SOLAPUR UNIVERSITY, SOLAPUR.
Syllabus and Structure of the
Bachelor of Computer Applications (BCA)

To be effective from June 2017 (Under Science Faculty)

1) Title:
The degree shall be titled as Bachelor of Computer Applications (BCA)

2) Objectives of the course:
This is a three years bachelor degree course in computer applications aimed at developing computer professional versatile in use of computers mostly in business world. The emphasis is to have generality of developing professionals as programmer, system analysts, database administrators, documentation officer etc.

3) Duration:
i) The course shall be a full time course.
ii) The duration of course shall be three years.
iii) The course shall be run on self-supporting basis.

4) Number of Students:
A batch shall consist of not more than 60 students.

5) Eligibility:
i) A candidate for being eligible for admission to the Degree Course in Computer Science. Candidate shall have passed XII std. Examination of the Maharashtra Board of Higher Secondary Education or its equivalent or any Diploma of not less than two years.
ii) A candidate has to appear for a common entrance test to be conducted by respective college for getting admission to this course.

1. Percentage at HSC	100
2.Percentage at Entrance	100
Total	200

The merit list will be prepared on the basis of percentage of HSC and percentage at entrance examination. Students will be admitted on the basis of Merit list.

6) Medium:
The medium of instruction and examination will be only in English.
 a) Details of Internal examination:

1. Attendance	05 marks
2. Assignment	20 marks (3 Home & 2 class assignments)
3. Mid-Test	05 marks
Total	30 marks

b) Marks of Lab course and mini project will be given by the concerned college
on the basis of evaluation by the internal teacher.
c) Original Report and Viva-Voce:
Project Report will be assessed by the internal teacher at the end of sixth semester out of 70 marks and there will be viva-voce examination of 80 marks. The panel of examiners will consist of one internal and one external appointed by university.
Standard of Passing:
A candidate must obtain minimum 40% marks for passing in each university examination paper, internal examination, Lab course, Major Project.
i) Class will be awarded on the basis of marks obtained by the candidate in all the six semester examination.

ii) Candidate who has secure 40% marks in each head of internal credit and semester examination shall be declared to have passed in the paper.

iii) A candidate who fails in any particular theory papers shall be allowed to reappear for that theory paper. However, his/her internal credit marks shall be carrying forwarded.

Award of Class:

Class should be awarded to the students of BCA on the basis of aggregate marks in the six semesters.

The award of class shall be as under:

Aggregate 70% and above	First class with distinction
Aggregate 60% and above	First Class But less than 70%,
Aggregate 50% and above	Second Class But less than 60%
Aggregate 40% and above	Pass Class But less than 50%

Syllabus Structure for BCA-II Course

Faculty Name	
BOS Name	
Subject Name	
Course Pattern	CBCS
Syllabus Implement from Academic Year	June-2017

Year of Course FY/SY/TY	Sem	Paper Code (Computer Code will be given by Computer Section)	Paper Code (BOS Code)	Paper Name (This name is displayed on mark sheet)	Paper Number (I/II/III)	Paper Type (1. Core/Compulsory 2. Fundamental/Optional/Elective)	Credits	Number of Lectures in Hr/WK	Total Lecture in Semester	Teaching Learning Method (Lecture/ Laboratory)	Assessment Method (Theory/ Practical/ Teamwork/Oral/Viva/Field Work/Project/Seminar)	Total Marks		Theory				Practical/TeamWork/Oral/Viva/FieldWork/Project/Seminar			
														ESE(UA)		ICA(CA)		ESE(UA)		ICA(CA)	
												Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
SY	III	BCA 301		Data structures using 'C'		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	III	BCA 302		Networking & Data communication		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	III	BCA 303		DBMS with Oracle		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	III	BCA 304		OOP with C++		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	III	BCA 305		Operations Research		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-

SY	III	BCA 306	Lab 3 Based on 301, 303, 304		1	12	-		Laboratory	Practical	100	40	-	-	-	-	70	28	30	12
SY	IV	BCA 401	Software Testing		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	IV	BCA 402	Python		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	IV	BCA 403	Operating System		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	IV	BCA 404	Advanced Web technology		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	IV	BCA 405	E- Governance		1	4	5		Lecture	Theory	100	40	70	28	30	12	-	-	-	-
SY	IV	BCA 406	Lab 4 Based on 402, 404		1	12	-		Laboratory	Practical	100	40	-	-	-	-	70	28	30	12

Practical batch - contents No. of students – 20
Practical batch - 12 lab. hours per week

Second Year BCA (Under Science)
Semester- III

Course Code: BCA 301   **Course Title: Data Structures using 'C'**

Total Contact Hours: 48 Hrs.   **Total Marks: 100(60Lectures)**

Teaching Scheme: Theory 5 Lect./Week   **Total Credits: 04**

Course Objective: The objective of this course is to study Data structure concepts.

Unit No.	Description	No. of Lectures

Unit- 1	**An Introduction to Data Structures:**
	• Introduction, Definition, types of Data structure
	• Dynamic Memory Allocation in 'C' Programming
	• Introduction to Abstract Data Type (ADT)
	• Algorithm:
	  ➢ Definition, characteristics
	  ➢ Complexity of algorithm- Space complexity, time complexity, Big-O Notation
	• Design of Algorithm- Divide and Conquer, Greedy Algorithm, branch & bound, backtracking, dynamic programming.
		8

Unit- 2	**Stack:**
	• Operations of stack- Create, isempty, isfull, push, pop, display (status)
	• Implementation of stack using array (Static Implementation)
	• Applications of Stack-
	  ➢ Algorithm of conversion of infix expression to postfix expression
	  ➢ Algorithm of conversion of infix expression to prefix expression
	  ➢ Matching parenthesis in an expression (Checking expression is valid or invalid)
	  ➢ Evaluation of postfix expression
	  ➢ Stack in recursion
	  ➢ Implementation of applications of stack.
		12

Unit- 3	**Queue:**
	• Introduction to Queue
	• Operations of queue- Create, isempty, isfull, insert, remove, display (status)
	• Types of Queue-
	  1) Linear Queue
	  2) Circular Queue
	  3) Deque (Double Ended Queue)
	  4) Priority queue.
	• Implementation of all types of queue using array (Static Implementation)
	• Difference between stack and queue.
	• Applications of Queue
		10

Unit- 4	• Introduction to Linked Lists
	• Difference between Array and linked list.
	• Types of linked list
	  1) Linear linked list-
	    ➢ Singly (Single) linear linked list
		10

	➢ Doubly (Double) linear linked list.
	  2) Circular linked list-
	    ➢ Singly (Single) circular linked list
	    ➢ Doubly (Double) circular linked list.
	  • Operations of linked list- Creation, Insertion, Deletion, Traversing, Searching, Concatenation, Display, count, reverse.
	  • Implementation of stack using linked list (Dynamic stack)
	  • Implementation of queue using linked list (Dynamic queue)	

Unit- 5	**Trees:**
	  • Introduction to Tree
	  • Introduction to Binary Trees
	  • Types of Binary tree-
	    ➢ Strictly Binary tree
	    ➢ Complete Binary tree
	    ➢ Extended (2-Tree) Binary tree
	    ➢ Binary expression tree
	    ➢ Binary Search tree
	  • Operations of Binary search tree-
	    ➢ Creating and inserting node
	    ➢ Searching node
	    ➢ Counting total nodes
	    ➢ Counting and displaying leaf nodes
	    ➢ Tree Traversal methods- Preoder, Inorder, Postorder
	    ➢ Deletion of Nodes
	  • Implementation of binary search tree.
	  • Height balanced tree/Balanced Binary Tree/AVL tree
	  • Application of tree
		10

Unit-6	**Searching and Sorting:**
	  • Introduction and definition of Sorting
	  • Types of Sorting-
	    ➢ Bubble sort
	    ➢ Quick sort
	    ➢ Selection sort
	    ➢ Insertion sort
	    ➢ Merge sort
	    ➢ Radix Sort
	  • Introduction and definition of Searching
	  • Types of searching-
	    ➢ Linear (Sequential)Search
	    ➢ Binary Search
	    ➢ Indexed sequential search
		10

Books Recommended:
1. Tanenbaum: Data structures using C and C++
2. Data Structures Through C in Depth- S.K.Srivastava,D.Srivastava
3. Fundamentals of *Data Structures in C by Sahni*
4. Ulman: Data structures and Algorithms
5. Nikaulus Wirth: Algorithms, data structures, Programs.

Course Code: BCA 302   **Course Title: <u>Networking & Data</u>**

<u>**Communication**</u>

Total Contact Hours: 48 Hrs.   **Total Marks: 100**   **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week   **Total Credits: 04**

<u>Course Objective:</u> The objective of this course is to study Networking & data communication concepts.

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction to Data Communication & Networking:** • Data Communication: ➢ Components ➢ Data Representation ➢ Data Flow ➢ CommunicationModel • Computer Network: ➢ Introduction of Network ➢ Uses of a computer network • Network Components: ➢ Hubs, Switches, Repeaters, Bridges, Routers, Gateways	10
Unit- 2	**Network Models:** • Protocols & Standards • Protocol Hierarchies • Design Issues of Layers, • Services Primitives • Connection oriented and connection less services • Reference Model: ISO-OSI reference model	7
Unit- 3	**Physical layer :** • Signals: ➢ Analog & Digital Signals ➢ Period ➢ Frequency ➢ Phase ➢ Amplitude ➢ Bandwidth ➢ Bit Rate ➢ Bit Length • Transmission Media: • Guided Media: ➢ Magnetic Media ➢ Twisted Pair ➢ Coaxial Cable ➢ Fiber Optic Cable • Unguided Media: ➢ Wireless- Radio Waves ➢ Microwaves ➢ Infrared	13

	➢ Satellite Communication
	• Analog Transmission:
	  ➢ Modem
	  ➢ Telephone System
	• Modulation:
	  ➢ Amplitude Modulation
	  ➢ Frequency Modulation
	  ➢ Phase Modulation
	• Transmission Mode:
	  ➢ Parallel, Serial
	  ➢ Synchronous Transmission
	  ➢ Asynchronous Transmission
	• Multiplexing & Switching:
	• Multiplexing:
	  ➢ Frequency Division Multiplexing
	  ➢ Time Division Multiplexing,
	  ➢ Wavelength Division Multiplexing
	• Switching: Circuit Switching, Message Switching, Packet Switching	

Unit- 4	**Data link layer :**
	• Data link layer Design issues
	• Error Detection & Correction:
	  ➢ Types of Errors
	  ➢ Hamming Distance
	• ErrorDetection:
	  ➢ Parity Check
	  ➢ Cyclic Redundancy Check
	  ➢ Checksum Check
	  ➢ Error correction
	• Data Link Control: Framing, Flow & Error Control,
	• Protocols: Simplex, Stop and Wait
	• Multiple Access Protocol: Concept of-
	  ➢ ALOHA, CSMA
	  ➢ Channelization, FDMA, TDMA, CDMA
		10

Unit-5	**Network layer:**
	• Network layer Design issues
	• Routing Algorithm:
	  ➢ Optimality Principle
	  ➢ Shortest Path Routing
	  ➢ Distance Vector Routing
	  ➢ Link State Routing
	  ➢ Broadcast Routing
	  ➢ Multicast Routing
	• Congestion Control Algorithm
	• Congestion prevention policies
	• Congestion Control in Virtual-Circuit Subnets
	• Congestion Control inDatagram Subnets
		10

Unit- 6	**Transport, Session, Presentation & Application layers:** • Elements of Transport Protocols • Addressing • Connection establishment • Connection Release • Flow Control & Buffering • TCP/IP protocol suite	10

	• Concept of-
	    ➢ Transmission Control Protocol
	    ➢ User Datagram Protocol
	    ➢ IP, FTP, DNS, Telnet, SMTP, POP
	    ➢ HTTP, WWW, ARP, RARP
		Page -

Books Recommended:
1) Computer Networking by Tannenbaum.
2) Data communication and networking by William Stallings
3) Data communication and networking by B A Forouzan
4) Data communication and networking by AchyutGodbole
5) Data communication and networking by Jain

Course Code: BCA 303 **Course Title: DBMS with Oracle**

Total Contact Hours: 48 Hrs. **Total Marks: 100** **(60 Lectures)**

Teaching Scheme: Theory 05 Lect./Week **Total Credits: 04**

Course Objective: The objective of this course is to study database concepts using Oracle

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction to database system:** ➢ Definition, Limitations of traditional file system. ➢ Advantages of DBMS ➢ Components of DBMS ➢ Database Architecture ➢ Database Users ➢ Schemas and instances ➢ Database languages (DDL,DML, DCL)	5
Unit- 2	**Conceptual Design** ➢ Overview of DB design ➢ E-R model: E-R Diagram, entities, attributes and its types, Relationship and relationship sets, Cardinality, Degree, Generalization, Specialization, Aggregation ➢ Relational Model: Relation, Domain, Tuples, Degree, cardinality ➢ Relational database design: Key and types of keys, relational integrity rules, Codd's rules. ➢ Concepts of a table, a row, a relation, a tuple and a key in a relational database ➢ Conversion of ER to Relational model	12

Unit- 3	**Transaction and Concurrency Management :**
	➢ Introduction to transaction
	➢ Properties (ACID) of transaction
	➢ Transaction states
	➢ Problems of concurrency control.
	➢ Concurrency Control: Introduction to concurrency.
	   ➢ Lock and its types
	   ➢ Lock based protocols
	   ➢ Deadlock: Deadlock handling
	   ➢ Timestamp based protocol
		10

Unit- 4	**SQL** ➢ Introduction ➢ DDL commands (create, drop, alter) with examples ➢ DML Commands (insert, Update, Delete) with example ➢ DCL : Grant and Revoke	15

	- Constraints and its types - Data Retrieval Mechanism - Functions in SQL - Operators and clause - View - Index - Sub-query and Nested Sub-queries - SQL mechanisms for joining relations (inner joins, outer joins and its types	
Unit- 5	**PL/SQL using Oracle:** - Comparison between SQL and PL/SQL, Features of PL/SQL, Structure of PL/SQL - Data types in PL/SQL - Control statements : If-else construct, Loop statement for loop, while loop - Procedure & function : Definition of procedure & functions, IN, OUT AND INOUT Parameters, - Cursor : Definition of cursor, Types of cursor-implicit, Explicit, Open, Fetch, Cursor Attributes, Close cursor, Parameterized cursor. - Trigger and its types - Package in PL/SQL - Exception Handling in PL/SQL	18

Books Recommended:

1) Database System Concepts by KorthSilberschetz

2) Fundamentals of Database Systems by Elmsari, Navathe

3) SQL, PL/SQL The programming language of Oracle by Ivan Bayross

4) An Introduction to Database Systems by Bipin Desai

5) Database Management systems (DBMS) by Rajiv Chopra.

Course Code: BCA 304　　　　　　　　　　**Course Title: <u>OOP with C++</u>**

Total Contact Hours: 48 Hrs.　　　　　　**Total Marks: 100**　　**(60 Lectures)**

Teaching Scheme: Theory 5Lect./Week　　**Total Credits: 04**

<u>Course Objective:</u> The objective of this course is to study basics of OOP using C++ language.

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction to (Object Oriented Programming)OOP :** • Introduction to OOP • Features of OOP's- Class, Object, Data Abstraction, Data encapsulation, Data hiding, Message passing, polymorphism, inheritance, persistency, delegation, extensibility • Introduction to OOP languages. • Application of OOP • Comparison between POP (Procedural Oriented Programming) and OOP. • Advantages of OOP's	10
Unit- 2	**Introduction to C++ :** • History of C++ • C++ basics (C++ tokens)- Keywords, identifiers, data types, variables, constants, operators, special symbols • Types of Variables- Value, pointer and reference. • Structure of C++ program • Introduction to cin and cout objects. • Function and its types • Default value argument. • Parameter passing methods. • Static polymorphism (Function overloading)	10
Unit- 3	**Classes and Objects :** • Introduction to class and object. • Defining class (class specification) • Creating object • Access specifier (Visibility modes)- public, protected, private • Class members- data members, member functions • Non-member function • Defining member function inside and outside the class. • Inline function • Static data members and static member functions • Pointer to object • Array of object • Returning object • Passing object as parameter by value, by pointer and by reference • Dynamic memory allocation (new, delete) • Friend function and friend class. • Nesting of classes. • Constructors- Concept, characteristics of constructor • Types of constructor- default, parameterized and copy • Destructor- Concept, characteristics of destructor. • Constructor overloading • Static polymorphism (Operator overloading)- Concept, rules to	10

	overload operator, unary and binary operator overloading, overloading operator using member function and friend function. • Type conversion (type casting)- implicit and explicit.	

Unit- 4	**Inheritance and Runtime Polymorphism:**
	• Introduction and concept of inheritance
	• Defining derived class
	• Types of derivations
	• Types (Forms) of Inheritance- Single, Multi-level, Multiple, Hierarchical, Hybrid, Multi-path (Virtual base class)
	• Behavior of constructors and destructor in inheritance
	• Pointer to base class.
	• Pointer to derived class.
	• Runtime polymorphism-
	  ➢ Introduction and concept of runtime polymorphism
	  ➢ Virtual functions- Definition, concept, characteristics and use of virtual function.
	  ➢ Pure virtual function- Definition, concept, characteristics and use of pure virtual function.
	  ➢ Abstract class
	  ➢ Virtual destructor
		15

Unit- 5	**Stream and Files:** • Introduction to streams in C++ • Stream classes • File stream classes • Formatted and unformatted I/O functions and Manipulators. • File Manipulations- Opening, closing, reading, writing, appending • File opening modes • Opening files using open() and constructor • Error handling during file manipulations • Command line arguments.	10
Unit- 6	**Exception Handling and Template:** • Introduction to Exception • Exception handling mechanism- try, catch, throw keywords. • Custom exception. Introduction to Exception • Introduction to class template • Introduction to function template.	5

Books Recommended:
1) OOP in C++ – E-balagurusamy
2) Mastering C++ - K.R. Venugopal
3) Structured approach using C++ – Behrouz A. Forouzan
4) The Complete ReferenceC++- Fourth Edition. Herbert Schildt

Course Code: BCA 305 **Course Title: Operations Research**

Total Contact Hours: 48 Hrs. **Total Marks: 100** **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week **Total Credits: 04**

Course Objective: The objective of this course is to study the Operation research.

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction to Operations Research :** • History • Evolution • Scope and Limitations.	7
Unit- 2	**Linear Programming Problem(LPP):** • Statement of LPP • Formulation of problems as LPP • General form of LPP • Canonical form of LPP • Standard form of LPP • Definitions of decision variables, slack variables, surplus variables, a solution, feasible solution, basic feasible solution, an optimum solution and alternate optimum solution. • Solution of LPP by using graphical method • Duality Theory : Writing dual of primal problem	18

Unit- 3	**Transportation Problem (TP) :**
	• Statement of TP
	• Mathematical model of TP (Structure of TP)
	• Balanced TP and unbalanced TP
	• Degenerate solution and non-degenerate solution
	• Methods of obtaining initial basic feasible solution (IBFS) of TP:
	  ➢ North-West Corner method
	  ➢ Method of matrix minima i.e. least cost method
	  ➢ Vogel's approximation method.
	• Modified Distribution (MODI) Method of obtaining an optimal solution of TP.
		20

Unit- 4	**Assignment Problem(AP) :** • Statement of AP • Mathematical model of AP (Structure of AP) • Balanced and unbalanced AP • AP with restrictions • Optimal solution of AP by usingHungerian Method • Maximization in AP • Alternate solution • Difference between TP and AP	15

Books Recommended:
      1) Operations Research - H.A.Taha
      2) Operations Research - Kantiswarup Gupta
      3) Linear Programming - S. Vajda

Course Code: BCA 306　　　**Course Title: Lab 3 Based on301, 303, 304**

Total Contact Hours: 48 Hrs.　　　**Total Marks: 100**　　**(60 Practical's)**

Teaching Scheme: Practical 5 Pract. /Week　　　**Total Credits: 04**

Lab- 3

I) Practical's on course code BCA301:

Unit Name	Description
Introduction to Data structures	Write different programs in 'C' language that shows use of array, pointers, structure, dynamic memory allocation [use of malloc(), calloc(), realloc(), free()]
Stack	• Write a program to implement stack using array (static stack) • Write a program that check expression is valid or not • Write a program that reverse string using stack • Write a program that demonstrate use of recursion to find- 　　1. Digit sum of entered number 　　2. Face value of entered number 　　3. To find factorial of number 　　4. To find Fibonacci series
Queue	• Write a program to implement queue using array (static queue) • Write a program to implement circular queue • Write a program to implement input restricted deque (IRD) • Write a program to implement output restricted deque (ORD)
Linked list	• Write a program to implement singly linear linked list • Write a program to implement singly circular linked list • Write a program to implement stack using linked list (Dynamic stack) • Write a program to implement queue using linked list (Dynamic queue)
Tree	• Write a program to implement binary search tree with following operations- Insert( ), Search( ), Preorder( ), Inorder( ), Postorder( ), Count_leaf( ), Count_total( ), Delete( ), Find_max( ) Find_min( )
Sorting and searching	• Write a program to implement following sorting methods: 　　1. Bubble sort 　　2. Selection sort 　　3. Quick sort 　　4. Insertion sort 　　5. Merge sort 　　6. Radix sort • Write a program to implement following searching methods: 　1) Linear (Sequential) search for unsorted data. 　2) Linear (Sequential) search for sorted data. 　3) Binary search.

II) Practical's on course code BCA 303:

Description

1. Create following table. Book (id, title, author, publisher, category, year, price)
Distributor(did, name, city, discount) and Order(order_no, title, did, qty)
   a.   Display title and category of all books.
   b.   Display the total no of books per year.
   c.   Display list of authors.
   d.   Display the books published in 1991,92 and 93.
   e.   Display the books published from 1991 to 95.
   f.   Display the books whose price is greater than200.
   g.   Display the total no of books of each category.
   h.   Display titles of all books whose price is greater than average price.
   i.   Display the list of all books whose price is greater then average price of "computer" category.
   j.   Shoe the name of all the distributors who supply "software testing" books.
   k.   Display the details of all books whose price is greater than the maximum of the category average.
   l.   Display name of all books who are supplying the books whose author is 'Pressman'.
2.   Create the following table & solve given queries.

Table Name : branch

Column_name	Datatype	Constraint	Description
Bno	number(4)	Primary key	Branch number
Bname	Varchar2(20)	Not null	
City	Varchar2(15)	Not null	

Table Name : customer

Column_name	Datatype	Constraint	Description
Cust_no	Number(6)	Primary key	
Cust_name	Varchar2(20)	Not null	
City	Varchar2(15)	Not null	

Table Name : deposit

Column_name	Datatype	Constraint	Description
Acc_no	Varchar2(5)	Primary key	Starts from 'D'characcter
Cust_no	Number(6)	Foreign key	references table 'customer'
Bno	Number(4)	Foreign key	Branch number references from table 'branch'
Amount	Number(9,2)	Not null	Default amount is 500.00
Adate	Date	Not null	Date of money deposited

Table Name : borrow

Column_name	Datatype	Constraint	Description
Loan_no	Number(5)	Primary key	
Cust_no	Number(6)	Foreign key	references table 'customer'
Bno	Number(4)	Foreign key	references from table 'branch'
Amount	Number(9,2)	Not null	Default amount is 500.00

    a) Give names of depositors having amount greater than 4000.
    b) Give name of customer having living city BOMBAY and branch city DELHI.
    c) Give name of customers who are borrowers as well as depositors and having living city NAGPUR.
    d) Give name of customers who are depositors and have the same branch city as that of sunil.
    e) Give names of depositors having the same living city as that of shivani and having deposit amount greater than 200.
    f) Give names of borrowers having deposit amount greater than 1000 and loan amount greater than 2000.
    g) Give names of borrowers having loan amount greater than the loan amount of anil.
    h) Give loanno and loan amount of borrowers having the same branch as that of depositor sunil.
    i) Give loanno, loan amount, account no, and deposit amount of customers living in city NAGPUR.
    j) Give loanno, loan amount, account no, and deposit amount of customers having deposit branch located in delhi.

3. write a plsql block to find maximum number.
4. Write a program to find grade of marks.
5. write a plsql block for insert 10 rows in table.
6. write a plsql block for display sum of first n numbers.
7. write a function which return multiplication of two numbers.
8. write a plsql block to demonstrate the reverse loop.
9. write a procedure without parameter.
10. Define cursor for display information of student.
11. Write a procedure for addition and subtraction of two numbers. (Return result).
12. Create trigger for generating primary key.
13. Create trigger for avoiding inserting the records whose address 'solapur' and deleting the records whose address 'satara'.(use any table with address field).
14. Create package for addition, multiplication.
15. Create a function to calculate square of number

III) Practical's on course code BCA 304:

Unit Name	Description
Introduction to C++	• Write different programs in 'C++' language that shows use of array, pointers variable, reference variable, cin and cout objects, scope resolution operators, basic operators
Class & Object	• Write a program that shows use of class and object. • Write a program that shows parameter passing techniques in C++ • Write a program that shows defining member function inside and outside of class body • Write a program that demonstrate use of inline function • Write a program to implement function overloading concept • Write a program to implement default, parameterized and copy constructor • Write a program to implement friend function and friend class • Write a program to implement constructor overloading concept • Write a program that shows use of static data member and static member function. • Write a program that shows use of nesting classes. • Write a program that shows use of array of object • Write a program that shows passing and returning object from function. • Write a program that shows use of new and delete operator • Write a program that shows explicit type conversion • Write a program to overload different unary and binary operators by using friend and member function.
Inheritance & Runtime polymorphism	• Write a program to implement single inheritance. • Write a program to implement multi-level inheritance • Write a program to implement multiple inheritance • Write a program to implement hierarchical inheritance • Write a program to implement hybrid inheritance • Write a program to implement multi-path inheritance • Write a program that shows use of pointer to base class • Write a program that shows use of pointer to derived class • Write a program that shows use of virtual function. • Write a program that shows use of pure virtual function. • Write a program that shows use of abstract class • Write a program that shows use of virtual destructor • Write a program that shows behavior of constructor and destructor in inheritance.
Streams and Files	• Write a program that shows use of istream class. • Write a program that shows use of ostream class. • Write a program that shows use of different manipulators. • Write a program to read, write and append data into file. • Write a program that checks two files are identical or not. • Write a program that shows use of random access of file. • Write a program that shows use of command line argument.
Exception Handling and template	• Write a program that shows use try, catch and throw • Write a program that shows use multiple catch blocks. • Write a program that shows use of custom exception. • Write a program that shows use of function template • Write a program that shows use of class template

Second Year BCA (Under Science) Semester- III

Course Code: BCA 401 **Course Title: Software Testing**

Total Contact Hours: 48 Hrs. **Total Marks: 100** **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week **Total Credits: 04**

Course Objective: The objective of this course is to study software testing in detail.

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction To Software Testing:** • What is Software Testing? • Use or need of software testing. • Software Development Life Cycle (SDLC) : ➢ Water Fall Model ➢ Spiral Model ➢ V- Model ➢ Prototype Model ➢ Hybrid Model	10
Unit- 2	**White Box Testing:** • Introduction to White box testing • Advantages and Disadvantages of White box testing • Loop Testing • Path Testing • Condition testing • Memory Testing • Performance Testing	10
Unit- 3	**Black Box Testing:** • Introduction to black box testing • Advantages and Disadvantages of black box testing • Functional Testing- • Integration Testing (Incremental Integration Testing) ➢ Top Down Incremental Integration Testing ➢ Bottom Up Incremental Integration Testing ➢ Non Incremental Integration Testing • System Testing • Acceptance Testing • Smoke Testing • Exploratory Testing • Adhoc Testing • Performance Testing – ➢ Load Testing ➢ Stress Testing ➢ Volume Testing ➢ Soak Testing • Regression Testing- ➢ Unit Regression Testing/Retest ➢ Regional Regression Testing, ➢ Full Regression Testing	10
Unit- 4	**Test cases and its design Techniques:** • Introduction to Test Case • Characteristics Of Good Test Case	15

	• Test Case Template
	• How To Write A Test Case
	• How To Ensure The Test Coverage Is Good ,
	• How To Identify whether It Is a Good Test Case Or Not
	• Review Process/Peer Review ,
	• Preparing Review Report
	• Examples On Writing Test Cases
	• Test Cases Design Techniques-
	    ➢ Error Guessing
	    ➢ Equivalence Partitioning,
	    ➢ Boundary Value Analysis	

Unit- 5	**Software Test Life cycle and Defect Life Cycle:**
	• Software Test Life Cycle-
	    ➢ Writing Test Plan
	    ➢ Preparing Traceability Matrix
	    ➢ Writing Test Execution Report
	    ➢ Summary Report
	    ➢ Retrospect Meeting /Triage Meetings
	• Defect Life Cycle-
	    ➢ Concept of Defect life cycle
	    ➢ Difference between Bug, Defect, Failure, Error
		15

Books Recommended:
1) The art of Software Testing– Glenford J. Myers
2) Lessons learned in Software Testing – CemKaner, James Bach, Bret Pettichord
3) A Practitioner's Guide to Software Test Design- Lee Copeland
4) Software Testing Techniques, 2nd edition- Boris Beizer
5) How to Break Software: A Practical Guide to Testing- James Whittaker

Course Code: BCA 402 **Course Title: <u>Python</u>**

Total Contact Hours: 48 Hrs. **Total Marks: 100** **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week **Total Credits:04**

<u>Course Objective:</u> The objective of this course is to study basics Python.

Unit No.	Description	No. of Lectures

Unit- 1	**Introduction to Python Programming**:
	• Features/characteristic of Python
	• Basic syntax
	• Writing and executing simple program
	• Basic Data Types
	• Declaring variables
	• Performing assignments, arithmetic operations,
	• Simple input-output
	• Precedence of operators
	• Type conversion
	• Conditional Statements:
	  if, if-else, nested if –else
	• Looping:
	  for, while, nested loops
	• Terminating loops, skipping specific conditions
		10

Unit- 2	**String, collection lists and Tuples:**
	• Declaring strings
	  ➤ String Manipulation using string functions
	  ➤ Introduction to Collection lists
	• Introduction to Collection list
	  ➤ Manipulating Collections Lists
	• Tuples-
	  ➤ Introduction to Tuples
	  ➤ Manipulating Tuples
		10

Unit- 3	**Dictionaries , Functions and Modules:**
	• Concept of dictionary
	• Techniques to create, update &delete dictionary items
	• Functions:
	  ➤ Defining a function
	  ➤ Calling a function
	  ➤ Advantages of functions
	  ➤ Types of functions
	  ➤ Function parameters
	  ➤ Formal parameters,
	  ➤ Actual parameters
	  ➤ Anonymous functions
	  ➤ Global and Local variables
	• Modules:
	  ➤ Importing module
	  ➤ Creating & exploring modules
	  ➤ Mathmodule, Random module, Time module
		10

	Python File Input-Output, Exception Handling and Regular Expression:	

Unit- 4	- Opening and closing file - Various types of file modes - Reading and writing to files - Manipulating directories - <u>Exception Handling –</u> - What is exception - Various keywords tohandle exception such try, catch, except, else, finally, raise - <u>Regular Expressions –</u> - Concept of regular expression - various typesof regular expressions, using match function	10
Unit- 5	**GUI Programming in Python (using Tkinter/wxPython/Qt) :** - What is GUI - Advantages of GUI - Introduction to GUI library - Layout management - Events and bindings, Font, Colors, drawing on Canvas (line, oval, rectangle, etc.) - Widget such as : - Frame - Label - Button - Checkbutton, - Entry - Listbox - Message - Radiobutton - Text - Spinbox etc.	12
Unit- 6	**Database connectivity in Python –** - Installing mysql connector - Accessing connector module using connect, cursor - Execute& close functions - Reading single & multiple results of query execution - Executing different types of statements - Executing transactions - Understanding exceptions in database connectivity	8

<u>Books Recommended:</u>
1) Introduction to Computer Science using Python- Charles Dierbach
2) Beginning Python: Using Python 2.6 and Python 3- James Payne
3) Practical Programming: An Introduction toComputer Science Using Python 3- Paul Gries , Jennifer Campbell, Jason Montojo
4) Programming Languages – Principles and Paradigms- AdeshPandey
5) MySQL for Python: Database Access Made Easy- A. Lukaszewski

Course Code: BCA 403   **Course Title: <u>Operating System</u>**

Total Contact Hours: 48 Hrs.   **Total Marks: 100**   **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week   **Total Credits: 04**

<u>Course Objective:</u> The objective of this course is to study basics of Operating System.

Unit No.	Description	No. of Lectures

Unit- 1	**An Introduction to Operating System:**
	 • Definition, introduction of Operating system.
	 • Types of Operating System:
	   ➢ Batch
	   ➢ Parallel
	   ➢ Multiprogramming,
	   ➢ Time Sharing
	   ➢ Distributed
	   ➢ Real time
	 • Structure of Operating System.
	 • System Components
	 • Services provided by Operating System.
	 • Monolithic and Layered Systems
	 • System design and implementation
	 • System Generalization and virtual machine.
		15

Unit- 2	**Process Management, Scheduling and Synchronization:**
	 • Process Management:
	   ➢ Introduction to process
	   ➢ Process life cycle.
	   ➢ Concept of process management
	   ➢ System calls
	   ➢ Operations on Process
	   ➢ Cooperating Process and threads
	   ➢ Interprocess Communication
	 • Process Scheduling:
	 • Basic Concept of process scheduling
	 • Scheduling criteria
	 • Scheduling Algorithms:
	   ➢ FCFS (First Come First Serve)
	   ➢ SJF (Shortest Job First)
	   ➢ Round Robin
	   ➢ Priority Scheduling
	   ➢ Multilevel Queue Scheduling
	 • Process Synchronization:
	   ➢ Critical section problem
	   ➢ Semaphores, Critical Regions, Classic
	   ➢ Problems of Synchronization
		20

Unit- 3	**Deadlocks Prevention, avoidance, detection and recovery:** • Definition and concept of Deadlock • Handling Deadlocks • Deadlock Prevention • Deadlock Avoidance • Deadlock Avoidance Algorithm:	10

	➢ Mutual exclusion ➢ Resource allocation graph (RAG) ➢ Bankers • Deadlock Detection and recovery	

Unit- 4	**Memory Management:**
	• Concept &Background of Memory Management
	• Swapping
	• Continuous Memory Allocation
	• Fragmentation
	• Paging
	• Segmentation
	• Virtual memory Demand Paging
	• Process criteria
	• Page replacement.
	• Page replacement algorithm:
	   ➢ FIFO (First In First Out)
	   ➢ LRU (Least Recently used)
	   ➢ Optimal
	   ➢ LFU (Least frequently Used)
		10

Unit- 5	**File System:** • Concept of file • File Structure • File Naming (File attributes) • File Types • File operations • File Protection • Directory structure of file • Allocation of disk space for file • File Handling	5

Books Recommended:
1) System programming and O.S. By D.M. Dhamdhere.
2) Modern O.S. By Andrews Tanenbaum.
3) Operating System Concepts BySiberchatz and Galvin.

Course Code: BCA 404   **Course Title: Advanced Web Technology**

Total Contact Hours: 48 Hrs.   **Total Marks: 100   (60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week   Total Credits: 04

<u>Course Objective:</u> The objective of this course is to study advanced web technology

Unit No.	Description	No. of Lectures

Unit- 1	**Introduction and Basics of PHP:**
	• History of PHP
	• PHP is better than Its alternatives
	• Interfaces to External systems
	• Hardware and Software requirements
	• Benefits of PHP as a server side languages
	• How PHP works with the web server
	• Installation and Configuration files
	• PHP Framework
	• Basic PHP syntax
	• PHP data types
	• Displaying type information
	• Testing for specific data type
	• Changing type with Set type
	• Operators
	• Variable manipulation
	• Dynamic variables
	• Static vs. Dynamic Optimization
	• Redirecting web pages
	• Control Structures
	  ➢ If condition Statement
	  ➢ The switch statement
	  ➢ Using the ? operator
	  ➢ While, do while and for Loop
	  ➢ Breaking out of loops
	  ➢ Nesting loops
		10

Unit- 2	**Array, String and Functions:**
	• Array:
	  ➢ Single-Dimensional Arrays
	  ➢ Multidimensional Arrays
	  ➢ Associative arrays
	  ➢ Accessing arrays
	  ➢ Getting the size of an array
	  ➢ Examining arrays
	  ➢ merging arrays
	  ➢ Sorting arrays
	  ➢ Sorting an associative arrays
	• String:
	  ➢ Formatting String for Presentation
	  ➢ Formatting String for Storage
	  ➢ Joining and Splitting String
	  ➢ Comparing String
		15

	➢ Matching and replace Substring, patterns
	➢ The basic regular expressions
	➢ Matching patterns
	➢ Finding matches
	• Functions:
	  ➢ Function and its Types
	  ➢ Library Function
	  ➢ Array functions
	  ➢ String functions
	  ➢ Date and time functions
	  ➢ Maths functions
	  ➢ User-defined functions
	  ➢ Creating a function
	  ➢ Returning value from function
	  ➢ Dynamic function calls
	  ➢ Variable scope
	  ➢ Accessing variable with the global statement
	  ➢ Function calls with the static statement
	  ➢ Setting default values for arguments
	  ➢ Passing arguments to a function by value
	  ➢ Passing arguments to a function by reference
	  ➢ Using require() and include()	

Unit- 3	**Object Oriented Programming in PHP:** • Object oriented concepts • Define a class and objects • Class attributes • Object properties • Object methods • constructors and destructors • Class constants • Static method • inheritance • Abstract classes • Exception Handling • Final keyword • Implementing Interface • Object serialization • Understanding Advance and New • Checking for class and method existence	10
Unit- 4	**Working With Forms and Database (MySQL):** Working With Forms: • Forms • Forms controls properties, methods and events • Retrieving form data with $_POST, $_GET and $_REQUEST arrays • Validating retrieved data • Strategies for handling invalid input • Super global variables • Super global array • Importing user input • Accessing user input • Combine HTML and PHP code • Using hidden fields	15

	- Redirecting the user - File upload and scripts - Validation ➢ Server side validation ➢ Client side validation (Java script) **Working with Database MySQL:** - History of MySQL - Installation and Up gradation to MYSQL - MySQL Architecture - Invoking MySQL through Command Line - MySQL Server Start and Stop - Overview of Data Types in MySQL - Defining a Database - Creating Tables and Fields in MySQL - Working with PHP-MySQL Environment - Connecting to the MYSQL - Selecting a database - Adding data to a table - Displaying returned data on Web pages - Finding the number of rows - Inserting, deleting and updating data - Executing multiple queries	
Unit- 5	**State Management:** - Cookies: ➢ What is a Cookie? ➢ Setting time in a cookie with PHP ➢ Deleting a cookie ➢ Creating session cookie ➢ Working with the query string - Session: ➢ What is session? ➢ Starting a session ➢ Registering Session variables ➢ working with session variables ➢ destroying session ➢ passing session Ids ➢ encoding and decoding session variables	10

Books Recommended:
1) PHP: The Complete Reference-Steven Holzner.
2) Professional PHP 5-Ed Lecky-Thompson,HeowEide-Goodman, Steven D. Nowicki, Alec Cove.
3) Programming PHP- Rasmuslerdorf, Kevin Tatroe.
4) Beginning PHP 5.3 –WroxPlublication-Matt Doyle
5) Learning php, mysql, javascript and css –Oreilly- Robin Nixon

Course Code: BCA 405   **Course Title: E- Governance**

Total Contact Hours: 48 Hrs.   **Total Marks: 100**   **(60 Lectures)**

Teaching Scheme: Theory 5 Lect./Week   Total Credits: 04

Course Objective: The objective of this course is to study the basic of E-Governance.

Unit No.	Description	No. of Lectures
Unit- 1	**Introduction to e-Government:** • Definitions • Domains, • Taxonomy • Current Status in India and Global • Conceptual Foundations • Citizen Centric E-Governance • E-Governance Services • E-Governance Models	10
Unit- 2	**Managing E-Governance-Strategy and Implementation:** • Management Models- ➢ Centralized ➢ Decentralized ➢ Hybrid • Implementation Models- ➢ Back End Automation ➢ Front End Services ➢ Holistic • Business Models- ➢ Self-Finance ➢ PPP ➢ JV • Different Payment • Facilities Management outsourcing, • Management of Intellectual Properties	10
Unit- 3	**Theories of Evolution in e-Government:** • Four stages of e-Government evolution • Various models • E-Government maturity model	7
Unit- 4	**Managing e-Government:** • Transformational Government for value creation • Theory and practice of BPRs • Change Management • Capacity Building • Role of Political Leadership • Role of Social Media and Citizens • Technology- ➢ Components and Overview, ➢ Procurement Strategyand Challenges	10
Unit- 5	**E-Government Life Cycle:** • Different between general and e-Government Project Life Cycle • Concept behind and importance of each PLC stage.	9

	Challenges in Implementation of e-Government Project: • Universally identified challenges • Challenges facing e-Government practitioners in India.	
Unit- 6	**Performance Management:** • India and Global Assessment framework and variety of readiness • indexes and their usefulness Outcomes and Benefitsmanagement.	9

Books Recommended:
1) E-Government: From vision to implementation- SubhashBhatnagar
2) E-Government- Concepts and case studies- C S R Prabhu
3) Unlocking E-Governance Potential Concepts Cases and Practical Insights- SubhashBhatnagar
4) Compendium of E-Governance Initiatives in India-Piyush Gupta, R. K.Bagga
5) E-Governance Case Studies-Ashok Agarwal
6) Information Technology and E-Governance- N. Gopalsamy

Course Code: BCA 406Course Title: Lab 4 Based on 402, 404

Total Contact Hours: 48 Hrs.   **Total Marks: 100   (60 Practical's)**

Teaching Scheme: Practical 05 Lect. /Week   Total Credits: 4

Lab- 4
I) Practical's on course code BCA 402:

Description
1) Installing python and setting up python environment
2) Write a program in python that uses simple statements like printing thenames, numbers, mathematical calculations, etc.
3) Write a program in python that uses conditional constructs like if, if-else, nested if
4) Write a program in python that uses loops
5) Write a program in pythonto manipulate on string like string copy, string concatenation, string comparison, string length, string reverse etc.
6) Write Programs in python which are related to Lists and Tuples
7) Write Programs in python which are related to dictionaries
8) Write Programs in python which are related to functions & modules
9) Write Programs in python to read & write file.
10) Write a python program to demonstrate exception handling
11) Write a python program to demonstrate the use of regular expressions
12) Write a python program to draw different shapes
13) Write a python program to show different GUI controls and their processing
14) Write a python program to show database connectivity

III) Practical's on course code BCA 404:

Description
1) Write PHP code to check entered number is Armstrong or Not.
2) Write a menu driven program to perform following operations: a) Check Number is Palindrome or not.   b) Check Number is Perfect or not.   c) Find face value of Entered number.   d) Check Number is Prime or not.   e) Check Number is Strong or not.

3) Write a PHP code to perform following operations:

    a) Sort array element

    b) Find Maximum and Minimum number in array

    c) Merge two arrays in third array.

    d) Swap two array elements

4) Write a program to overload the constructor.

5) Write a program which uses the static methods and static variables.

6) Write a program to implement different types of inheritance.

7) Write a program to implement interface.

8) Write a program to handle different types of exceptions.

9) Write a program which shows the use of 'final' keyword.

10) Write a program to copy the content of one file into another.

11) Write a program to merge two files into third file.

12) Design a web application to perform following task on employee table.

  I) Add New II) Save   III) Delete   IV) Update   V) Move First VI) Move Last

13) Design a web application that uses cookies and session object.