STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(Session: 2022-2025)

SEMESTER II, YEAR I

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA202	Introduction to Operating Systems	CC4	5+1+0	50	100	150	6
BCA211	Python Programming	CC5	3+1+0	30	70	100	4
BCA212	Data Structures	CC6	3+1+0	30	70	100	4
BCA**	GE3	GE	1+1+0	15	35	50	2
IIOT12	Fundamental of IOT Development	SEC1	3+1+0	30	70	100	4
PRACTICAL / PROJECTS							
BCA255	Python Programming Lab	CC5(P)	0+0+4	15	35	50	2
BCA256	Data Structures Lab	CC6(P)	0+0+4	15	35	50	2
TOTAL			**15+5+8**	**185**	**415**	**600**	**24**

** Generic Elective Course (GE) 3 List			
S.No	**Code**	**GE LIST**	**Subject Name**
1	BCA208	GE3	Numerical and Statistical Techniques
2	BCA210	GE3	Engineering Mathematics

BCA202: Introduction to Operating Systems	
Teaching Scheme	**Examination Scheme**
Lectures: 5 hrs/Week	Class Test -20Marks
Tutorials: 1 hr/Week	Teachers Assessment - 10Marks Attendance – 20 Marks
Credits: 6	End Semester Exam – 100 marks

Prerequisite: - Programming languages, Data Structures, Microprocessor peripherals and interfacing

Course Objectives:

1. Define and list the functions of an operating system.
2. list resources involved in process creation and management.
3. Explain the use of paging and segmentation
4. Explain the function and structure of the I/O system.
5. Describe path names and directory structure visible to end users

Detailed Syllabus:

Unit-1 **Introduction:** Operating System, Simple Batch Systems, Multi programmed Batched Systems, TimeSharing Systems, Real-Time Systems, System Components, Operating System Services & Functions.
Unit-2 **Process:** Process Concept, Process Scheduling, CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms with examples.
Unit-3 **Process Communication and Synchronization:** Co-operating Process, Inter-process communication, Threads (Thread Concept, Single and Multiple Threads, Benefits). Introduction to process synchronization, Critical Section Problem.
Unit-4 **Deadlock:** Deadlock Introduction, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
Unit-5 **Memory Management:** Logical versus Physical Address Space, Swapping, Contiguous Allocation (Memory Allocation, Fragmentation), Paging (Basic Method, Hardware Support), Segmentation (Basic Method, Hardware). **Virtual Memory:** Demand Paging, Page Replacement, Page Replacement Algorithms.
Unit-6 **File System:** File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management, Protection of File System. Input/output Management. Linux Case Study.

BCA211: Python Programming	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12Marks
Tutorials: 1 hr/Week	Teachers Assessment - 6Marks Attendance – 12 Marks
Credits: 4	End Semester Exam – 70 marks

Course Objectives:

1. To give knowledge about python programming.
2. To introduce python development language.
3. To give knowledge about concept of python.
4. To explore the skills of web programming using python.

Detailed Syllabus

Unit-1 Introduction to Python: Importance of Python, Installing and working with Python in Windows, Linux and Mac, Using Python as calculator, Comments, how to define main function in Python The concept of data types - Variables, Arithmetic Operators and Expressions.
Unit-2 Subscript Operator, Indexing, Slicing a string, Converting strings to numbers and vice versa, split function, **Control flow** - if statements, for and while loops, nested loops, Short-circuit (lazy evaluation), range() function, break and continue statements, pass statements.
Unit-3 **Data Structures**: **Lists** - Basic list operations, Replacing, inserting, removing an element; Searching and sorting a list, Methods of list objects, using lists as Stacks and Queues, how efficient lists are when used as stack or queue, List and nested list Comprehensions Tuple, Sets, Difference between list and tuple, **Dictionary** - adding and removing keys, accessing and replacing values, traversing dictionaries
Unit-4 Python functions and modules - **OS** and **SYS** modules, defining python functions, calling a function, function arguments, Lambda and map function, Importing python module, **Useful Python Packages –** Beautiful Soup, NumPy, iPython, tkinter, **Classes and OOP** - Class definition syntax, objects, class and instance variables, Inheritance and multiple inheritance, Polymorphism, Overloading, Overriding, Data Hiding.
Unit-5 Regular Expressions - re module, Searching a string (match and search), Finding a string (findall), Break string into substrings (split), Replace part of a string (sub), **Examples of Regex** - Return the first word of a given string, Extract all the words of a given string, Extract domain name from given e-mail id's, Extract date from given string, Return all the words of a string that starts with vowel, Split a string with multiple delimiters, Retrieve some information from HTML or XML file.
Unit-6 File Handling - Reading keyboard input, opening and closing file, Read, Write and Append mode, Create and Read a text file, Looping over a file object, Writing on a file, with statements, splitting lines in a text file, Renaming and Deleting files, **Exception Handling** - Exceptions, Why use exceptions, Raising an exception, try and except, try, except and else clause; try and finally

BCA212: Data Structures	
Teaching Scheme	**Examination Scheme**
Lectures: 3 hrs/Week	Class Test -12Marks
Tutorials: 1 hr/Week	Teachers Assessment - 6Marks Attendance – 12 Marks
Credits: 4	End Semester Exam – 70 marks

Prerequisite: -

1. Familiarity with the fundamentals of C or other programming language
2. A solid background in mathematics, including probability, set theory

Course Objectives:

1. To learn the basics of abstract data types.
2. To learn the principles of linear and nonlinear data structures.
3. To build an application using sorting and searching.

Detailed Syllabus

UNIT I (10 Hours) **Introduction Data Structure:** Introduction to Data Structure, Classification of data Structure, Operation on data structure, Top down and Bottom-up approaches to algorithm, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space.
UNIT II (10 Hours) **Arrays:** Representation of array (single & multi-dimensional arrays), Traversing, insertion and deletion operations. Merging, matrix addition, subtraction, multiplication, transpose, sparse matrix
UNIT III (10 Hours) **Stacks:** Introduction to stack, primitive operation on stack, Stacks application: Infix, post fix, Prefix and Recursion. **Queues:** Introduction to queues, Primitive Operations on the Queues, Circular queue, Dequeue, Priority queue, Applications of queue.
UNIT IV (10 Hours) **Linked List:** Introduction to the Linked List, Basic operations on linked list, Header nodes, Doubly Linked List, Circular Linked List, and Application of Linked List.
UNIT V (6 Hours) **Trees**: Basic Terminology, Binary Trees, Tree Representations using Array & Linked List, Basic operation on Binary tree. **Traversal of binary trees:** In order, Preorder & post order, Application of Binary tree, Threaded binary tree, Heap Tree,B-tree & Height balanced tree.
UNIT VI (10 Hours) **Searching and Sorting:** Sequential search & binary search, Hashing, sorting method (Insertion sort, Selection sort, Bubble sort, Quick sort, Merge sort, Heap sort).

BCA208 (GE): Numerical and Statistical Techniques	
Teaching Scheme Lectures: 1 hr/Week Tutorials: 1 hr/Week Credits: 2	**Examination Scheme** Class Test -6 Marks Teachers Assessment - 3Marks Attendance – 6 Marks End Semester Exam – 35 marks

Prerequisite: - Elementary Mathematics

Course Objectives:

The aim is to teach the student various topics in Numerical Analysis such as solutions of nonlinear equations in one variable, interpolation and approximation, numerical differentiation and integration, direct methods for solving linear systems, numerical solution of ordinary differential equations. Numerical Techniques for finding roots, Bisection method, Newton-Raphson method, numerical integration using Simpson's rules, Newton Cote's quadrature method, solving differential equations, interpolation and extrapolation.

Detailed Syllabus

Unit-1

Transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method.

Unit-2

Interpolation-Finite differences, difference tables, Newton's forward and backward interpolation formulae, Lagrange's and Newton's Divided difference formulae for unequal intervals.

Unit-3

Gauss's interpolation formula, Stirlling's formula, Bessel's formula, Laplace-Everett formula.

Unit-4

Numerical Differentiation and Integration, Newton- Cote's quadrature formula, Trapezoidal Rule, Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ Rule.

Text and Reference Books

1. Numerical Methods for Scientific Engineering Computation , Jain, Iyenger & Jian, New Age International , New Delhi, 2003.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2006.
3. Advanced Engineering Mathematics, E. Kreysig, John Wiley & Sons, 2005.
4. An Introduction to Numerical Analysis, Devi Prasad, Narosa Publication House, 3^{rd} Edition.
5. Advanced Engineering Mathematics, R.K. Jain & S.R.K. Iyenger, Narosa Publication House, 3^{rd} Edition.
6. Calculus of finite differences and numerical analysis, H.C. Saxena, S. Chand Publication, 1^{st} Edition, 2005.