



Department of Information Technology  
Bachelor of Computer Application (Honours)

L T P - Indicates Theory Lectures (L), Tutorial(T) and Practical (P) classes per week.

1L Earns 1 credits

1P Earns 0.5 credits

1T Earns 1 Credit

Semester III							
Sl. No.	Category	Course Code	Course Name	L	T	P	Credits
<b>Theory</b>							
1	CC5	BCAC301 BCAC391	Object Oriented Programming	4	0	4	6
2	CC6	BCAC302 BCAC392	Operating Systems	4	0	4	6
3	CC7	BCAC303 BCAC393	Data Structure and Algorithm using Python	4	0	4	6
4	GE-3	BCAG301	A. Climate Change and Health B. Environmental Law and Policy C. Environmental Informatics D. Health Informatics	5	1	0	6
<b>Practical</b>							
5	SEC-2	BCAS391	Web Design and Development	0	0	4	2
<b>Total Credit</b>							26

**CC: Core Course**

**GE: General Electives (To be selected from MOOCs Basket listed below)**

**AEC: Ability Enhancement Course**

**SEC: Skill Enhancement Course**



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Semester-3

<b>Name of the Course: BCA</b>	
<b>Subject: Object Oriented Programming</b>	
<b>Course Code: BCAC301 + BCAC391</b>	<b>Semester: 3rd</b>
<b>Duration: 48 Hours</b>	<b>Maximum Marks: 100 + 100</b>
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Theory: 4	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 4 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60
<b>Aim:</b>	
<b>Sl. No.</b>	
1	In-depth understanding of various concepts of object oriented programming language.
2	Ability to read, understand and trace the execution of programs
3	Skill to debug a program.
4	Skill to write program code in java to solve real world problems.
<b>Objective:</b>	
<b>Sl. No.</b>	
1	To introduce students to a powerful programming language
2	To understand the basic structure of object oriented program
3	To gain knowledge of various programming errors.
4	To enable the students to make flowchart and design an algorithm for a given problem.
5	To enable the students to develop logics and programs
<b>Pre-Requisite:</b>	
<b>Sl. No.</b>	
1	Understanding of basic programming logic.
<b>Contents</b>	

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Chapter	Name of the Topic	Hours	Marks
01	<b>Object oriented design</b>	6	10
	Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.		
02	<b>Object oriented concepts</b>	6	10
	Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism		
03	<b>Basic concepts of object oriented programming using Java</b>	6	10
	Implementation of Object oriented concepts using Java. Language features to be covered:		
04	<b>Class &amp; Object properties</b>	8	10
	Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String [discuss charAt[] , compareTo[], equals[], indexOf[], length[] equalsIgnoreCase[], substring[], toCharArray[] , toLowerCase[], toString[], toUpperCase[] , trim[] , valueOf[] methods] & StringBuffer classes [discuss append[], capacity[], charAt[], delete[], deleteCharAt[], ensureCapacity[], getChars[], indexOf[], insert[], length[], setCharAt[], setLength[], substring[], toString[] methods], concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.		
05	<b>Reusability properties</b>	6	10
	Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super[ ] method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.		
06	<b>Exception handling &amp; Multithreading [6L]</b>	6	10
	Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, interthread communication, deadlocks for threads, suspending & resuming threads.		
07	<b>Applet Programming [using swing]</b>	6	10
	Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint[], getDocumentBase[], getCodeBase[] methods, layout manager [basic concept], creation of buttons [JButton class only] & text fields.		



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	<b>Sub Total:</b>	<b>44</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>48</b>	<b>100</b>

**Practical**

**Course Code: BCAC391**

**Credit: 2**

**Skills to be developed:**

Intellectual skills:

1. Ability to read, understand and write object oriented programs.
2. Ability to analyze problems and provide program based solutions.

**List of Practical:**

1. Basic programming structures
2. Class and Objects
3. Constructors
4. Overloading
5. Inheritance
6. Overriding
7. Exception Handling
8. Applets
9. JDBC
10. Mini project

**Assignments:**

Based on the curriculum as covered by the subject teacher.

**List of Books**

**Text Books:**

<b>Name of Author</b>	<b>Title of the Book</b>	<b>Edition/ISSN/ISBN</b>	<b>Name of the Publisher</b>
E. Balaguruswamy	Object Oriented Modelling and Design		Tata McGraw-Hill
Ali Bahrami	Object Oriented System Development		Mc Graw Hill

**Reference Books:**

Patrick Naughton, Herbert Schildt	The complete reference-Java2		TMH
Kenneth A. Reek	Pointers on C		Pearson
R.K Das	Core Java For Beginners		VIKAS PUBLISHING



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<b>List of equipment/apparatus for laboratory experiments:</b>							
Sl. No.							
1.		Computer with moderate configuration					
2.		A programming language compiler					
<b>End Semester Examination Scheme.</b>		<b>Maximum Marks-70.</b>			<b>Time allotted-3hrs.</b>		
Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	
<ul style="list-style-type: none"> <li>Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.</li> <li>Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.</li> </ul>							
<b>Examination Scheme for end semester examination:</b>							
Group	Chapter	Marks of each question	Question to be set	Question to be answered			
A	All	1	10	10			
B	All	5	5	3			
C	All	15	5	3			
<b>Examination Scheme for Practical Sessional examination:</b>							
<b>Practical Internal Sessional Continuous Evaluation</b>							
<b>Internal Examination:</b>							
Five No of Experiments							
<b>External Examination: Examiner-</b>							
Signed Lab Note Book(for five experiments)				5*2=10			
On Spot Experiment(one for each group consisting 5 students)				10			
Viva voce				5			

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<b>Name of the Course: BCA</b>			
<b>Subject: Operating Systems</b>			
<b>Course Code: BCAC302 + BCAC392</b>		<b>Semester: 3rd</b>	
<b>Duration: 48 Hours</b>		<b>Maximum Marks: 100 + 100</b>	
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Theory: 4		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical: 4		Continuous Assessment: 25	
Credit: 4 + 2		Practical Sessional internal continuous evaluation: 40	
		Practical Sessional external examination: 60	
<b>Aim:</b>			
<b>Sl. No.</b>			
1	To understand the principles and tasks of operating systems.		
2	Ability to apply CPU scheduling algorithms to manage tasks.		
3	Initiation into the process of applying memory management methods and allocation policies.		
4	Knowledge of methods of prevention and recovery from a system deadlock.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1	To deliver a detailed knowledge of integral software in a computer system –Operating System.		
2	To understand the working of operating system as a resource manager.		
3	To familiarize the students with Process and Memory management.		
4	To describe the problem of process synchronization and its solution.		
5			
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>	<b>None</b>		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	Introduction Importance of OS, Basic concepts and terminology, Types of OS, Different views, Journey of a command execution, Design and implementation of OS	6	10
02	Process Concept and views, OS view of processes, OS services for process management, Scheduling algorithms, Performance evaluation; Inter-process communication and synchronisation, Mutual exclusion, Semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problem of concurrent programming, Critical region and conditional critical region, Monitors, Messages, Deadlocks	10	20
03	Resource Manager Memory management, File management, Processor management, Device management	8	20
04	Security and related Issues Security and protection, Authentication, Protection and access control, Formal models of protection, Worms and viruses	8	5





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<b>A</b>	<b>1 to 6</b> <b>1 to 6</b>	<b>10</b>	<b>10</b>				
<b>B</b>				<b>5</b>	<b>3</b>	<b>5</b>	<b>70</b>
<b>C</b>	<b>1 to 6</b>			<b>5</b>	<b>3</b>	<b>15</b>	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

**Examination Scheme for end semester examination:**

<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>
<b>A</b>	<b>All</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>All</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>All</b>	<b>15</b>	<b>5</b>	<b>3</b>

**Name of the Course: BCA**

**Subject: Data Structure and Algorithm with Python**

**Course Code: BCAC303 and BCAC393**

**Semester: 3**

**Duration: 48 Hrs.**

**Maximum Marks: 100 + 100**

**Teaching Scheme**

**Examination Scheme**

Theory: 4

End Semester Exam:70

Tutorial: 0

Attendance: 5

Practical: 4

Continuous Assessment: 25

Credit: 4+2

Practical Sessional internal continuous evaluation:  
40

Practical Sessional external examination: 60

**Aim:**

**Sl. No.**

1. The point of this course is to give you a vibe for algorithms and data structures as a focal area of what it is to be a computer science student.
2. You ought to know about the way that there are regularly a few calculations for some issue, and one calculation might be superior to another, or one calculation better in certain conditions and another better in others.
3. You should have some idea of how to work out the efficiency of an algorithm.
4. You will be able to use and design linked data structures
5. You will learn why it is good programming style to hide the details of a data structure within an abstract data type.
6. You should have some idea of how to implement various algorithm using python programming.

**Objective:**

**Sl. No.**

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques.
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Pre-Requisite:**



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Sl. No.			
1.	Basics of programming language.		
1.	Logic building skills.		
<b>Contents</b>			
Chapter	Name of the Topic	Hours	Marks
01	<b>Introduction to Data Structure</b> Abstract Data Type.	1	2
02	<b>Arrays</b> 1D, 2D and Multi-dimensional Arrays, Sparse Matrices. Polynomial representation.	3	4
03	<b>Linked Lists</b> Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists, Polynomial representation.	6	7
04	<b>Stacks</b> Implementing single / multiple stack/s in an Array, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another, Applications of stack, Limitations of Array representation of stack.	6	10
05	<b>Queues</b> Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues.	4	7
06	<b>Recursion</b> Developing Recursive Definition of Simple Problems and their implementation, Advantages and Limitations of Recursion, Understanding what goes behind Recursion (Internal Stack Implementation)	6	5
07	<b>Trees</b> Introduction to Tree as a data structure, Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees), Threaded Binary Trees (Insertion, Deletion, Traversals), Height-Balanced Trees (Various operations on AVL Trees).	6	15
08	<b>Searching and Sorting</b> Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	6	15
09	<b>Hashing</b> Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.	6	5
	<b>Sub Total:</b>	<b>44</b>	<b>70</b>

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	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>48</b>	<b>100</b>
<p><b>Practical:</b>  <b>Skills to be developed:</b>  Intellectual skills:  1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.  2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.</p>			
<p>3. Ability to implement algorithms to perform various operations on data structures.</p> <p><b>List of Practical:</b></p> <ol style="list-style-type: none"> <li>1. Implementation of array operations.</li> <li>2. Stacks and Queues: adding, deleting elements.</li> <li>3. Circular Queue: Adding &amp; deleting elements</li> <li>4. Merging Problem : Evaluation of expressions operations on Multiple stacks &amp; queues</li> <li>5. Implementation of linked lists: inserting, deleting, and inverting a linked list.</li> <li>6. Implementation of stacks &amp; queues using linked lists:</li> <li>7. Polynomial addition, Polynomial multiplication</li> <li>8. Sparse Matrices: Multiplication, addition.</li> <li>9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.</li> <li>10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching &amp; sorting techniques.</li> </ol> <p><b>Assignments:</b> Based on the curriculum as covered by the subject teacher.</p> <p><b>List of Books</b>  <b>Text Books:</b></p>			
<b>Name of Author</b>	<b>Title of the Book</b>	<b>Edition/ISSN/ISBN</b>	<b>Name of the Publisher</b>
Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia	Data Structures and Algorithms in Python	1118476735, 9781118476734	John Wiley & Sons
Rance D Necaise	Data Structures and Algorithms Using Python	9788126562169	John Wiley & Sons
<b>Reference Books:</b>			
Sartaj Sahni	DataStructures, Algorithms and applications in C++	Second Edition	Universities Press
<b>List of equipment/apparatus for laboratory experiments:</b>			
Sl. No.			
1.	Computer with moderate configuration		
2.	Python 2.7 or higher and other softwares as required.		



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**End Semester Examination Scheme.                      Maximum Marks-70.                      Time allotted-3hrs.**

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
<b>A</b>	<b>1 to 9</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>5</b>	<b>60</b>
<b>B</b>	<b>1 to 9</b>			<b>5</b>	<b>3</b>	<b>15</b>	
<b>C</b>	<b>1 to 9</b>						

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

**Examination Scheme for end semester examination:**

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

**Examination Scheme for Practical Sessional examination:**

**Practical Internal Sessional Continuous Evaluation**

**Internal Examination:**

Continuous evaluation			<b>40</b>
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**External Examination: Examiner-**

Signed Lab Note Book	<b>10</b>		
On Spot Experiment	<b>40</b>		
Viva voce	<b>10</b>		<b>60</b>

<b>Name of the Course: BCA</b>	
<b>Subject: Web Design and Development</b>	
<b>Course Code: BCAS391</b>	<b>Semester: 3rd</b>
<b>Duration: 48 Hrs.</b>	<b>Maximum Marks: 100</b>
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Theory: 0	End Semester Exam:
Tutorial: 0	Attendance:
Practical: 4	Continuous Assessment:
Credit: 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60



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**Practical:**

**Skills to be developed:**

Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.

**List of Practical:**

1. Design basic HTML pages with HTML tags.
2. Enhancing design with CSS
3. Include dynamic contents using javascript.
4. Understanding and working with JQuery.
5. Understanding server side programming.
6. Develop a website with frontend, backend and database connectivity.
7. Mini project.

**List of equipment/apparatus for laboratory experiments:**

Sl. No.	
1.	Computer with moderate configuration
2.	Javascript enabled browser.
3.	Database package and web service

**Examination Scheme for Practical Sessional examination:**

**Practical Internal Sessional Continuous Evaluation**

**Internal Examination:**

Continuous evaluation			<b>40</b>
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**External Examination: Examiner-**

Signed Lab Note Book	<b>10</b>		
On Spot Experiment	<b>40</b>		
Viva voce	<b>10</b>		<b>60</b>