



## Department of Information Technology

### Bachelor of Computer Application

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	CC6	BCAC301 BCAC391	Object Oriented Programming	4	0	4	6
2	CC7	BCAC302 BCAC392	Database Management System	4	0	4	6
3	CC8	BCAC303 BCAC393	Data Structure and Algorithm using Python	4	0	4	6
4	GE-3	BCAG301 BCAG302 BCAG303 BCAG304	MOOCS Basket 1 MOOCS Basket 2 MOOCS Basket 3 MOOCS Basket 4	4/ 5	0/ 1	4/ 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**

### Bachelor of Computer Application Semester-3

Name of the Course: BCA

<b>Subject:</b> Object Oriented Programming	
<b>Course Code:</b> BCAC301 + BCAC391	<b>Semester:</b> 3rd
<b>Duration:</b> 48 Hours	<b>Maximum Marks:</b> 100 + 100
<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>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<p><b>Object oriented design</b></p> <p>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.</p>	6	10
02	<p><b>Object oriented concepts</b></p> <p>Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism</p>	6	10
03	<p><b>Basic concepts of object oriented programming using Java</b></p> <p>Implementation of Object oriented concepts using Java. Language features to be covered:</p>	6	10
04	<p><b>Class &amp; Object properties</b></p> <p>Basic concepts of java programming – advantages of java, byte-code &amp; JVM, data types, access specifiers, operators, control statements &amp; loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter &amp; methods returning objects, call by value &amp; call by reference, static variables &amp; methods, garbage collection, nested &amp; inner classes, basic string handling concepts- String [discuss charAt[] , compareTo[], equals[], indexOf[], length[]</p> <p>equalsIgnoreCase[], substring[], toCharArray[] , toLowerCase[], toString[], toUpperCase[] , trim[] , valueOf[] methods] &amp; 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 &amp; Scanner classes.</p>	8	10

05	<p><b>Reusability properties</b></p> <p>Super class &amp; 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 &amp; methods, interfaces. Creation of packages, importing packages, member access for packages.</p>	<b>6</b>	<b>10</b>
06	<p><b>Exception handling &amp; Multithreading [6L]</b>Exception handling basics, different types of exception classes, use of try &amp; catch with throw, throws &amp; 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 &amp; resuming threads.</p>	<b>6</b>	<b>10</b>
07	<p><b>Applet Programming [using swing]</b></p> <p>Basics of applet programming, applet life cycle, difference between application &amp; 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] &amp; text fields.</p>	<b>6</b>	<b>10</b>
	<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:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
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

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

Sl. No.	
1.	Computer with moderate configuration
2.	A programming language compiler

--	--

**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
A	1 to 5	10	10				
B	1 to 5			5	3	5	70
C	1 to 5			5	3	15	

- 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:**

Five No of Experiments			

**External Examination: Examiner-**

Signed Lab Note Book(for five experiments)	<b>5*2=10</b>	
On Spot Experiment(one for each group consisting 5 students)	<b>10</b>	
Viva voce	<b>5</b>	

<b>Name of the Course: BCA</b>	
<b>Subject: Database Management System</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	Familiarization with Database Management System.
2	Comprehensive knowledge of database models.
3	Ability to code database transactions using SQL.
<b>Objective:</b>	
<b>Sl. No.</b>	
1	To introduce the students to the database system.
2	To learn how to design a database by using different models.
3	To enable the students to understand the database handling during execution of the transactions.
4	To understand the handling of database by concurrent users.
5	To gain complete knowledge of SQL and PL/SQL.
<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 Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Data Abstraction, Three Schema architecture of DBMS.	6	5
02	E-R Model  Need for E-R Model, Various steps of database design, Mapping Constraints, E-R diagram, Subclass, Generalization, Specialization, Aggregation, Strong Entity-Weak Entity,	6	10
03	SQL  Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Stored procedures,cursors and triggers.	6	10
04	Relational Model and Relational Database Design  Concept of Relational Model, Design Issues, Keys, Closure set, Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multivalued dependencies, 4NF,5NF, Centralized and distributed database.	8	20
05	File Organization and Query Optimization  Concepts of File and Records, Fixed Length-Variable length Record, Query optimization.	6	10
06	Indexing Primary, secondary, clustering, Multilevel Indexes.	6	5
07	Transaction Management Transaction definition, properties, transaction state diagram, commit and rollback, Concurrency control,lock based protocols,two phase locking, Recovery management.	6	10





		be set		be set			
<b>A</b>	<b>1 to 7</b>	<b>10</b>	<b>10</b>				
<b>B</b>	<b>1 to 7</b>			<b>5</b>	<b>3</b>	<b>5</b>	<b>70</b>
<b>C</b>	<b>1 to 7</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:**

Group	Chapter	Marks of each question	Question to be set	Question to be answered
<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>

**Examination Scheme for Practical Sessional examination:**

**Practical Internal Sessional Continuous Evaluation**

**Internal Examination:**

Five No of Experiments			

**External Examination: Examiner-**

Signed Lab Note Book(for five experiments)	<b>5*2=10</b>	
On Spot Experiment(one for each group consisting 5 students)	<b>10</b>	
Viva voce	<b>5</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		
<b>Aim:</b>			
<b>Sl. No.</b>			
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.		
<b>Objective:</b>			
<b>Sl. No.</b>			
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		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Basics of programming language.		
1.	Logic building skills.		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Introduction to Data Structure</b> Abstract Data Type.	<b>1</b>	<b>2</b>
02	<b>Arrays</b> 1D, 2D and Multi-dimensional Arrays, Sparse Matrices. Polynomial representation.	<b>3</b>	<b>4</b>
03	<b>Linked Lists</b> Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists,	<b>6</b>	<b>7</b>

	Polynomial representation.		
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>
	<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:**

**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.

3. Ability to implement algorithms to perform various operations on data structures.

**List of Practical:**

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements.
3. Circular Queue: Adding & deleting elements
4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, and inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.
10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching & sorting techniques.

**Assignments:**

Based on the curriculum as covered by the subject teacher.

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Michael H. Goldwasser, Michael T. Goodrich, and Roberto Tamassia	Data Structures and Algorithms in Python	1118476735, 9781118476734	John Wiley & Sons
Rance D Necaie	Data Structures and Algorithms Using Python	9788126562169	John Wiley & Sons

**Reference Books:**

Sartaj Sahni	DataStructures, Algorithms and applications in C++	Second Edition	Universities Press
--------------	--	----------------	--------------------

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

Sl. No.	
1.	Computer with moderate configuration
2.	Python 2.7 or higher and other softwares as required.

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

Group	Unit	Objective Questions	Subjective Questions
-------	------	---------------------	----------------------

		(MCQ only with the correct answer)					
		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>
<b>External Examination: Examiner-</b>			
Signed Lab Note Book	<b>10</b>		
On Spot Experiment	<b>40</b>		
Viva voce	<b>10</b>		<b>60</b>

**Name of the Course: BCA**

**Subject: Web Design and Development**

<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
<b>Practical:</b>	
<b>Skills to be developed:</b>	
Intellectual skills:	
<ol style="list-style-type: none"> <li>1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.</li> <li>2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.</li> </ol>	
<b>List of Practical:</b>	
<ol style="list-style-type: none"> <li>1. Design basic HTML pages with HTML tags.</li> <li>2. Enhancing design with CSS</li> <li>3. Include dynamic contents using javascript.</li> <li>4. Understanding and working with JQuery.</li> <li>5. Understanding server side programming.</li> <li>6. Develop a website with frontend, backend and database connectivity.</li> <li>7. Mini project.</li> </ol>	
<b>List of equipment/apparatus for laboratory experiments:</b>	
Sl. No.	
1.	Computer with moderate configuration
2.	Javascript enabled browser.
3.	Database package and web service
<b>Examination Scheme for Practical Sessional examination:</b>	
<b>Practical Internal Sessional Continuous Evaluation</b>	
<b>Internal Examination:</b>	
Continuous evaluation	40
<b>External Examination: Examiner-</b>	
Signed Lab Note Book	10
On Spot Experiment	40
Viva voce	10
	60

Semester IV							
Sl. No.	Category	Course Code	Course Name	L	T	P	Credits
<b>Theory + Practical</b>							
1	CC9	BCAC401	Computer Networking	4	0	4	6

		<b>BCAC491</b>					
<b>2</b>	<b>CC10</b>	<b>BCAC402 BCAC492</b>	<b>Software Engineering</b>	<b>4</b>	<b>0</b>	<b>4</b>	<b>6</b>
3	CC11	BCAC403 BCAC493	Design and Analysis of Algorithms	4	0	4	6
4	GE-4	BCAG401	MOOCS Basket 1 MOOCS Basket 2 MOOCS Basket 3 MOOCS Basket 4	4/ 5	0 / 1	4/0	<b>6</b>
<b>Practical</b>							
<b>5</b>	<b>SEC-3</b>	<b>BCAS481</b>	<b>Minor Project and Entrepreneurship II</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
				<b>Total Credit</b>			<b>26</b>

**Bachelor of Computer Application  
Semester-4**

<b>Name of the Course: BCA Subject: Computer Networking</b>	
<b>Course Code: BCAC401 + BCAC491</b>	<b>Semester: 4th</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 gain Knowledge of uses and services of Computer Network		
2	To enhance Ability to identify types and topologies of network.		
3	To gain Understanding of analog and digital transmission of data.		
4			
<b>Objective:</b>			
<b>Sl. No.</b>			
1	To deliver comprehensive view of Computer Network.		
2	To enable the students to understand the Network Architecture, Network type and topologies		
3	To understand the design issues and working of each layer of OSI model.		
4	To familiarize with the benefits and issues regarding Network Security.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	None		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	Introduction Introduction to communication systems, Data, signal and Transmission: Analog and Digital, Transmission modes, components, Transmission Impairments, Performance criteria of a communication system. Goals of computer Network, Networks: Classification, Components and Topology, categories of network [LAN, MAN, WAN]; Internet: brief history, internet today; Protocols and standards; OSI and TCP/IP model.	6	10
02	Data link layer: Types of errors, framing [character and bit stuffing], error detection & correction methods; Flow control; Protocols: Stop & wait ARQ	8	10

03	Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols:ALOHA, CSMA,FDMA, TDMA, CDMA; Ethernet	6	10
04	Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address, Routing : techniques, static vs. dynamic routing , Protocols: IP, IPV6	6	10
05	Transport layer: Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, Quality of services [Qos]	6	10
06	Application Layer DNS, SMTP, FTP, HTTP & WWW; Security: Cryptography [Public, Private Key based], Digital Signature, Firewalls [technology & applications]	6	10
07	Physical Layer: Overview of data[analog & digital], signal[analog & digital], transmission [analog & digital] & transmission media [guided & unguided]; Circuit switching: time division & space division switch, TDM bus; Telephone Network	6	10
	<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>
<p><b>Practical</b>  <b>Course Code: BCAC491</b>  <b>Credit: 2</b></p> <p><b>List of Practical:</b>  Implementation of practicals are adhered to the theoretical curriculum.</p> <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>
B. A. Forouzan	Data Communications and Networking		TMH

A. S. Tanenbaum	Computer Networks		Pearson Education/PHI
W. Stallings	Data and Computer Communications		PHI/ Pearson Education

**Reference Books:**

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

Sl. No.	
1	Computer with moderate configuration
2	Network simulator package

**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
A	1 to 7	10	10				
B	1 to 7			5	3	5	70
C	1 to 7			5	3	15	

- 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

<b>C</b>	<b>All</b>	<b>15</b>	<b>5</b>	<b>3</b>
<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)		<b>5*2=10</b>		
On Spot Experiment(one for each group consisting 5 students)		<b>10</b>		
Viva voce		<b>5</b>		

<b>Name of the Course: BCA</b>	
<b>Subject: Software Engineering</b>	
<b>Course Code: BCAC402 + BCAC492</b>	<b>Semester: 4th</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>	
<b>1</b>	Familiarization with the concept of software engineering and its relevance.
<b>2</b>	Understanding of various methods or models for developing a software product.
<b>3</b>	Ability to analyze existing system to gather requirements for proposed system.

4	Gain skill to design and develop softwares.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1	To introduce the students to a branch of study associated with the development of a software product.		
2	To gain basic knowledge about the pre-requisites for planning a software project.		
3	To learn how to design of software		
4	To enable the students to perform testing of a software.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	None		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS Development Life Cycles- SDLC and its phases Models- Waterfall, Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS System analysis- DFD, Data Modeling with ERD	12	20
02	Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree. Concept of User Interface, Essence of UML. CASE tool.	12	15
03	Testing- Test case, Test suit, Types of testing- unit testing, system testing, integration testing, acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.	10	20
04	ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]	10	15
	<b>Sub Total:</b>	<b>44</b>	

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

**Practical: BCAC492**

**Credit: 2**

**List of Practicals:**

- 1: Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements).
- 2: Develop Structured Design for a given software in its requirement phase
- 3: Develop Object Modelling Using UML for a given software in its requirement phase
- 4: Develop Use Case Diagram for a given software in its requirement phase
- 5: Develop Class Diagrams for a given software in its requirement phase
- 6: Develop Interactive Diagram for a given software in its requirement phase
- 7: Develop Activity and State Chart Diagram for a given software in its requirement phase
- 8: Use of any testing tool and how to handle it.
- 9: Use of any configuration management tool and how to handle it
- 10: Use of any one project management tool and how to handle it
- 11: Complete documentation of developing the software using SDLC model -1
- 12: Complete documentation of developing the software using SDLC model -2

**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>
Igor Hawryszkiewicz	System analysis and design		PEARSON
V Rajaraman	Analysis and design of Information System		PHI
Ian Sommerville	Software Engineering		Addison-Wesley

<b>Reference Books:</b>							
<b>List of equipment/apparatus for laboratory experiments:</b>							
Sl. No.							
1		Computer with moderate configuration					
2		MS-Project or similar software.					
<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 4	10	10				
B	1 to 4			5	3	5	70
C	1 to 4			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			<b>5*2=10</b>				

experiments)		
On Spot Experiment(one for each group consisting 5 students)		<b>10</b>
Viva voce		<b>5</b>

<b>Name of the Course: BCA</b>	
<b>Subject: Design and Analysis of Algorithms</b>	
<b>Course Code: BCAC403 + BCAC493</b>	<b>Semester: 4th</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>	
<b>1</b>	To gain knowledge of algorithm complexity analysis.
<b>2</b>	To understand and apply several algorithm design strategies.
<b>3</b>	
<b>Objective:</b>	
<b>Sl. No.</b>	
<b>1</b>	To be familiar with algorithm complexity analysis.
<b>2</b>	To understand and apply several algorithm design strategies.
<b>3</b>	
<b>4</b>	



<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Basic knowledge of mathematics.		
2.	Basic Knowledge of programming.		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	Complexity Analysis Time and Space Complexity, Different Asymptotic notations big O,Ω,Θ, Little o,ω and their mathematical significance and proof.	8	10
02	Algorithm Design by Divide and Conquer Basic concept of divide and conquer, Merge sort, Quick sort ,heap sort and their complexity analysis in best case, worst case and average case.	8	15
03	Disjoint Set Data Structure Set Manipulation Algorithm by Union-Find, Union by Rank, Path Compression	8	10
04	Algorithm Design by Greedy Strategy Basic concept, Activity Selection Problem, Fractional Knapsack problem, Job sequencing with deadline,Prims, Kruskal.	6	10
05	Algorithm Design by Dynamic Programming Basic concept, 0/1 Knapsack Problem, Matrix Chain Multiplication, All Pair Shortest Path - Floyd Warshall Algorithm, Dijkstra's.	6	15
06	Algorithm Design by Backtracking Basic concept, Use - N-Queen Problem, Graph Coloring Problem, Hamiltonian Path Problem	8	10
	<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>
<b>Practical</b>			
<b>Course Code: BCAC493</b>			

**Credit: 2****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.
3. Ability to implement algorithms to perform various operations on data structures.

**List of Practical:**

1. Implement Merge sort, Implement Quicksort.
2. Find maximum and minimum elements from an array of integers using divide and conquer strategy.
3. Implement fractional knapsack,
4. Implement Job sequence with deadline
5. Implement Dijkstra's algorithm,
6. Implement Prim's algorithm
7. Implement Kruskal's algorithm.
8. Implement Matrix Chain Multiplication
9. Implement Floyd Warshall Algorithm
10. Implement Dijkstra's Algorithm

**Assignments:**

Based on the curriculum as covered by subject teacher.

**List of Books****Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
E.Horowitz and Sahni	Fundamentals of Computer Algorithms		
T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein	Introduction to Algorithms		

**Reference Books:**

<b>List of equipment/apparatus for laboratory experiments:</b>							
Sl. No.							
<b>1</b>		Computer with moderate configuration					
<b>2</b>		Softwares as required.					
<b>End Semester Examination Scheme. Maximum Marks-70. 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
<b>A</b>	<b>1 to 6</b>	<b>10</b>	<b>10</b>				
<b>B</b>	<b>1 to 6</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>	
<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			
<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>			
<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					<b>5*2=10</b>		

experiments)		
On Spot Experiment(one for each group consisting 5 students)		<b>10</b>
Viva voce		<b>5</b>

GE Basket 1		GE Basket 2		GE Basket 3		GE Basket 4	
Mathematics		Humanities and Social Sciences		General Science		Emerging Technologies, Innovation & Entrepreneurship	
1	Mathematics for Computing	1	Creative Writing	1	Climate Change and Health	1	Digital Marketing
2	Probability & Statistics	2	Business English	2	Environmental Law and Policy	2	Entrepreneurship Theory and Practice
3	Bayesian Statistics	3	Leadership	3	Environmental Informatics	3	Project Management
4	Operations Research	4	Professional Communication	4	Health Informatics	4	E-Commerce System Development
5	Data Analytics	5	E-Learning	5	Intelligence of Biological Systems	5	Effective Problem-Solving and Decision-Making
6	Applied Cryptography	6	Model Thinking	6	Simulation and Modelling Natural Processes	6	Business Analytics
7	Inferential Statistics	7	Digital Transformation and Industry 4.0	7	Bioinformatics	7	Design Thinking for Innovation