University of Madras

Chepauk, Chennai 600 00 5
[Est. 1857, State University, NAAC 'A^{++}' Grade, C GPA 3.59, NIRF 2019 Rank: 20]
Website: www.unom.ac.in, Tel. 044 - 2539 9 561

Undergraduate Programme

in

Computer Applications

Bachelor of Computer Applications (BCA)
(With effect from the Academic Year 2023 -24)

Learning Outcome Based Curriculum Framework

Note: The Board of Studies is designed Learning Outcome s Based Curriculum Framework of Under Graduate Computer Application Programme prescribed by UGC

I Preamble

Bachelor of Computer Applications (BCA) is a 3 – Year under Graduate Programme Spread over six semesters. The Course is designed to bridge the gap between IT industries and Academic institutes by incorporating the latest development, into the Curriculum and to give students a complete understanding within a structured framework. The Course helps the students to build-up a successful Career in Computer Science and for pursuing higher studies in Computer Science.

II Eligibility

A pass in the Higher secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu with Mathematics or Business Mathematics orComputer Science or Computer
Application as one of the subjects.

III Programme Objectives

PO1	Scientific aptitude will be developed in Students
PO2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
PO3	Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
PO4	Students will possess basic subject knowledge required for higher studies, professional and applied courses.
PO5	Students will be aware of and able to develop solution-oriented approach towards various Social and Environmental issues.
PO6	Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
PO7	The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
PO8	Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.
PO9	Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
PO10	Mould the students into responsible citizens in a rapidly changing interdependent society.

IV Programme Specific Objectives

PSO1	Think in a critical and logical based manner
PSO2	Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.
PSO3	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
PSO4	Understand, formulate, develop programming model with logical approaches to Address issues arising in social science, business and other contexts.
PSO5	Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.
PSO6	Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.
PSO7	Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
PSO8	Develop a range of generic skills helpful in employment, internships& societal activities.
PSO9	Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.
PSO10	The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured

Bachelor of Computer Applications (BCA)

COURSE STRUCTURE

YEAR – I SEMESTER – I

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-I	3	6	25	75	100
Part-II	100L1Z	English Paper-I	3	6	25	75	100
Part-III	120C1A	CC - I: Python Programming **@#$%&**	5	4	25	75	100
	120C11	CC - II: Python Programming Practical **@#$%&**	5	5	40	60	100
	120E1A 120E1B 120E1C	EC - II Generic / Discipline Specific (Any one): Mathematics I **@#$%& /** Statistics I **@#$%& /** Financial Accounting I **@#&**	3	5	25	75	100
Part-IV	120S1A	SEC - I: Office Automation * **@#$%&**	2	2	25	75	100
	100S1A	Basic Tamil-I (Other Language Students) *					
	100S1B	Advanced Tamil-I (Other Language Students) *					
	120B1A	FC: Fundamentals of Computers **@#$%&**	2	2	25	75	100
			23	30			

* PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)

1. Students who have studied Tamil upto XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have not studied Tamil upto XII STD and have taken any Language other than Tamil in Part - I shall take Basic Tamil comprising of Two Courses (level will be at 6th Std.).
3. Students who have studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take Advanced Tamil comprising of Two Courses.

YEAR – I SEMESTER – II

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-II	3	6	25	75	100
Part-II	100L2Z	English Paper-II	3	6	25	75	100
Part-III	120C2A	CC - III: Object Oriented Programming using C++ **@#**	5	4	25	75	100
	120C21	CC - IV: Object Oriented Programming using C++ Practical **@#**	5	5	40	60	100
	120E2A 120E2B 120E2C	Elective Course - II Generic / Discipline Specific: Mathematics II **@#$%& /** Statistics II **@#$%& /** Financial Accounting II **@#&**	3	5	25	75	100
Part-IV	120S21	SEC - II: Office Automation Practical * **@#%&**	2	2	40	60	100
	100S2A	Basic Tamil-II (Other Language Students) *			25	75	100
	100S2B	Advanced Tamil-II (Other Language Students) *			25	75	100
	120S2A	SEC - III: Quantitative aptitude **@#$%&**	2	2	25	75	100
			23	30			

YEAR – II SEMESTER – III

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-III	3	6	25	75	100
Part-II	200L3Z	English Paper-III	3	6	25	75	100
Part-III	220C3A	CC - V: Data Structures **@%&**	5	4	25	75	100
	220C31	CC - VI: Data Structures Practical **@%&**	5	5	40	60	100
	220E3A 220E3B 220E3C	EC - III Generic / Discipline Specific: Mathematics I **@#$%& /** Statistics I **@#$%& /** Cost and Management Accounting-I **@#**	3	5	25	75	100
Part-IV	220S31	SEC-IV:(EB): Web Page Design Practical **@#$%&**	1	1	40	60	100
	220S32	SEC-V: Desktop Publishing Practical **@#$%&**	2	2	40	60	100
	----	Environmental Science	--	1	--	--	--
			22	30			

YEAR – II SEMESTER – IV

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-IV	3	6	25	75	100
Part-II	200L4Z	English Paper-IV	3	6	25	75	100
Part-III	220C4A	CC - VII: Java Programming **@#$%&**	5	4	25	75	100
	220C41	CC -VIII: Java Programming Practical **@#$%&**	5	4	40	60	100
	220E4A 220E4B 220E4C	EC-IV: Generic/Discipline Specific: Mathematics II **@#$%& /** Statistics II **@#$%& /** Cost and Management Accounting-II **@#**	3	5	25	75	100
Part-IV	220S4A	SEC -VI: Emotional Intelligence **@#$%&**	2	2	25	75	100
	220S4B	SEC -VII: Technical Writing **@#$%&**	2	2	25	75	100
	----	Environmental Science	2	1	25	75	100
			25	30			

YEAR – III SEMESTER – V

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	320C5A	CC - IX: Operating System **@$**	3	5	25	75	100
	320C5B	CC - X: Relational Database Management System **@#$**	4	5	25	75	100
	320C5C	CC - XI: Web Technology **@#**	5	5	25	75	100
	320C51	CC - XII: Web Technology Practical **@#**	5	5	40	60	100
	320E5A 320E5B 320E5C	EC -V: Operations Research **@** / Software Engineering **@#$%&** / Agile Project Management **@#**	3	4	25	75	100
	320E5D 320E5E 320E5F	EC -VI: Cloud Computing **@#$%&** / Big Data Analytics **@#$%&** / Introduction To Data Science **@#$**	3	4	25	75	100
Part-IV	---	Value Education	2	2	25	75	100
	---	Internship / Industrial Training (During summer vacation at the end of IV semester)	2	--	--	--	--
			27	30			

YEAR – III SEMESTER – VI

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	320C6A	CC - XIII: R-Programming **@#&**	4	6	25	75	100
	320C61	CC - XIV: R-Programming Practical **@#&**	4	6	40	60	100
	320C6B	CC - XV: Advanced Networking **@**	3	6	25	75	100
	320E6A 320E6B 320E6C	EC -VII: Mobile Ad-hoc Network **@#$%&** / Data Mining and Warehousing **@#$%&** / Grid Computing **@&**	3	5	25	75	100
	320E6D 320E6E 320E6F	EC -VIII: Internet of Things and its Applications **@#$%& /** Robotics and Its Applications **@#%&** / Network Security **@#**	3	5	25	75	100
Part-IV	320S61	Professional Competency Skill Course: Mini Project **@%&**	2	2	40	60	100
Part-V	---	Extension Activity	1	--	--	--	--
			20	30			

@ - Common to B.C.A.
 # - Common to B.Sc. Software Applications
$ - Common to B.Sc. Computer Science
% - Common to B.Sc. Computer Science with Artificial Intelligence
& - Common to B.Sc. Computer Science with Data Science

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UNIVERSITY OF MADRAS

BACHELOR OF COMPUTER APPLICATIONS (BCA)

DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester:I**

Core-II: Python Programming Practical (Common to B.Sc.-CS, CS with AI, CS with DS, Software Appl.)	**120C11**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Acquire programming skills in core Python.
- Acquire Object-oriented programming skills in Python.
- Develop the skill of designing graphical-user interfaces (GUI) in Python.
- Develop the ability to write database applications in Python.
- Acquire Python programming skills to move into specific branches

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the problem solving approaches

CO2: To learn the basic programming constructs in Python

CO3: To practice various computing strategies for Python-based solutions to real world problems

CO4: To use Python data structures - lists, tuples, dictionaries.

CO5: To do input/output with files in Python.

List of Programs

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Write a Python program to construct the following pattern, using a nested loop

```
*
**
***
****
*****
****
***
**
*
```

3. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria:
   Grade A: Percentage >=80 Grade B: Percentage >=70 and 80
   Grade C: Percentage >=60 and <70 Grade D: Percentage >=40 and <60
   Grade E: Percentage < 40
4. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
5. Write a Python script that prints prime numbers less than 20.

6. Program to find factorial of the given number using recursive function.
7. Write a Python program to count the number of even and odd numbers from array of N numbers.
8. Write a Python class to reverse a string word by word.
9. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input: tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output: 3)
10. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).
11. Read a file content and copy only the contents at odd lines into a new file.
12. Create a Turtle graphics window with specific size.
13. Write a Python program for Towers of Hanoi using recursion
14. Create a menu driven Python program with a dictionary for words and their meanings.
15. Devise a Python program to implement the Hangman Game.

Learning Resources:

Recommended Texts

1. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem-solving Focus”, Wiley India Edition, 2015.
2. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books

1. Mark Lutz, “Learning Python Powerful Object Oriented Programming”, O’reilly Media 2018, 5th Edition.
2. Timothy A. Budd, “Exploring Python”, Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.
3. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410
4. Michel Dawson, “Python Programming for Absolute Beginers”, Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009

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BACHELOR OF COMPUTER APPLICATIONS (BCA)

DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester:I**

Core-I: Python Programming (Common to B.Sc.-CS, CS with AI, CS with DS, Software Appl.)	**120C1A**

Credits 5 **Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Describe the core syntax and semantics of Python programming language.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Understand the usage of packages and Dictionaries

Course Outcomes: (for students: To know what they are going to learn)

CO1: Develop and execute simple Python programs

CO2: Write simple Python programs using conditionals and looping for solving problems

CO3: Decompose a Python program into functions

CO4: Represent compound data using Python lists, tuples, dictionaries etc.

CO5: Read and write data from/to files in Python programs

UNITS	CONTENTS
I	Introduction: The essence of computational problem solving – Limits of computational problem solving-Computer algorithms-Computer Hardware-Computer Software-The process of computational problem solving-Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / output.
II	Control Structures: Boolean Expressions - Selection Control - If Statement-Indentation in Python- Multi-Way Selection -- Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops- Boolean Flag. String, List and Dictionary, Manipulations Building blocks of python programs,Understanding and using ranges.
III	Functions: Program Routines- Defining Functions- More on Functions: Calling Value-Returning Functions- Calling Non-Value-Returning Functions- Parameter Passing - Keyword Arguments in Python - Default Arguments in Python-Variable Scope. Recursion: Recursive Functions.
IV	Objects and their use: Software Objects - Turtle Graphics – Turtle attributes-Modular Design: Modules - Top-Down Design - Python Modules - Text Files: Opening, reading and writing text files – Exception Handling.
V	Dictionaries and Sets: Dictionary type in Python - Set Data type. Object Oriented Programming using Python: Encapsulation - Inheritance – Polymorphism. Python packages: Simple programs using the built-in functions of packages matplotlib, NumPy, pandas etc.

Learning Resources:

Recommended Texts

1. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem-solving Focus”, Wiley India Edition, 2015.
2. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books

1. Mark Lutz, “Learning Python Powerful Object Oriented Programming”, O’reilly Media 2018, 5th Edition.
2. Timothy A. Budd, “Exploring Python”, Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.
3. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1590282410
4. Michel Dawson, “Python Programming for Absolute Beginers” , Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-143545500

Web resources

1. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year : I **Semester: II**

Object Oriented Programming using C++ Common for B.C.A. , B.Sc.-SA	**120C2A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To engender an appreciation for the need and characteristics of Object-orientation.
- To impart knowledge of the C++ language grammar in order to design and implement programming solutions to simple problems by applying Object-oriented thinking.

Course Outcomes: (for students: To know what they are going to learn)
CO1: Explain the various basic concepts of Object-orientation.
CO2: Write programs to implement static binding
CO3: Write programs to implement inheritance and dynamic binding
CO4: Write programs to implement templates and exception handling and learn how to use STL class library.
CO5: Write programs implementing File and Stream I/O.

Units	**Contents**
I	Object Oriented Programming Concepts: Complexity in software - The need for object-orientation – Abstraction – Encapsulation – Modularity – Hierarchy. Basic Elements of C++: Classes – Objects – Data members and member functions – private and public access specifiers - Static members - Constructors – Singleton class - Destructors - Friend Functions and Friend Classes - Array of objects – Pointer to objects - this pointer – References – Dynamic memory allocation - Namespaces.
II	Function Overloading: Overloading a function - Default arguments – Overloading Constructors. Operator Overloading: Overloading an operator as a member function – Overloading an operator as a friend function – Overloading the operators [], (), -> and comma operators – Conversion Functions.
III	Inheritance: Types of inheritance – protected access specifier –Virtual Base Class – Base class and derived class constructors. Run-time Polymorphism: Virtual Functions – Function overriding - Pure virtual function – Abstract base class.
IV	Templates: Function templates – Overloading a function template – Class templates. Standard Template Library (STL): Containers: vector, list – Iterators: forward, backward – Algorithms: removing and replacing elements, sorting, counting, reversing a sequence. Exception Handling: Exceptions – try, catch, throw – Rethrowing an exception – Restricting exceptions - Handling exceptions in derived classes - terminate(), abort(), unexpected(), set_terminate().
V	I/O Streams: Formatted I/O with ios class functions - Manipulators – Creating own manipulator – Overloading << and >> operators. File I/O: fstream class – Opening and closing a file – Reading from and writing to a text file - Unformatted and Binary I/O – Random access I/O.

Learning Resources:

Recommended Texts

1. Herbert Schildt, *C++ - The Complete Reference*, Third Edition, TMH, 1999.
2. Grady Booch, *Object Oriented Analysis and Design*, Pearson Education, 2008. (For Unit I)

Reference Books

1. Bjarne Strousstrup, *The C++ Programming Language*, Addison Wesley, 2000.
2. J. P. Cohoon and J. W. Davidson, *C++ Program Design – An Introduction to Programming and Object-Oriented Design*, Second Edition, McGraw Hill, 1999.
3. C. J. Lippman, *C++ Primer*, Third Edition, Addison Wesley, 2000.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester: II**

Object Oriented Programming using C++ Practical Common for B.C.A. , B.Sc.-SA	**120C21**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Design classes for the given problems.
- Write programs in C++.
- Code, debug and execute a C++ program to solve the given problems using an IDE.

Course Outcomes: (for students: To know what they are going to learn)
CO1: Design and create classes. Implement Stream I/O as appropriate.
CO2: Design appropriate data members and member functions.
CO3: Implement functions, friend functions, static members, constructors and compile-time polymorphism.
CO4: Implement inheritance, run-time polymorphism and destructors.
CO5: Implement templates and exceptions. Use STL class library. Implement File I/O.

List of Programs

1. Write a class to represent a complex number which has member functions to do the following
   a. Set and show the value of the complex number
   b. Add, subtract and multiply two complex numbers
   c. Multiplying the complex number with a scalar value
2. Write a Point class that represents a 2-d point in a plane. Write member functions to
   a. Set and show the value of a point
   b. Find the distance between two points
   c. Check whether two points are equal or not
3. Design and implement a class that represents a Harmonic Progression (HP). Implement functions to do the following:
   a. Generate the HP up to a specified number of terms
   b. Calculate the sum of the HP to n terms and to infinity
   c. Generate the nth term of the HP
   d. Generate the corresponding Arithmetic Progression. (Design and implement a class that encapsulates an AP, and allow the HP class to use its facilities by implementing friend functions.)
4. Design and implement a class to represent a Solid object.
   a. Apart from data members to represent dimensions, use a data member to specify the type of solid.
   b. Use functions to calculate volume and surface area for different solids.
5. Design a class representing time in hh:mm:ss. Write functions to
   a. Set and show the time
   b. Find the difference between two time objects
   c. Adding a given duration to a time
   d. Conversion of the time object to seconds

6. Design a 3x3 matrix class and demonstrate the following:
    a. Addition and multiplication of two matrices using operator overloading
    b. Maintaining a count of the number of matrix object created
7. Design a class called cString to represent a string data type. Create a data member in the class to represent a string using an array of size 100. Write the following functionality as member functions:
    a. Copy Constructor
    b. Concatenate two strings
    c. Find the length of the string
    d. Reversing a string
    e. Comparing two strings
8. Design a class called cString to represent a string data type. Create a data member in the class to represent a string whose size is dynamically allocated. Write the following as member functions:
    a. Copy Constructor
    b. Destructor
    c. Concatenate two strings
    d. Find the length of the string
    e. Reversing a string
    f. Comparing two strings
9. Create a class to represent a 2-d shape and derive classes to represent a triangle, rectangle and circle. Write a program using run-time polymorphism to compute the area of the figures.
10. Define a class template representing a single-dimensional array. Implement a function to sort the array elements. Include a mechanism to detect and throw an exception for array-bound violations.
11. Demonstrate the use of the vector STL container.
12. Implement a telephone directory using files

Learning Resources:

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: III**

Data Structures Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**220C3A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart the basic concepts of data structures and algorithms.
- To acquaint the student with the basics of the various data structures
- This course also gives insight into the various algorithm design techniques

Course Outcomes: (for students: To know what they are going to learn)
CO1: To introduce the concepts of Data structures and to understand simple linear data structures.
CO2: Learn the basics of stack data structure, its implementation and application
CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.
CO4: To introduce the basic concepts of algorithms
CO5: To give clear idea on algorithmic design paradigms like Divide and conquer and Backtracking,

Units	**Contents**
I	**INTRODUCTION TO DATA STRUCTURES:** Representation of arrays, Applications of arrays, sparse matrix and its representation - Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list
II	Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations. **STACKS and QUEUES:** Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation
III	Queues: operations on queues, array and linked representations - Circular Queue: operations, applications of queues. **TREES & GRAPHS:** **Trees:** Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, preorder), Binary search trees in arrays
IV	Heaps - AVL Trees – B Trees **Graphs:** Representation of Graphs- Types of graphs
V	**Graph Applications:** Breadth first traversal – Depth first traversal- -Single source shortest path – Minimal spanning trees – prim's and kruskal's algorithms

Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of ComputerAlgorithms", Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: III**

Data Structures Practical Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**220C31**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand and implement basic data structures using C++
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

Course Outcomes: (for students: To know what they are going to learn)
CO1: Implement data structures using C++
CO2: Implement various types of linked lists and their applications
CO3: Implement Tree Traversals
CO4: Implement various algorithms in C++

List of Programs

Implement the following exercises using Java Programming language:

1. Array implementation of stacks
2. Array implementation of Queues
3. Linked list implementation of stacks
4. Linked list implementation of Queues
5. Covert infix expression to postfix.
6. Binary Tree Traversals (Inorder, Preorder, Postorder)
7. Implementation of Linear search and binary search
8. Implementation of Depth-First Search & Breadth-First Search of Graphs.
9. Finding single source shortest path of a Graph.

Learning Resources:
Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Java Programming Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**220C4A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide fundamental knowledge of object-oriented programming.
- To equip the student with programming knowledge in Core Java from the basics up.
- To enable the students to use AWT controls, Event Handling and Swing for GUI.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java
CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3: Implement multi-threading and I/O Streams of Core Java
CO4: Implement AWT and Event handling.
CO5: Use Swing to create GUI.

Units	**Contents**
I	Introduction: Review of Object-Oriented concepts - Java buzzwords (Platform independence, Portability, Threads)- JVM architecture –Java Program structure - – Java main method - Java Console output(System.out) - simple java program - Data types - Variables - type conversion and casting- Java Console input: Buffered input - operators - control statements - Static Data - Static Method - String and String Buffer Classes
II	Java user defined Classes and Objects – Arrays – constructors - Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword -Packages: Definition - Access Protection - Importing Packages - Interfaces: Definition – Implementation – Extending Interfaces
III	Exception Handling: try – catch - throw - throws –- finally – Built-in exceptions - Creating own Exception classes - garbage collection, finalise -Multithreaded Programming: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock.
IV	The AWT class hierarchy - Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox – JscrollPane - Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events
V	Adapter classes - Inner classes -Java Util Package / Collections Framework:Collection & Iterator Interface- Enumeration- List and ArrayList- Vector- Comparator

Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O'Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Java Programming Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**220C41**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To gain practical expertise in coding Core Java programs
- To become proficient in the use of AWT, Event Handling and Swing.

Course Outcomes: (for students: To know what they are going to learn)
CO1: Code, debug and execute Java programs to solve the given problems
CO2: Implement multi-threading and exception-handling
CO3: Implement functionality using String and String Buffer classes
CO4: Demonstrate Event Handling.
CO5: Create applications using Swing and AWT

List of Programs

1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer?
2. Write a Java program to multiply two given matrices.
3. Write a Java program that displays the number of characters, lines and words in a text?
4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
5. Write a program to do String Manipulation using Character Array and perform the following string operations:
   a) String length
   b) Finding a character at a particular position
   c) Concatenating two strings
6. Write a program to perform the following string operations using String class:
   a) String Concatenation
   b) Search a substring
   c) To extract substring from given string
7. Write a program to perform string operations using StringBuffer class:
   a) Length of a string
   b) Reverse a string
   c) Delete a substring from the given string
8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

9. Write a threading program which uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.

10. Write a program to demonstrate the use of following exceptions.

a) Arithmetic Exception

b) Number Format Exception

c) Array Index Out of Bound Exception

d) Negative Array Size Exception

11. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes?

12. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.

13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).

14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

15. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.

Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O’Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

Web resources: Web resources from NDL Library, E-content from open-source libraries

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

OPERATING SYSTEM Common for B.C.A. , B.Sc.-CSc	**320C5A**
Credits 3	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms
- To understand the Memory Management policies
- To gain insight on I/O and File management techniques

Course Outcomes: (for students: To know what they are going to learn)

1. Understand the structure and functions of Operating System
2. Compare the performance of Scheduling Algorithms
3. Analyse resource management techniques

Units	**Contents**
I	Introduction: Views - Types of System - OS Structure – Operations - Services – Interface- System Calls - System Structure - System Design and Implementation. Process Management: Process – ProcessScheduling - Inter-process Communication. CPU Scheduling: CPU Schedulers - Scheduling Criteria -Scheduling Algorithms.
II	Process Synchronization: Critical- Section Problem - Synchronization Hardware Semaphores – ClassicalProblems of Synchronization - Monitors. Deadlocks: Characterization - Methods for Handling Deadlocks- Deadlock Prevention - Avoidance - Detection - Recovery.
III	Memory Management: Hardware - Address Binding – Address Space - Dynamic Loading and Linking - Swapping – Contiguous Allocation - Segmentation - Paging – Structure of the Page Table.
IV	Virtual Memory Management: Demand Paging - Page Replacement Algorithms - Thrashing. File System:File Concept -. Access Methods - Directory and Disk Structure - Protection - File System Structures -Allocation Methods - Free Space Management.
V	I/O Systems: Overview - I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Transforming 1/0 Requests to Hardware Operations - Performance. System Protection: Goals - Domain - Access matrix. System Security: The Security Problem - Threats – Encryption- User Authentication.

TEXT BOOK:

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, “Operating System Concepts”, Wiley India Pvt. Ltd 2018, 9th Edition,.

REFERENCES:

1. William Stallings, “Operating Systems Internals and Design Principles”, Pearson, 2018, 9th Edition.
2. Andrew S. Tanenbaum, Herbert Bos, “Modern Operating Systems”, Pearson 2014, 4th Edition.

WEB REFERENCES:

NPTEL & MOOC courses titled Operating Systems ¬ https://nptel.ac.in/courses/106106144/

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Relational Database Management System Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc	**320C5B**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Gain a good understanding of the architecture and functioning of Database Management Systems
- Understand the use of Structured Query Language (SQL) and its syntax.
- Apply Normalization techniques to normalize a database.
- Understand the need of transaction processing and learn techniques for controlling theconsequences of concurrent data access.

Course Outcomes: (for students: To know what they are going to learn)

1. Describe basic concepts of database system
2. Design a Data model and Schemas in RDBMS
3. Competent in use of SQL
4. Analyse functional dependencies for designing robust Database

Units	**Contents**
I	Introduction to DBMS– Data and Information - Database – Database Management System – Objectives- Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram –Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints –Aggregation and Composition – Advantages
II	Relational Model: CODD's Rule- Relational Data Model - Key - Integrity – Relational AlgebraOperations – Advantages and limitations – Relational Calculus – Domain Relational Calculus -QBE.
III	Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools –Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF –BCNF. Transaction Processing – Database Security.
IV	Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.Advanced SQL:Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.
V	Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control -Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.

TEXT BOOK:

1. S. Sumathi, S. Esakkirajan, “Fundamentals of Relational Database Management System”, Springer International Edition 2007.

REFERENCE BOOKS:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”,McGrawHill2019, 7th Edition.
2. Alexis Leon & Mathews Leon, “Fundamentals of DBMS”, Vijay Nicole Publications 2014, 2nd Edition.

WEB REFERENCES:

NPTEL & MOOC courses titled Relational Database Management Systems
https://nptel.ac.in/courses/106106093/
https://nptel.ac.in/courses/106106095/

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BACHELOR OF COMPUTER APPLICATIONS (BCA)

DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Web Technology Common for B.C.A. , B.Sc.-SA	**320C5C**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To use PHP and MySQL to develop dynamic web sites for user on the Internet
- To develop web sites ranging from simple online information forms to complex e-commerce sites with MySQL database, building, connectivity, and maintenance

Course Outcomes: (for students: To know what they are going to learn)

1. Understand the general concepts of PHP scripting language for the development of Internetwebsites.
2. Understand the basic functions of MySQL database program and XML concepts
3. Learn the relationship between the client side and the server side scripts.

Units	Contents
I	Introducing PHP – Basic development Concepts – Creating first PHP Scripts – Using Variableand Operators – Storing Data in variable – Understanding Data types – Setting and Checkingvariables Data types – Using Constants – Manipulating Variables with Operators.
II	Controlling Program Flow: Writing Simple Conditional Statements - Writing More ComplexConditional Statements – Repeating Action with Loops – Working with String and NumericFunctions.
III	Working with Arrays: Storing Data in Arrays – Processing Arrays with Loops and Iterations –Using Arrays with Forms - Working with Array Functions – Working with Dates and Times.
IV	Using Functions and Classes: Creating User-Defined Functions - Creating Classes – UsingAdvanced OOP Concepts. Working with Files and Directories: Reading Files-Writing FilesProcessing Directories.
V	Working with Database and SQL : Introducing Database and SQL- Using MySQL-Adding andmodifying Data-Handling Errors – Using SQLite Extension and PDO Extension. IntroductionXML - Simple XML and DOM Extension.

TEXT BOOK:

1. VikramVaswani, “PHP A Beginner's Guide”, Tata McGraw Hill 2008.

REFERENCE BOOKS:

1. Steven Holzner , “The PHP Complete Reference”, Tata McGraw Hill, 2007.

2. Steven Holzer , “Spring into PHP”, Tata McGraw Hill 2011, 5thEdition.

WEB REFERENCES:

https://www.w3schools.com/php/

https://www.phptpoint.com/php-tutorial-pdf/

http://www.xmlsoftware.com/

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Web Technology Practical Common for B.C.A. , B.Sc.-SA	**320C51**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- The objectives of this course are to have a practical understanding about how to writePHP code to solve problems.
- Display and insert data using PHP and MySQL.
- Test, debug, and deploy web pages containing PHP and MySQL.
- It also aims to introduce practical session to develop simple applications using PHP andMySQL.

Course Outcomes: (for students: To know what they are going to learn)

1. On the completion of this laboratory course the students ought to
2. Obtain knowledge and develop application programs using Python.
3. Create dynamic Web applications such as content management, user registration, and ecommerce using PHP and to understand the ability to post and publish a PHP website.
4. Develop a MySQL database and establish connectivity using MySQL.

LIST OF PRACTICALS

1. Write a PHP program which adds up columns and rows of given table
2. Write a PHP program to compute the sum of first n given prime numbers
3. Write a PHP program to find valid an email address
4. Write a PHP program to convert a number written in words to digit.
5. Write a PHP script to delay the program execution for the given number of seconds.
6. Write a PHP script, which changes the colour of the first character of a word
7. Write a PHP program to find multiplication table of a number.
8. Write a PHP program to calculate Factorial of a number.
9. Write a PHP script to read a file, reverse its contents, and write the result back to a newfile
10. Write a PHP script to look through the current directory and rename all the files withextension .txt to extension .xtx.
11. Write a PHP script to read the current directory and return a file list sorted by lastmodification time. (using filemtime())
12. Write a PHP code to create a student mark sheet table. Insert, delete and modify records.
13. From a XML document (email.xml), write a program to retrieve and print all the e-mailaddresses from the document using XML
14. From a XML document (tree.xml), suggest three different ways to retrieve the text value'John' using the DOM:
15. Write a program that connects to a MySQL database and retrieves the contents of any oneof its tables as an XML file. Use the DOM.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)

DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Year:III **Semester: V**

Operations Research	**320E5A**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to the students

Course Outcomes: (for students: To know what they are going to learn)

1. Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
2. Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems
3. Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.
4. Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

Units	**Contents**
I	Definition of operations research, models of operations research, scientific methodology of operations research, scope of operations research, importance of operations research in decision making, role of operations management, limitations of OR.
II	Linear Programming: Introduction – Mathematical formulation of a problem – Graphical solutions, standard forms the simplex method for maximization and minimization problems. Method application to management decisions. Transportation problem – Introduction – Initial basic feasible solution – NWC method – Least cost method – Vogel's method – MODI – moving towards optimality – solution procedure without degeneracy
III	Assignment problem – Algorithm – Hungarian method – simple problems
IV	Sequencing and replacement model: Sequencing problem – processing through 2machines, 3 machine – s jobs and k machines and traveling salesman problem. Replacement of items that deteriorate gradually – with time, without time, that fails completely – individual replacement – group replacement.
V	Network models and simulation. Network models for project analysis CPM - Network construction and time analysis; cost time trade off, PERT – problems

Text Books:

1. Kanti swaroop, P.K.Guptha and Man Mohan: Operation Research. SultanChand.
2. BA/BSc III Year paper - IV Statistics - quality, reliability and operationsResearch - Telugu Academy by Dr T.C.Ravichandra Kumar, DrR.V.S.Prasad, Dr D.Giri, Dr G.S.Devasena.
3. Operation Reach – S.D.Sharma.

Reference books

1. S.K Sinha: Reliability and life testing. Wiley Eastern.
2. Operations research - Models and methods by Chandrasekar Salimath,Bhupendar Parashar.
3. Operation Research – Taha.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)

DEGREE PROGRAMME

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Software Engineering Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E5B**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce the software development life cycles
- To introduce concepts related to structured and objected oriented analysis & design co
- To provide an insight into UML and software testing techniques

Course Outcomes: (for students: To know what they are going to learn)

1. The students should be able to specify software requirements, design the software using tools
2. To write test cases using different testing techniques.

Units	Contents
I	Introduction – Evolution – Software Development projects – Emergence of Software Engineering.Software Life cycle models – Waterfall model – Rapid Application Development – Agile Model – SpiralModel
II	Requirement Analysis and Specification – Gathering and Analysis – SRS – Formal System Specification
III	Software Design – Overview – Characteristics – Cohesion & Coupling – Layered design – Approaches Function Oriented Design – Structured Analysis – DFD – Structured Design – Detailed design
IV	Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Interaction, Activity, State Chart – Postscript
V	Coding & Testing – coding – Review – Documentation – Testing – Black-box, White-box, Integration, OO Testing, Smoke testing.

TEXT BOOK:

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI 2018, 5th Edition.

REFERENCE BOOKS:

1. Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, McGraw Hill 2010, 7thEdition.

2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House 2011,3rd Edition.

WEB REFERENCES:

NPTEL online course – Software Engineering - https://nptel.ac.in/courses/106105182/

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Agile Project Management Common for B.C.A. , B.Sc.-SA	**320E5C**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide students with a theoretical as well as practical understanding of Agile software development practices and how small teams can apply them to creating high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To provide a detailed examination and demonstration of Agile development and testing techniques.
- To provide an understanding of the benefits and pitfalls of working in an Agile team.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understanding of the Agile manifesto and its advantages over other SDLC paradigms.
CO2: Understanding essential Agile concepts.
CO3: Understanding how to plan and execute a project using Agile concepts
CO4: Understanding Agile management concepts.
CO5: Practical application of Agile principles.

Units	**Contents**
I	Introduction:Modernizing Project Management: Project Management Needed a Makeover – Introducing Agile Project Management. Applying the Agile Manifesto and Principles: Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 12 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. Why Being Agile Works Better: Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.
II	Being Agile:Agile Approaches: Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary Agile Environments in Action: Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. Agile Behaviours in Action: Establishing Agile roles – Establishing new values – Changing team philosophy.
III	Agile Planning and Execution Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning. Working Throughout the Day: Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. Showcasing Work, Inspecting and Adapting: The sprint review – The sprint retrospective. Preparing for Release: Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment

IV	Agile Management Managing Scope and Procurement: What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. Managing Time and Cost: What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management – Managing Agile budgets. Managing Team Dynamics and Communication: What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication. Managing Quality and Risk: What's different about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.
V	Implementing Agile Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time. Being a Change Agent: Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. Benefits, Factors for Success and Metrics: Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.

Learning Resources:

Recommended Texts

1. Mark C. Layton, Steven J. Ostermiller, *Agile Project Management for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2. Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.

Reference Books

1. Mark C. Layton, David Morrow, *Scrum for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2. Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.
3. Alex Moore, Agile Project Management, 2020.
4. Alex Moore, *Scrum*, 2020.
5. Andrew Stellman and Jennifer Greene, *Learning Agile: Understanding Scrum*, *XP*, *Lean*, *and Kanban*, Shroff/O'Reilly, First Edition, 2014.

Web resources

1. www.agilealliance.org/resources

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Cloud Computing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E5D**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart fundamental concepts of Cloud Computing.
- To impart a working knowledge of the various cloud service types and their uses and pitfalls.
- To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.
- To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the concepts and technologies involved in Cloud Computing.
CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.
CO3: To understand the aspects of application design for the Cloud.
CO4: To understand the concepts involved in benchmarking and security on the Cloud.
CO5: To understand the way in which the cloud is used in various domains.

Units	**Contents**
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.
II	Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation

	Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).
IV	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Learning Resources:

Recommended Texts

1. Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2012.
4. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

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DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Big Data Analytics Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E5E**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Work with big data tools and its analysis techniques.
CO2: Analyse data by utilizing clustering and classification algorithms.
CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.
CO4: Perform analytics on data streams.
CO5: Learn NoSQL databases and management.

Units	**Contents**
I	INTRODUCTION TO BIG DATA : Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model
II	CLUSTERING AND CLASSIFICATION: Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. - Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier
III	ASSOCIATION AND RECOMMENDATION SYSTEM:Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches
IV	STREAM MEMORY: Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform (RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

V	NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION: NoSQL Databases: Schema-less Models- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Learning Resources:

Recommended Texts

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CambridgeUniversity Press, 2012.

Reference Books

1. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration withTools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013.

2. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Introduction To Data Science Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc	**320E5F**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- An understanding of the data operations
- An overview of simple statistical models and the basics of machine learning techniques of regression.
- An understanding good practices of data science
- Skills in the use of tools such as python, IDE
- Understanding of the basics of the Supervised learning

Course Outcomes: (for students: To know what they are going to learn)

1. Clean and reshape messy datasets
2. Use exploratory tools such as clustering and visualization tools to analyze data
3. Perform linear regression analysis
4. Use methods such as logistic regression, nearest neighbours, decision trees, support vector machines, and neural networks to build a classifier
5. Apply dimensionality reduction tools such as principal component analysis

Units	Contents
I	Introduction: Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in aData Science Project – Applications of Data Science in various fields – Data Security Issues.
II	Data Collection and Data Pre-Processing: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – DataIntegration and Transformation – Data Reduction – Data Discretization.
III	Exploratory Data Analytics: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots –Pivot Table – Heat Map – Correlation Statistics – ANOVA.
IV	Model Development: Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot –Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sampleEvaluation – Prediction and Decision Making.
V	Model Evaluation: Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting –Under Fitting and Model Selection – Prediction by using Ridge Regression – TestingMultiple Parameters by using Grid Search

Books for References

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”,PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”,EMC 2013
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big DataAnalytics”, IGI Global.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

R-Programming Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wDS	**320C6A**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand and able to use basic programming concepts
- To automate data analysis, working collaboratively and openly on code
- To know how to generate dynamic documents

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the problem solving approaches
CO2: To learn the basic programming constructs in R Programming
CO3: To learn the basic programming constructs in R Programming
CO4: To use R Programming data structures - lists, tuples, dictionaries.
CO5: To do input/output with files in R Programming.

Units	Contents
I	Introduction to R programming: What is R? - Installing R and R Studio – R Studio Overview - Working in the Console - Arithmetic Operators – LogicalOperations - Using Functions - Data structures, variables, and data typesin R: Creating Variables - Numeric, Character and Logical Data - Vectors -Data Frames - Factors -Sorting Numeric, Character, and Factor Vectors -Special Values.
II	CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations
III	Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions Data Visualization using R: Scatter Plots - Box Plots - Scatter Plots and Box and-Whisker Plots Together -Customize plot axes, labels, add legends, and add colours
IV	Descriptive statistics in R: Measures of central tendency - Measures of variability - Skewness and kurtosis - Summary functions, describe functions,and descriptive statistics by group. Testing of Hypothesis using R: T-test, Paired Test, correlation, Chi Square test, Analysis of Variance and Correlation
V	Predictive Analytics: linear Regression model, Non-Linear Least Square, multiple regression analysis, Logistic Regression, Panel Regression Analysis,ARCH Model, GARCH models, VIF model

Learning Resources:

Recommended Texts

1. Roger D. Peng," R Programming for in", 2012
2. Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011

Reference Books

1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2. Venables , W.N.,and Ripley,"S programming", Springer, 2000.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Advanced Networking	**320C6B**
Credits 3	**Lecture Hours: 6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the concept of Data communication and Computer network
- To get a knowledge on routing algorithms.
- To impart knowledge about networking and inter networking devices
- To gain the knowledge on Security over Network communication

Course Outcomes: (for students: To know what they are going to learn)

CO1: To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models
CO2: To gain knowledge on Telephone systems and Satellite communications
CO3: To impart the concept of Elementary data link protocols
CO4: To analyze the characteristics of Routing and Congestion control algorithms
CO5: To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

Units	**Contents**
I	Introduction to Networking Concepts and Terminology: Network Hardware and Software Overview - Reference Models: OSI and TCP/IP Models - Example Networks: Internet, ATM, Ethernet, and Wireless LANs - Physical Layer Fundamentals: Guided and Unguided Transmission Media - Network Protocols: IPv6, ARP, ICMP, DHCP, DNS - Network Virtualization
II	Wireless Transmission Technologies and Standards: Communication Satellites and Their Role in Networking - Telephone System Structure: Local Loop, Trunks, Multiplexing, and Switching - Data Link Layer: Design Issues, Error Detection, and Correction - Wireless Standards and Technologies: 5G, Wi-Fi 6/6E, Bluetooth, Zigbee Mobile Networking Protocols: LTE, VoIP
III	Advanced Data Link Protocols: HDLC, PPP - Sliding Window Protocols Data Link Layer in the Internet - Medium Access Layer: Channel Allocation Problem, MAC Protocols - Ethernet Evolution: Gigabit Ethernet, 10 Gigabit Ethernet, Ethernet Switching - Software-Defined Networking (SDN)
IV	Design Issues in the Network Layer - Routing Algorithms and Optimization Techniques - Congestion Control Algorithms and Traffic Engineering - IP Protocol: IPv4 and IPv6 - IP Addresses, Subnetting, and Address Resolution - Multiprotocol Label Switching (MPLS), IPv6 Deployment Strategies
V	Transport Layer Services and Error Recovery Mechanisms - Connection Management: TCP, UDP, SCTP - Simple Transport Protocol (STP) - Internet Transport Protocols (ITP): TCP and UDP Enhancements - Network Security Fundamentals: Cryptography, Firewalls, IDS/IPS, VPN

Learning Resources:

- **Recommended Texts**
  1. A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.
- **Reference Books**
  1. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2015.
  2. F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008.
  3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
  4. Lamarca, "Communication Networks", Tata McGraw- Hill, 2002

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

R-Programming Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wDS	**320C61**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Acquire programming skills in core R Programming
- Acquire Object-oriented programming skills in R Programming.
- Develop the skill of designing graphical-user interfaces (GUI) in R Programming
- Acquire R Programming skills to move into specific branches

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the problem solving approaches
CO2: To learn the basic programming constructs in R Programming
CO3: To practice various computing strategies for R Programming -based solutions to real world problems
CO4: To use R Programming data structures - lists, tuples, dictionaries.
CO5: To do input/output with files in R Programming

List of Exercises

1. Data In R
2. Reading And Writing Data
3. R And Databases
4. Dates
5. Factors
6. Subscribing
7. Character Manipulation
8. Data Aggregation
9. Reshaping DataBasics
10. The R Environment
11. Probability And Distributions
12. Descriptive Statistics And Graphics
13. One- And Two-Sample Tests
14. Regression And Correlation
15. Analysis Of Variance And The Kruskal–Wallis Test
16. Tabular Data
17. Power And The Computation Of Sample Size
18. Advanced Data Handling
19. Multiple Regression
20. Linear Models
21. Logistic Regression
22. Survival Analysis
23. Rates And Poisson Regression
24. Nonlinear Curve Fitting

Learning Resources:

Recommended Texts

1. Roger D. Peng," R Programming for Data Science ", 2012
2. Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011

Reference Books

1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2. Venables , W.N.,and Ripley,"S programming", Springer, 2000.

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Mobile Ad-hoc Network Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E6A**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- To introduce students to artificial neural networks and fuzzy theory from a theoretical perspective

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic concepts ad-hoc networks and ad-hoc mobility models.

CO2: Acquire knowledge about Medium access protocols and standards like IEEE 802.11a and HIPERLAN.

CO3: Identify the significance of Routing protocols and analyze about routing Algorithm.

CO4: Understand about the applications of end-end delivery and security issues in ad-hoc networks

CO5: Analyze and understand the concept of cross-layer design and parameter optimization techniques.

Units	**Contents**
I	Introduction: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.
II	Medium Access Protocol: MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.
III	Network Protocols : : Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.
IV	End – end delivery and security: Transport Layer: Issues in designing – Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.
V	CROSS -LAYER DESIGN: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.

Learning Resources:

Recommended Texts

1. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols II edition, Pearson Edition, 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-
2. hoc networking, Wiley-IEEE press, 2004.
3. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
4. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad-hoc Network”
5. Research, “Wireless Commn. and Mobile Comp - Special Issue on Mobile Ad-
6. hoc networking Research, Trends and Applications”, Vol. 2, no. 5, 2002, pp. 483 – 502.
7. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri
8. M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no:12007.

Web resources

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Data Mining and Warehousing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E6B**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms, and applications

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic concepts and the functionality of the various data mining and data warehousing component
CO2: To know the concepts of Data mining system architectures
CO3: To analyse the principles of association rules
CO4: To get analytical idea on Classification and prediction methods.
CO5: To Gain knowledge on Cluster analysis and its methods.

Units	Contents
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Pre-processing: Pre-processing the Data – Data cleaning – Data Integration and Transformation – Data Reduction
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on ConceptsfromAssociationRuleMining–OtherMethods. Prediction – Introduction – Classifier Accuracy.
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method

Learning Resources:

Recommended Texts

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

Reference Books

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques',Cambridge University Press, 2019

Web resources: Web resources from NDL Library, E-content from open-source libraries

UNIVERSITY OF MADRAS

BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Grid Computing Common for B.C.A. , B.Sc.-CSc-wDS	**320E6C**
Credits 3	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on the basic construction and use of Grid computing.
- To know and understand the grid computing applications.
- To assess the efficiency of the grid computing in solving large scale scientific problems

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic elements and concepts related to Grid computing
CO2: To identify the Grid computing toolkits and Framework.
CO3: To know about the concepts of Virtualization
CO4: To analyse the concept of service oriented architecture.
CO5: To Gain knowledge on grid and web service architecture.

Units	Contents
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.
II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), Organization Developing Grid Computing Toolkits and Framework, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, Grid Architecture and relationship to other distributed technology
IV	The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, Semantic Grids.
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, XML messages and Enveloping, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.

Learning Resources:

Recommended Texts

1. Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.

Reference Books

2. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

- **Web resources**

UNIVERSITY OF MADRAS

BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Internet of Things and its Applications Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E6D**
Credits 3	**Lecture Hours: 5 per week**
Learning Objectives: (for teachers: what they have to do in the class/lab/field) To understand the concepts of Internet of Things and the application of IoT	
Course Outcomes: (for students: To know what they are going to learn) CO1: Use of Devices, Gateways and Data Management in IoT. CO2: Design IoT applications in different domain and be able to analyse their performance CO3: Implement basic IoT applications on embedded platform CO4: To gain knowledge on Industry Internet of Things CO5: To Learn about the privacy and Security issues in IoT	

Units	**Contents**
I	IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.
III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views
IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Learning Resources:

Recommended Texts

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference Books

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,.
3. WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Robotics and Its Applications Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320E6E**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To make the students familiar with the various drive systems of robots, sensors and their applications in robots
- To introduce the parts of robots, basic working concepts and types of robots

Course Outcomes: (for students: To know what they are going to learn)

CO1: Describe the different physical forms of robot architectures
CO2: Kinematically model simple manipulator and mobile robots
CO3: Mathematically describe a kinematic robot system.
CO4: Analyse manipulation and navigation problems using knowledge of coordinate frames,

Units	Contents
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.
II	Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors-model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge-based force torque sensor-proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision-based localizations – Ultrasonic based localizations - GPS localization systems.
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planningpotential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.

Learning Resources:

Recommended Texts

1. RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001
2. SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011

Reference Books

1. Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008
2. Robotics technology and flexible automation by S.R.Deb, THH-2009

Web resources

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BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Network Security Common for B.C.A. , B.Sc.-SA	**320E6F**
Credits 3	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To study the number theory used for network security
- To understand the design concept of cryptography and authentication
- To develop experiments on algorithm used for security

Course Outcomes: (for students: To know what they are going to learn)

1. Identify the security issues in the network and resolve it.
2. Analyse the vulnerabilities in any computing system and hence be able to design a security solution.
3. Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.
4. Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc

Units	**Contents**
I	Model of network security – Security attacks, services and attacks –OSI security architecture – Classical encryption techniques – SDES – Block cipher PrinciplesDES – Strength of DES – Block cipher designprinciples–Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function – traffic confidentiality.
II	Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality –Chineseremaindertheorem– Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography.
III	Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC– SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.
IV	Authentication applications – Kerberos – X.509 Authentication services - E- mail security – IP security - Web security
V	Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security

Learning Resources:

Recommended Texts

1. William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.

Reference Books

1. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security, Private communication in public world", PHI Second Edition, 2002.
2. Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.
3. Douglas R Simson "Cryptography – Theory and practice", CRC Press, First Edition, 1995.

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SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Mini Project Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**320S61**
Credits 2	**Lecture Hours: 2 per week**

Student Mini-Project Instructions:

Objective:
Mini-project aims to demonstrate student's understanding and application of course concepts. It consists of three components: a comprehensive report, software development, and an external presentation (viva).

Development Process:

- **Planning:** Define project scope, objectives, and required functionalities.
- **Execution:** Follow a structured development process with clear milestones.
- **Documentation:** Maintain a detailed report covering methodology, design, implementation, and testing.

Components for Evaluation:

1. **Mini-Project Report:** Ensure completeness, clarity, and adherence to guidelines.
2. **Software Development:** Create a fully functional application meeting specified requirement.
3. **External Presentation (Viva):** Communicate and defend your project effectively to external evaluators.

Specifications:

- **Functional Requirements:** List essential features the software must incorporate.
- **Non-functional Requirements:** Consider performance, security, usability, etc.
- **Technologies:** Specify programming languages, frameworks, and tools to be used.

Submission Guidelines:

- Follow a prescribed report format and submission method for the software.
- Prepare concise and engaging materials for the external presentation.

Support and Integrity:

- Seek guidance from mentors and utilize available resources.
- Ensure originality and adhere to ethical standards in your work.

Evaluation Criteria:

- Creativity, functionality, documentation quality, and presentation skills are key assessment areas.