1. Program to implement Breadth-First Search(BFS) algorithm.
2. Program to illustrate Depth-First Search (DFS) algorithm.
3. Program to describe A* algorithm.
4. Program to enforce Hill climbing algorithm.
5. Program to perform Tic Tac Toe algorithm.
6. Program to Implement and evaluate a simple linear regression model.
7. Program to Implement a KNN classifier.

Part B

1. Program to execute NaiveBayes algorithm
2. Program to perform decision tree algorithm
3. Program to Implement and visualize K-means clustering.
4. Program to carry out SVM for classification.
5. Program to demonstrate K-means clustering.
6. Program to describe Agglomerative clustering.
7. program to fulfill Apriori algorithm

Note : Programs to be implemented using Python Programming Language

Instructions:

- Certified Journal is mandatory for every student to appear for the examination.
- Student has to execute all programs in each part to complete the Lab course.
- 10 marks of internal assessment (IA) will be awarded based on practical test.

Year	III	Course Code: SEPBCASPEP 6.6	Credits	10
Semester	VI	Course Title: Project work		
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 60		Summative Assessment Marks: 240	Duration of ESA: 03hrs.	

Objective:

The objective of the BCA project work is to develop a quality software solution by following the software engineering principles and practices. During the development of the project the students shall implement all the stages of the software development life cycle (SDLC).
This Lab will enable students to demonstrate their practical and theoretical skills gained during five semesters of study in BCA Programme

Part A

Instructions

- The students are required to carry out the project in a group of two or three students under the guidance of course teacher.
- Project work problem statement shall be identified by the students with the help of the course teachers and students shall submit the synopsis/project proposal of the same during the second week of the commencement of VI semester BCA course.
- During project development, students are expected to define a project problem, do requirements analysis, systems design, software development, apply testing strategies and do documentation with an overall emphasis on the development of a robust, efficient and reliable software systems.
- No change in the title of the project work shall be allowed after 3rd week of the commencement of VI semester BCA course.
- The project development process has to be consistent and should follow standards identified by the guide monitoring the project work.
- There is no restriction on use of hardware and software for carrying out the project work except that ready application packages are not allowed.
- The students have to submit the individual dissertation of the project work carried out in one hard copy along with soft copy written on compact disc.

Project Dissertation Details:

- The standard procedure for documenting the project work shall be followed. However, while writing is in progress, students shall get each chapter evaluated by to their supervisor for necessary feedback, especially on technical content. Note that the quality of the dissertation is more important than its number of pages.
- The dissertation text (defined as everything except title page, table of contents, references and appendices) should be around 50-70 A4 pages. The length (dissertation text together with appendices) of the dissertation should be less than 100pages.

The students are advised to follow the following typing recommendations

Contents of the dissertation:

Preface: Title page, certificate, student declaration page, abstract, acknowledgement page, contents, list of figures, list of tables, and list of acronyms.

Main chapters:

- **Introduction:** The motivation for the project should be argued here. Then a brief introduction to the project should be provided indicating its objectives and scope. Finally, a paragraph containing an outline of the remaining chapters (starting with Chapter 2) is recommended.
- **Analysis:** information on the existing system should be provided-The students can incorporate different types of diagrams to describe the processes and functionalities of the existing system. The candidate should review software of the proposed system. An analysis of the requirements should

also be provided in this chapter. For example, the requirements of the system could be listed. A specification of the number of users, the frequency of use, and the jobs of the users could be provided. Functional requirements covering system functionality expected by the users should be addressed. Include a section to the end of the analysis chapter to describe the selected methodology.

- **Design:** In this chapter the student should consider different competing design strategies (alternative solutions) for his system. The different strategies may involve the way of development (developing from scratch, using open-source components, etc.), the development platform (stand-alone personal computer, client-server environment, etc.), choice of system software (Windows, Linux, etc.). The candidate should compare how the project requirements are satisfied through each alternative. The design of the proposed system should be another major section of this chapter. The candidate should describe the design of the system referring to different types of diagrams/models; for example, if no object oriented methodology has been selected then include use case diagrams, use case narratives, activity diagrams, and entity relationship diagrams, and if object oriented methodology has been selected then include use case diagrams and use case narratives, class diagrams, sequence diagrams. User interface design is the next major section of this chapter. The candidates should describe the design considerations for designing user interfaces of the system and justify the design decisions that were made. Layouts of relevant interfaces should be included in order to clarify the design decisions taken.
- **Implementation:** This chapter should describe the implementation of the system. For example, it should identify and explain all major code and module structures. Include a diagram to depict and describe the interaction between modules of the system. Also, the implementation environment (hardware and software), any existing code that was reused by the candidate, development tools used, and any platform dependence must be discussed. Appropriate technical documentation may be included as appendices to the dissertation if they are expected to be useful for the reader. Note that a list of selected code will appear in appendix and the code used in this chapter should be presented for the purpose of explaining the implementation aspects of selected important code. This code should be presented as a code segment.
- **Evaluation:** A comprehensive test plan that was used to verify and validate the system should be provided. Evidence should be provided of using a wide range of test data. Evidence should be produced to show that all aspects of the system have been tested and specification has been met. Description of the effects of various kinds of errors and the required system behavior upon occurrence of an error should be included. The candidate should report the test results in text in a table in this chapter and include detailed actual test results (in screen shots) in an appendix of the dissertation.
- **Conclusion:** This chapter will conclude the dissertation with a critical evaluation of the system and suggestions for any future work. The evaluation should include a critical discussion and assessment of results of project. This chapter should also identify any deficiencies in the final product and highlight how improvements could be made
- **References:** The details of the references are provided in References section of the dissertation. You should include any web links too.
- **Appendices:** - System Documentation-Provide program installation, compilation and execution details.; Design Documentation- Any design documentation that is not critical to be included in the main text (Chapter 3) but could still be of interest to a reader can be added to the appendices. These could be for example design diagrams (e.g., data flow, entity relationship, database schema and UML) that have not been included in the main text; User Documentation-User documentation may cover all aspects of the system, with appropriate screen shots and explanations; Management Reports- In addition to producing day to day transaction reports (e.g. a payroll system should produce an individual pay sheet, coin analysis to make cash payments, EPF report etc.) a system must produce summarized reports for the management (e.g. monthly, quarterly payments made by

organization, employees, overtime Hrs by employee, etc.). These reports will be included here; -
Code Listing; Glossary and Index

Note: Project guidelines shall be notified by the Department at the end of V semester BCA course. The documentation guideline to document the project work in the form of dissertation shall be notified to the students well in advance during VI semester BCA course.

Year	III	Course Code: SEPBCASECT 6.7	Credits	02
Semester	VI	Course Title: Digital Marketing (Theory)	Hours	30
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 10		Summative Assessment Marks: 40	Duration of ESA: 02 hrs.	
Course Outcomes	<p>At the end of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamental concepts and principles of digital marketing. • Develop practical skills to implement various digital marketing strategies and techniques. • Analyze and evaluate the effectiveness of digital marketing campaigns. • Apply critical thinking and problem-solving skills to real-world digital marketing scenarios. • Create comprehensive digital marketing plans and strategies. 			
Unit No.	Course Content			Hours
UNIT I	Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms .Digital Marketing Strategy and Planning: Developing a digital marketing strategy, Budgeting and resource allocation.			10
UNIT II	Social Media Marketing: Campaign planning and execution, Social media platforms and their features, Creating and optimizing social media profiles Content creation and distribution: Content Creation, Content promotion and amplification. Email Marketing: Introduction to email marketing, Building an email list, Email automation and segmentation			10
UNIT III	Mobile Marketing: Mobile marketing overview, Mobile app marketing, Location-based marketing Search Engine Optimization: Introduction to SEO, Abstraction of SEO, Types of SEO. Analytics and Reporting: Steps and Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization			10
Recommended Learning Resources				
Reference Books: <ol style="list-style-type: none"> 1. Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kingsnorth. 2. "Email Marketing Rules: How to Wear a White Hat, Shoot Straight, and Win Hearts" by Chad S. White 3. "Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi 4. "Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles 5. "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik 				

Scheme of Evaluation
Semester End Exam Question Paper Pattern

Duration of the examination: 3hour Max. Marks: 80

Section A

Answer any TEN Questions from the following, each carries 2 marks: [10X2=20]

1. -----
2. -----
3. -----
4. -----
5. -----
6. -----
7. -----
8. -----
9. -----
10. -----
11. -----
12. -----

Section B

Answer any FOUR from the following questions each carries 5 marks. [4X5=20]

13. -----
14. -----
15. -----
16. -----
17. -----

Section C

Answer any FOUR from the following questions each carries 10 marks. [4X10=40]
(The Question may consists two sub-questions)

18. -----
19. -----
20. -----
21. -----
22. -----

CIA for Practical	
Assessment Type	Marks
Test1	10
Total	10 Marks

Semester End Examination Scheme of Evaluation for Lab Examination

Assessment Criteria	Marks
Writing of 2 Programs (Each from Part A & Part B)	15
Execution (Includes program code modification and execution result)	15
Journal	05
Viva Voice	05
Total 40 Marks	40 Marks

Instructions:

1. Certified Journal is mandatory for appearing in the Lab examination.
2. Students shall be given two programming assignments taking into consideration the duration of the time allotted to students for writing, typing and executing the programs.

CIA for Theory	
Assessment Type	Marks
Test 1 / Seminar / Activity	10
Test 2 / Seminar / Activity	10
Total	20 Marks

Note: Guidelines given by the university from time-to-time shall be followed for IA.

CIA for Project Work	
Assessment Type	Marks
First Internal Assessment	30
Second Internal Assessment	30
Total	60 Marks

First Internal Assessment

Max.Marks: 30

Time: 20 minutes

Students shall present the details of the project work carried out that includes the following

- Synopsis contents
- Problem identification and proposed solution
- SAD, SRS
- Database Design
- Functions

PowerPoint slides shall be used by the students to present the work carried out.

Second Internal Assessment

Max. Marks: 30

Time: 30minutes

Students shall present the details of the project work carried out that includes the following

- Coding details
- Forms and reports
- Demo of the application developed

Note: IA marks shall be assigned by the concerned guide monitoring the project work of the students.

Semester End Examination Scheme of Evaluation for Project Work.

Assessment Criteria	Marks
Dissertation/Project Report evaluation	100
Presentation/Demo of the application developed : (navigation of the application, features incorporated, data validation, UI, reports, etc.)	100
Viva Voice	40
Total	240 Marks