



SWAMI VIVEKANAND
SUBHARTI
UNIVERSITY
UGC Approved Meerut



AN ISO 21001: 2018 ORGANIZATION

OFFICE OF THE REGISTRAR

Gp Capt M Yakoob

M-in-D (Retd.), M.Tech.

REGISTRAR

registrar@subharti.org

Ref.No.U-508(i)/SVSU/2025/1564

Date:25.01.2025

NOTIFICATION

It is hereby notified for information of all the concerned that the Academic Council in its 34th meeting held on 25-07-2024 vide resolution No.34(7) has approved the ordinance relating to course curriculum & syllabus of degree of Four Year Degree Program (FYDP) of the following:

Ordinance No.V-126 (B7), relating to B.C.A. program

The copies of all above are enclosed and shall be applicable from Academic Session 2024-25 onwards.

This issues with the approval of the Hon'ble Vice Chancellor.

M. Yakoob
25.01
2025
Registrar

Ref.No.U-508(i)/SVSU/2025/1564

Date: 25.01.2025

Copy forwarded to information of:

1. Hon'ble Vice-Chancellor
2. Controller of Examination
3. Dean-Academics
4. Director-IQAC
5. Dean-Faculty of Science (for compliance please)
6. CTO (with a request to upload the ordinance on University website)
7. Additional Registrar-Academics
8. Guard File

M. Yakoob
25.01
2025
Registrar



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SWAMI VIVEKANAND SUBHARTI UNIVERSITY
MEERUT



Keral Verma Subharti College of Science

Ordinance Number V 126 B-7

Bachelor in Computer Application

**Department of Computer Application
Keral Verma Subharti College of Science
SWAMI VIVEKANAND SUBHARTI UNIVERSITY
Meerut**



**Syllabus of BCA (Bachelor in Computer Application)/BCA-Hons Program
Four Year Degree Program
as per
National Education Policy-2020**

**Proposed Titles for Theory and Practical Papers
Under Graduate Program**

**Bachelor in Computer Application
2024-25**

FIRST YEAR (Certificate in Computer Application)												
Sem.	Course Code	Course Name	Subject Type	Course Type	TEACHING LOAD PER WEEK				Credits	marks		
					L	T	P	Total		cIE	ESE	Total
I	BCA-101	COMPUTER CONCEPTS & PROGRAMMING IN C	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-151	OS & C-PROGRAMMING LAB	Major I & II	Practical	0	0	4	4	4	25	75	100
	BCA-102	OPERATING SYSTEM	Major II	Theory	4	0	0	4	4	25	75	100
	VOC-CHI	Computer Hardware & Installation	Vocational Course	Theory	3	0	0	3	3	25	75	100
	Z010101	First Aid and Basic Health	Co-Curriculum course	Theory	2	0	0	2	2	25	75	100
	Semester Total					13	0	4	17	17	50	450
II	BCA-201	OBJECT-ORIENTED PROGRAMMING WITH C++	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-251	COMPUTER LAB USING C++ AND COMPUTER GRAPHICS	Major I & II	Practical	0	0	4	4	4	25	75	100
	BCA-202	COMPUTER GRAPHICS	Major II	Theory	4	0	0	4	4	25	75	100

	ENGLISH AND SKILLS	PROSE WRITING										
			MDC	Theory	6	0	0	6	6	25	75	100
		To be chosen from the List of Subjects Provided by the University	Vocational Course	Theory	3	0	0	3	3	25	75	100
Z020201	Human Values and Environmental Studies		Co-Curriculum course	Theory	2	0	0	2	2	25	75	100
Semester Total					19	0	4	23	23	150	450	600

SECOND YEAR (Diploma in Computer Application)												
Sem	Course Code	Course Name	Subject type	Course type	TEACHING LOAD PER WEEK				Credits	Marks		
					L	T	P	Total		cIE	ESE	Total
III	BCA-301	DATA STRUCTURES USING C	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-351	DATA STRUCTURE LAB	Major I	Practical	0	0	4	4	4	25	75	100
	BCA-302	COMPUTER NETWORK	Major II	Theory	4	0	0	4	4	25	75	100

	To be chosen from the List of Subjects Provided by the University	Vocational Course	Theory	3	0	0	3	3	25	75	100
Z030301	Physical Education and Yoga	Co-Curriculum course	Theory	2	0	0	2	2	25	75	100
Semester Total				13	0	4	17	17	50	450	500
		Major I	Theory								
BCA-401	DATABASE MANAGEMENT SYSTEM			4	0	0	4	4	25	75	100
BCA-451	DBMS LAB & WEB DESIGNING	Major I & II	Practical	0	0	4	4	4	25	75	100
	WEB DESIGNING USING SCRIPTING LANGUAGE	Major II	Theory								
BCA-402				4	0	0	4	4	25	75	100
BCA-403	Management Information System	MDC	Theory	6	0	0	6	6	25	75	100
	Indian/Regional Language	Co-Curricular course	Theory	2	0	0	2	2	25	75	100
		Survey/Project	Practical								
INT-01/INT-H-01	Research project /Dissertation/Internship/Survey Works			0	0	6	3	3	25	75	100
IV	Semester Total			16	0	10	23	23	150	450	600

THIRD YEAR (UG Degree- Bachelor of Computer Application)												
Sem	Course Code	Course Name	Subject type	Course type	TEACHING LOAD PER WEEK				Credits	Marks		
					L	T	P	Total		cIE	ESE	Total
V	BCA-501	DESIGN & ANALYSIS OF ALGORITHM	Major I	Theory	4	0	0	4	4	25	75	100

	BCA-502	DATA MINING & DATA WAREHOUSING	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-503	FUNDAMENTALS OF IOT	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-551	ALGORITHM LAB	Major I	Practical	0	0	4	4	4	25	75	100
	INT-02	Research project /Dissertation/Internship/Survey Works	Survey Works	Practical	0	0	4	4	4	25	75	100
Semester Total					20	0	8	20	20	150	450	500
VI	BCA-601	SOFTWARE ENGINEERING	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-602	.NET FRAMEWORK WITH VB.NET	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-603	CLOUD COMPUTING	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-651	S/W ENGG & VB.NET LAB	Major I	Practical	0	0	4	4	4	25	75	100
	INT-03	Research project /Dissertation/Internship/Survey Works	Survey Works	Practical	0	0	4	4	4	25	75	100
	Semester Total					20	0	8	20	20	150	450

THIRD YEAR (UG Degree- Bachelor of Computer Application) with Hon's												
Sem	Course Code	Course Name	Subject type	Course type	TEACHING LOAD PER WEEK				Credits	Marks		
					L	T	P	Total		cIE	ESE	Total
V	BCA-501-H	Software Project Management	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-502-H	Fog Computing	Major I	Theory	4	0	0	4	4	25	75	100

	BCA-503-H	Data Analytics	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-504-H	Programming in Python	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-551-H	Python Lab	Major I	Practical	0	0	4	4	4	25	75	100
	INT-02	Research project /Dissertation/Internship/Survey Works	Survey Works	Practical	0	0	5	5	5	25	75	100
	Semester Total				16	0	9	25	25	150	450	600
VI	BCA-601-H	AI & Machine Learning	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-602-H	Cloud Computing and Cyber Security	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-603-H	Cyber Security	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-604-H	Java Programming	Major I	Theory	4	0	0	4	4	25	75	100
	BCA-651-H	Java Programming Lab	Major I	Practical	0	0	4	4	4	25	75	100
	INT-03	Research project /Dissertation/Internship/Survey Works	Survey Works	Practical	0	0	5	5	5	25	75	100
	Semester Total				16	0	9	25	25	150	450	600

Semester-Wise Titles of the Major Course (MJC) Papers in BCA

Year	Sem.	Course Code	Paper Title	Theory/Practical	Credits
1	I	BCA-101	Computer Concepts & Programming in C	Theory	04
		BCA-102	Operating System	Theory	04
		BCA-151	1- C-Programming Lab 2- OS Lab	Practical	04
	II	BCA-201	Object-Oriented Programming with C++	Theory	04
		BCA-202	Computer Graphics	Theory	04
		BCA-251	COMPUTER LAB USING C++ AND COMPUTER GRAPHICS	Practical	04
2	III	BCA-301	Data Structures Using C	Theory	04
		BCA-302	Computer Network	Theory	04
		BCA-351	Data Structure Lab	Practical	04
	IV	BCA-401	Database Management System	Theory	04
		BCA-402	Web designing using Scripting Language	Theory	04
		BCA-451	DBMS Lab & Web Designing	Practical	04
3	V	BCA-501	Design & Analysis of Algorithm	Theory	04
		BCA-502	Data Mining & Data Warehousing	Theory	04
		BCA-503	Fundamentals of IOT	Theory	04
		BCA-551	Algorithm Lab	Practical	04
	VI	BCA-601	Software Engineering	Theory	04
		BCA-602	.Net Framework with VB.net	Theory	04
		BCA-603	Cloud Computing		
		BCA-651	S/w Engg & VB.Net Lab	Practical	04
			Theory	04	
OR					
3 Hons Degree program	V	BCA-501-H	Software Project Management	Theory	04
		BCA-502-H	Fog Computing	Theory	04
		BCA-503-H	Data Analytics	Theory	04
		BCA-504-H	Programming in Python	Theory	04
		BCA-551-H	Python Lab	Practical	04
	VI	BCA-601-H	AI & Machine Learning	Theory	04
		BCA-602-H	Cloud Computing and Cyber Security	Theory	04
		BCA-603-H	Cyber Security	Theory	04
		BCA-604-H	Java Programming	Theory	04
		BCA-651-H	Java Programming Lab	Practical	04

**Semester-Wise Titles of the Minor Multidisciplinary Course (MDC) Papers in
BCA**

Year	Sem.	CourseCode	PaperTitle	Theory/Practical	Credits
1	I/II	MMDC-101	Introduction to computer system	Theory	06
2	III/IV	MMDC-102	Management Information System	Theory	06

**Semester-Wise Titles of the Vocational Skill Enhancement Course (SEC)
Papers in BCA**

Year	Sem.	CourseCode	PaperTitle	Theory/Practical	Credits
1	I	VOC-1-CHI	Computer Hardware & Installation	Theory	03
2	II	VOC-2-DOT	Data Entry/Application of office Tools	Theory	03
	III	VOC-3-GD	1. Graphics Designing 2. UGC & PKMVY 4.0 Affiliated Course (Online/Offline)	Theory	03

Semester-Wise Titles of the Ability Enhancement Course (AEC) Papers in BCA

Year	Sem.	CourseCode	PaperTitle	Theory/Practical	Credits
1	I		First Aid and Basic Health	Theory	02
	II		Human Values and Environmental Studies	Theory	02
2	III		Physical Education and Yoga	Theory	02
	IV		Regional and Indian Language	Theory	02

**Semester-Wise Titles of the Research Project /Dissertation/Internship/Survey
Works in BCA (major Category)
Three Years Plain Degree**

Year	Sem.	CourseCode	PaperTitle	Theory/Practical	Credits
1	IV	INT-01	Research project /Dissertation/Internship/Survey Works	Practical	03
	V	INT-02	Research project /Dissertation/Internship/Survey Works	Practical	04
2	VI	INT-03	Research project /Dissertation/Internship/Survey Works	Practical	04

**Semester-Wise Titles of the Research project /Dissertation/Internship/Survey
Works in BCA (major Category)
Three Years Hon's Degree**

Year	Sem.	CourseCode	PaperTitle	Theory/Practical	Credits
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1	IV	INT-H-01	Research project /Dissertation/Internship/Survey Works	Practical	03
	V	INT-H-02	Research project /Dissertation/Internship/Survey Works	Practical	05
2	VI	INT-H-03	Research project /Dissertation/Internship/Survey Works	Practical	05

Detailed Syllabus Major Courses

Syllabus for BACHELOR IN COMPUTER APPLICATION (BCA)

Programme/Class: BCA		Year: First	Semester: First
Subject: Computer Application			
Course Code: BCA-101		Course Title: Computer Concepts & Programming in C	
Course outcomes: <ol style="list-style-type: none"> 1. Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers. 2. Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting. 3. Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in. 4. Describe the components of a Central Processing Unit (CPU) and memory (RAM and ROM). 5. Understand office packages including Word, Excel and PowerPoint. 			
Credits: 4		Major	
Max. Marks: 25+75		Min. Passing Marks: 40	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			
Unit	Topic		No. of Lectures
I	Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples. Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers.		10

<p style="text-align: center;">II</p>	<p>Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.</p> <p>Editors and Word Processors</p> <p>Basic Concepts, Examples: MS-Word, Introduction to desktop publishing. Spreadsheets and Database packages</p> <p>Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.</p>	<p style="text-align: center;">18</p>
<p style="text-align: center;">III</p>	<p>Introduction to C Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants.</p> <p>Input and output with C: Formatted I/O functions - printf and scanf, control stings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display single character and a string - getchar, putchar, gets and puts functions.</p> <p>C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associativity; Evaluation of arithmetic expressions; Type conversion.</p>	<p style="text-align: center;">10</p>
<p style="text-align: center;">IV</p>	<p>Simple Arithmetic Problems</p> <p>Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n, ab, Factorial, sine series, cosine series, nCr , Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping.</p>	<p style="text-align: center;">8</p>
<p style="text-align: center;">V</p>	<p>Control Structures: Decision making Statements - Simple if, if_else, nested if_else, else_if ladder, Switch Case, goto, break & continue statements; Looping Statements - Entry controlled and exit controlled statements, while, do-while, for loops, Nested loops.</p> <p>Functions</p> <p>Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.</p> <p>Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation.</p> <p>Strings: Declaring & Initializing string variables; String handling functions - strlen, strcmp, strcpy and strcat; Character handling functions – to ascii, to upper, to lower, is alpha, is numeric etc</p> <p>Introduction C Preprocessor</p>	<p style="text-align: center;">14</p>

	<p>Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation ,Bitwise Operators Bitwise operators; Shift operators; Masks; Bit field.</p> <p>File handling Definition of Files, Opening modes of files; Standard function: fopen(), fclose(), feof(), fseek(), fewind();Using text files: fgetc(), fputc(), fscanf() ,Command line arguments</p>	
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Text Books:

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC
3. C: The Complete Reference, By Herbert Schildt.
4. M.T Somashekara, D.S Guru and K.S. Manjunatha: Problem solving with C, PHI publication
5. C Programming Language, By Brain W. Kernighan

Reference:

1. J. Glenn Brook shear," Computer Science: An Overview", Addison-Wesley, Twelfth Edition,
2. R.G. Dromey, "How to solve it by Computer", PHI
3. Yashwant Kanitkar: Let us C
4. S. Byron Gottfried: Programming with C (TMH)

Programme/Class: BCA	Year: First	Semester: First
Subject: Computer Application		
CourseCode: BCA-102	CourseTitle: Operating System	
Course outcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand role, responsibilities, features, and design of operating system. 2. Analyze memory management schemes and process scheduling algorithms. 3. Apply process synchronization techniques to formulate solution for critical section problems. 4. Illustrate concept of disk scheduling. 5. Evaluate process deadlock handling techniques. 		
Credits: 4		Major
Max. Marks: 25+75		Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction Operating system and functions, Classification of Operating systems: Batch, Interactive, Timesharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure, System Components, Operating System Services, Kernels, Monolithic and Microkernel Systems.	7
II	Process Management Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process States, Process Transitions, Scheduling Algorithms, Interprocess Communication, Threads and their management, Security Issues.	8
III	CPUScheduling Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-Preemptive Scheduling: First-Come-First-Serve, Shortest Request Next, Highest Response Ratio Next, Round Robin, Least Complete Next, Shortest Time to Go, Long, Medium, Short Scheduling, Priority Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	8
IV	Memory Management Memory allocation, Relocation, Protection, Sharing, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing.	7

<p>V</p>	<p>I/O Management and Disk Scheduling & File System: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.</p>	<p>8</p>
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems," Fourth Edition, Pearson, 2014. 2. Abraham Silberschatz, Greg Gagne, and Peter B. Galvin, "Operating System Concepts," Tenth Edition, Wiley, 2018. 3. William Stallings, "Operating Systems: Internals and Design Principles," Seventh Edition, Prentice Hall, 2011. 4. Dhanjay Dhamdhere, "Operating Systems," First Edition, McGraw-Hill, 2008 Milan Milankovic "Operating Systems, Concepts and Design" McGraw Hill 		

Programme/Class: BCA	Year: First	Semester: First
CourseCode: BCA-151	CourseTitle: OS & C-Programming Lab	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand the basic programming concepts and syntax of the C language. 2. Design and implement algorithms to solve simple programming problems. 3. Write, compile, and execute C programs using integrated development environments (IDEs). 		
Credits: 4	Major	
Max.Marks: 25+75	Min.PassingMarks: 40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 0-0-4		
OS Lab <ol style="list-style-type: none"> 1. Detailed study of Window operating system 2. Detailed study of DOS 3. Perform all the operations in Window 4. Perform all the operations in DOS Programming Lab <ol style="list-style-type: none"> 1. Write a C Program to read radius of a circle and to find area and circumference. 2. Write a C Program to read three numbers and find the biggest of three. 3. Write a C Program to check for prime. 4. Write a C Program to generate n primes. 5. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome. 6. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder) 7. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array) 8. Write a C Program to remove Duplicate Element in a single dimensional Array. 9. Program to perform addition, subtraction and multiplication of Matrices. 10. Program to perform transpose of two dimensional Matrices. 11. Write a C Program to find the length of a string . 12. Write a C Program to demonstrate string functions. 13. Write a C Program to demonstrate pointers in C. 14. Write a C Program to read, display and to find the trace of a square matrix . 15. Write a C Program to read, display and multiply two matrices using functions . 16. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters. 17. Write a C Program to Reverse a String using Pointer. 18. Write a C Program to Swap Two Numbers using Pointers 		

19. Write a C Program to demonstrate student structure to read & display records of n students.
20. Write a C Program to demonstrate structure.

Programme/Class: Certificate	Year: First	Semester: Second
Subject/Stream: ComputerApplication		
CourseCode: BCA-201	CourseTitle: Object Oriented Programming with C++	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand the fundamental concepts of object-oriented programming. 2. Design and implement C++ programs using classes, objects, and inheritance. 3. Apply polymorphism and templates to develop reusable code. Utilize advanced features of C++ to develop efficient and modular programs.		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction to Object-Oriented Programming (OOP) OOP concepts: Abstraction, Encapsulation, Inheritance, Polymorphism, Procedural Vs. Object Oriented Programming, Principles of OOP and their benefits.	10
II	C++ Programming Basics Program structure and basic syntax in C++, Namespaces, Identifiers, Variables, Constants, Enums, Operators and typecasting in C++.	10
III	Classes and Objects Classes and Objects in C++, Access specifiers: Public, Private, Protected, Constructors and Destructors in classes.	10
IV	Inheritance and Polymorphism Concept of Inheritance and its types, Polymorphism and function overloading, Virtual functions and abstract classes.	10
V	Exception Handling and File I/O Introduction to exception handling, try-catch blocks, Exception propagation, File input and output operations in C++.	10

Programme/Class: Degree	Year: First	Semester: Second
Subject: ComputerScience		
CourseCode: BCA-251	CourseTitle: Computer Lab using C++ & Computer Graphics Lab	
Courseoutcomes:		
<p>1: Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.</p> <p>2: Develop solutions for a range of problems using objects and classes.</p> <p>3: Programs to demonstrate the implementation of constructors, destructors and operator overloading.</p> <p>4: Apply fundamental algorithmic problems including type casting, inheritance, and polymorphism.</p> <p>5: Understand generic programming, templates, file handling.</p>		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 0-0-4		
List of Practical:		
<p>1. Write a C++ program to find the sum of individual digits of a positive integer.</p> <p>2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.</p> <p>3. Write a C++program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.</p> <p>4. Write a C++program to find the factorial of a given integer</p> <p>5. Write a C++program to find the GCD of two given integers</p> <p>6. Write a C++program to implement call by value and call by reference parameters passing</p> <p>7. Write a C++ program to implement function templates</p> <p>8. Write a program to implement Overloading and Overriding</p> <p>9. Write C++programs that illustrate how the Single inheritance, Multiple inheritance</p> <p>10. Multi level inheritance and Hierarchical inheritance forms of inheritance are supported</p> <p>11. Write a C++program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class</p>		
List of CG practical		
<p>1. Program to create simple geometric objects.</p> <p>2. Program to implement the DDA technique to draw line.</p> <p>3. Program to implement the Bresenham's technique to draw line.</p> <p>4. Program to implement the DDA technique to draw Circle.</p> <p>5. Program to implement the midpoint circle algorithm.</p> <p>6. Program to implement 2 Dimensional basic transformations.</p> <p>7. Program to implement various attributes of Graphics primitives.</p> <p>8. Program to implement animation.</p> <p>9. Implement blinking of eyes using Graphics</p> <p>10. Draw a circle.</p>		

Programme/Class: Certificate	Year: First	Semester: Second
Subject: Computer Application		
Coursecode: BCA-202	CourseTitle: Computer Graphics	
Courseoutcomes: CO 1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics. CO 2: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.. CO 3: Use of geometric transformations on graphics objects and their application in composite form. CO 4: Extract scene with different clipping methods and its transformation to graphics display device. CO 5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. CO 6: Render projected objects to naturalize the scene in 2D view and use of illumination models for this.		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction: Interactive Computer Graphics, Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Conceptual Framework for Interactive Graphics, Classification of Application Development of Hardware and software for computer Graphics.	08
II	Scan Conversion: Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses. Clipping: point clipping, Cohen-Sutherland line clipping Algorithm, Midpoint Subdivision Algorithm, polygon clipping (Sutherland-Hodgeman)	12
III	Geometrical Transformation: 2D Transformation (translation, rotation, scaling, reflection and shearing), Homogeneous Coordinates and Matrix Representation of 2D Transformations, Successive and composite 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.	10
VI	Curves & Surfaces: Polygon Surfaces and polygon meshes, Quadratic and super quadrics surfaces, Spline curve and representation.	10
V	Computer Animation: introduction, Application of animation, Morphing, Keyframe system, Motion specifications in Animation, Types of animation, Sequencing of Animation Design and Fundamental principles of animation.	10

SuggestedReadings:

1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles& practice,2000.
2. D.J. Gibbs & D.C. Tsichritz: Multimedia programming Object Environment& Frame work, 2000
3. Ralf Skinmeiz and Klana Naharstedt, Multimedia: computing, Communication and Applications,

Pearson, 2001 4. D. Haran & Baker. Computer Graphics Prentice Hall of India,1986.

SyllabusforBCA
:Subject:ComputerApplication

Programme/Class: Degree	Year: Second	Semester: Third
Subject:ComputerApplication		
CourseCode:BCA-301	CourseTitle: Data Structure using C	
Courseoutcomes: By the end of this course, students should be able to: 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		
Credits:4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):4-0-0		
Unit	Topic	No.of Lectures
I	C-Language Programming Data types, I/O functions, Logical Operators, Control structures of C, Conditional Statements, Switch Statement, Arrays.	10
II	Pointers, Functions, Recursion, Structures & Unions, Operations on bits, File Handling & C Preprocessor.	08
III	Introduction to Algorithm Design and Data Structure : Design & analysis of algorithm, Topdown and Bottom-up approaches to algorithm design, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space.	12
IV	Arrays; Stacks and Queues : Representation of array (single & multi dimensional arrays), Address alculation using column & row major ordering, representation of stacks & Queues using arrays and their operations, circular queues, Applications of arrays, stacks & queues, conversions from Infix to postfix & prefix and evolution of prefix expressions using stack.Linked list: Singly linked list (Operations on list), Linked stacks and queues, polynomial representation and manipulation using linked list.	10
V	Trees : Logical level of binary search tree, BST transversal methods (Preorder, Postorder and Inorder), Recursive and non-recursive algorithms for traverse method, Insertion into and deletion from a BST and their implementation, preorder and Postorder, traversal, Insertion in Threaded tree, B-tree (Insertion and Deletion algorithms).Searching and Sorting: Sequential and binary searches, Indexed search, Hashing schemes, Sorting methods (Insertion,	10

	Selection, Bubble, Quick, Merge and Heap Sorts).	
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<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH 2. Classic Data Structures, 2/ e, Debasis , Sarnanta, PHI, 2009 3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

Programme/Class: Degree	Year: Second	Semester: Third
Subject: Computer Application		
Course Code: BCA-351	Course Title: Data Structure Lab	
<p>Course Outcomes:</p> <ol style="list-style-type: none"> 1 : Analyze algorithms and algorithm correctness 2: summarize searching and sorting techniques 3: Describe stack, queue and linked list operation 4: Ability to have knowledge of tree and graphs concepts 5 To develop application using data structures 		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
<p>List of Practical</p> <ol style="list-style-type: none"> 1. Write Programs to implement the Stack operations using an array. 2. Write Programs to implement the Queue operations using an array. 3. Write Programs to implement the Stack operations using Pointers. 4. Write Programs to implement the Queue operations using Pointers. 5. Write a program for arithmetic expression evaluation. 6. Write a program for Binary search Tree Traversals 7. Write a program to implement dequeue using a doubly linked list. 8. Write a program to search an item in a given list using (i) Linear Search (ii) Binary Search. 9. Write a program for (i) Bubble Sort (ii) Quick Sort (iii) Merge Sort. 10. Write a program for polynomial addition using SLL 		

Programme/Class: BCA	Year: Second	Semester: Third
CourseCode: BCA-302	CourseTitle: Computer Network	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand the fundamentals of data communication and networking concepts. 2. Analyze and design network architectures and topologies. 3. Configure and troubleshoot network devices and protocols. 4. Apply network security measures to protect data transmission. 5. Understand emerging trends and technologies in data communication and networks. 		
Credits:4	Minor	
Max.Marks: 25+75	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	: Introduction to Data Communication & Networks Components of a data communication system, Types of networks, Network topologies and communication protocols.	
II	Network Architecture and OSI Model Network architecture: client-server, peer-to-peer, OSI model layers and their functions, TCP/IP protocol suite.	
III	Data Link Layer and Network Devices Data link layer: framing, error detection, flow control, Network devices: switches, routers, bridges, etc., MAC addressing and Ethernet standards.	
IV	Network Management and Emerging Technologies Network management and monitoring tools, Cloud computing and virtualization, Internet of Things (IoT).	

Suggested Books:

1. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
2. "Data Communications and Networking" by Behrouz A.Forouzan and Sophia Chung Fegan

Programme/Class: Degree	Year: Second	Semester: Fourth
Subject: ComputerApplication		
CourseCode: BCA-401	CourseTitle: Database Management System	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understandthebasicconceptsof databasemanagementsystems. 2. DesignE-Rdiagramsforrealdappplications. 3. Formulaterelationalalgebraicexpressionsusingrelationaldatamodelsand languages. 4. Applynormalizationtransactionpropertiesandconcurrencycontroltodesign database. 5. Analyzethe securityalgorithms fordatabeprotection. 		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Overview of Database Management System Elements of Database System, DBMS and its architecture, Advantage of DBMS (including Data independence), Types of database users, Role of Database administrator.	10
II	Data Models Brief overview of Hierarchical and Network Model, Detailed study of Relational Model (Relations, Properties, Key & Integrity rules), Comparison of Hierarchical, Network and Relational Model ,CODD's rules for Relational Model,E-R diagram.	12
III	Normalization Normalization concepts and update anomalies ,Functional dependencies,Multivalued and join dependencies. Normal Forms: (1 NF, 2 NF, 3NF, BCNF, 4NF, and 5NF)	12
IV	SQL SQL Constructs, SQL Join: Multiple Table Queries, Build-in functions, Views and their use, Overviews of ORACLE: (Data definition and manipulation)	14
V	Database Security, Integrity and Control Security and Integrity threats, Defense mechanism, Integrity, Auditing and Control, Recent trends in DBMS- Distributed and Deductive Database.	10

Suggested Readings:

1. Henry F. Korth and Abraham Silberschatz, "Database System Concepts," Second Edition, McGraw Hill, 1991.
2. Atul Kahate, "Introduction to Database Management Systems," Pearson India, 2004.
3. Raghu Ramakrishnan and Johannes Gehrike, "Database Management Systems," Third McGraw Hill, Edition, 2003.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6 Edition, Pearson Education, 2013.
5. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010. C.J. Date "An Introduction to Database Systems", Addison Wesley

Programme/Class: Degree	Year: Second	Semester: Fourth
Subject: Computer Application		
Course Code: BCA-451	Course Title: DBMS Lab & Web Designing	
Course outcomes:		
Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database. Use a desktop database package to create, populate, maintain, and query a database. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
List of Practicals		
<p>1. The Order Tracking Database consists of the following defined six relation schemas. Employees(eno,ename,zip,hdate) Parts(pno,pname,qoh,price,level) (hint: qoh: quality on hand) Customers(cno,cname,street,zip,phone) Orders(ono,cno,eno,received date,shipped date) Odetails(ono,pno,qty) Zipcodes(zip,city) Solve the following queries</p> <p>2. Get all pairs of customer numbers for customers based on same zip code. 3. Get part numbers for parts that have been ordered by at least two different customers. 4. For each odetail row, get ono,pno,pname,qty and price values along with the total price for the item. (total price=price*qty)</p>		

5. Get customer name and employee pairs such that the customer with name has placed an order through the employee
6. Get customer names living in fort dodge or liberal.
7. Get cname values of customers who have ordered a product with pno 10506.
8. Get pname values of parts with the lowest price.

List of Web designing practicals

1. Write a HTML program to create a webpage about the different art forms of India, with appropriate title on the title bar. Use different heading tags for the headings, and list them using ordered list.
2. Write a HTML program to create sections in the document using appropriate tags and apply different color as background to them. Use internal hyperlinks to move to different points within the page.
3. Write a HTML program to insert a picture on the webpage, giving description for the picture in a paragraph. Use properties of height, width, hspace, vspace and align, with different values.
4. Write a HTML Program, to create a profile of 2 pages, the First page containing the applicant's picture with personal details using unordered lists, and the second containing Educational details using tables. Use hyperlinks to move to the next page.
5. Using Frames create an Indian Flag and insert the image of chakra in the center.
6. Create a frame like structure based on the given diagram, such that When the first link is clicked, the contents of the first frame is filled with the corresponding information and when the second link is clicked the second frame is filled.
7. Write a program using Javascript to do the multiplication table for a number entered by the user in the textbox.
8. Create a sparse array using the values entered by the user in the five textboxes, and use Array methods such as sort(),pop(),push(), reverse() and join().
9. Create a Math object and use methods ceil(),floor(), round() for rounding off the number, also use methods such as cos(), sin(),sqrt().
10. Write a Program using Javascript to print a bill for 5 items purchased by the user.

Programme/Class: Degree	Year: Second	Semester: Fourth
Subject: ComputerApplication		
CourseCode: BCA-402	CourseTitle: Web designing using Scripting Language	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 6. Ability to Develop and publish Web pages using Hypertext Markup Language (HTML). Ability to optimize page styles and layout with Cascading Style Sheets (CSS) 7. Ability to Understand, analyze and apply the role of languages to create a capstone 8. Website using client-side web programming languages like HTML, DHTML, CSS, XML, 9. 4 JavaScript, and AJAX. 		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames	7
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.	7
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML). Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding.	7
IV	JavaScript : Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition, Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations	7
V	Ajax: Introduction, advantages &disadvantages, Purpose of it, ajax based web application, alternatives of ajax Java Script & AJAX: Introduction to array-operators, making statements-date & time-mathematics strings-Event handling-form properties. AJAX. Introduction to jQuery and AngularJS.	7

Suggested Readings:

1. Pankaj Sharma, "Web Technology", Sk Kataria & Sons Bangalore 2011. (UNIT I, II, III & IV).
2. Mike Mcgrath, "Java Script", Dream Tech Press 2006, 1st Edition. (UNIT V: JAVASCRIPT)
3. Achyut S Godbole & Atul Kahate, "Web Technologies", 2002, 2nd Edition. (UNIT V: AJAX)

Programme/Class: Degree	Year: Second	Semester: Fourth
Subject: ComputerApplication		
CourseCode: BCA-403	CourseTitle: Web designing using Scripting Language	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand the fundamental concepts of management information systems. 2. Analyze business requirements and design effective information systems. 3. Evaluate and select appropriate technologies for information system implementation. 4. Apply information systems principles to support business operations and decision-making. 5. Understand the ethical and security considerations in managing information systems. 		
Credits: 6		Minor
Max.Marks: 30+70		Min.PassingMarks:40
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 6-0-0		
Unit	Topic	No.of Lectures
I	Introduction to Management Information System Definition and scope of Management Information System (MIS), Components and characteristics of MIS, Role of MIS in decision-making, Types of Information Systems: TPS, DSS, EIS, ERP, etc	6
II	Information Technology and Business Processes Business processes and their analysis, Business process reengineering and automation, Information Technology infrastructure for MIS.	7
III	Database and Data Management Database concepts and design, Data modeling and normalization, Data storage, retrieval, and security	8
IV	Decision Support Systems and Business Intelligence Introduction to Decision Support Systems (DSS), Data Warehousing and Data	6

	Mining, Business Intelligence tools and analytics.	
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Recommended Books:

1. "Management Information Systems: Managing the Digital Firm" by Kenneth C. Laudon and Jane P. Laudon.
2. "Information Systems Today: Managing in the Digital World" by Joseph Valacich, Christoph Schneider, and Robert M. Pearson.

Syllabus for BCA.: Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject: Computer Application		
Course code: BCA-501	Course Title: Design and Analysis of Algorithms	
Course outcomes: CO 1: Ability to analyze the performance of algorithms in terms of their time and space complexities. CO 2: Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design). CO 3: To understand the different algorithm designing technique for solving problems. CO 4: Assess how the choice of data structures and algorithm design methods impacts the performance of programs. CO 5: Solve problems using algorithm design strategies like the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound etc.		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction: Algorithm Specification-Simple example of design and analysis of time complexity-Performance Analysis: Space Complexity and Time complexity, Asymptotic Notation - Polynomial Vs Exponential Algorithm	11
II	Divide and Conquer algorithm: Introduction to Divide and Conquer Algorithms - Master Theorem – Sorting - Insertion Sort, Merge Sort using links, Quick Sort- Analysis of linear and binary search algorithm. Horner's method of evaluation a polynomial at a given point, Strassen's Matrix Multiplication.	13
III	Dynamic programming: Design and analysis, Computing a Binomial Coefficient, Multistage graphs, Traveling salesman problem. Greedy approach: General method, Dijkstra's Algorithm, Knapsack problem, Minimum cost Spanning trees, Single source shortest path problem.	13

VI	Back tracking: General method - Sum of subsets - 4-Queen Problem using backtracking. Branch and Bound method- 4-queens - Least Cost Search, Traveling Salesman problem using Branch and Bound method.	12
V	Limitations of Algorithm- Introduction to lower bound theory, Decision trees, Introduction to P, NP and NP complete problems, NP hard problems.	11

Suggested Readings:

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni SanguthevarRajasekaran. Fundamentals of Computer Algorithms. Universities Press (India) Private Limited. Second edition.
2. AnanyLevitin. Introduction to the design and Analysis of Algorithms. Dorling Kindersley (India) Pvt.Ltd. Second edition
3. Gav PAI, Data Structures and Algorithms, Tata McGraw Hill, Jan 2008.
4. Donald E. Knuth. The art of Computer Programming, Volume 1: Fundamental Algorithms. Addison Wesley.

Syllabus for BCA.: Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject: Computer Application		
Course Code: BCA-502	Course Title: Data Mining & Data Warehousing	
Course outcomes: CO 1: Demonstrate knowledge of Data Warehouse and its components. CO 2: Discuss the process of Warehouse Planning and Implementation. CO 3: Discuss and implement various supervised and non-supervised learning algorithms on data. CO 4: Explain the various process of Data Mining and decide best according to type of data. CO 5: Explain process of knowledge discovery in database (KDD). Design Data Mining model.		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.	08
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design	12

III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction: -Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree	10
VI	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	10
V	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	10

Suggested Readings:

Text Book:

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", TMH.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, "Data Warehousing: Architecture and Implementation", Pearson.
3. I. Singh, "Data Mining and Warehousing", Khanna Publishing House.

Referential Books:

1. Margaret H. Dunham, S. Sridhar, "Data Mining: Introductory and Advanced Topics" Pearson Education
5. Arun K. Pujari, "Data Mining Techniques" Universities Press.
2. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education

Syllabus for BCA.: Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject: Computer Application		
Course Code: BCA-503	Course Title: Fundamentals of IOT	
Course outcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Demonstrate basic concepts, principles and challenges in IoT. 2. Illustrate functioning of hardware devices and sensors used for IoT. 3. Analyze network communication aspects and protocols used in IoT. 4. Apply IoT for developing real life applications using Arduino programming. 5. To develop IoT infrastructure for popular applications. 		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction: IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security	15
II	IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.	15

III	WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.	15
VI	IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	15
V	Introduction: IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security	15

Suggested Readings:

REFERENCES:

1. 1 Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011
3. 3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. 4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Syllabus for BCA.: Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject: Computer Application		
Course Code: BCA-551	Course Title: Algorithm Lab	
Course outcomes: <ol style="list-style-type: none"> 1. Students will be able to calculate the time complexity of algorithm. 2. Students will be able to sort the given numbers using various sorting algorithms. 3. Students will be able to write programs for the problems using Divide and Conquer. 4. Students will be able to write programs for the problems using Greedy Method. 5. Students will be able to write programs for the problems using Dynamic programming. 6. Students will be able to write programs for the problems using Backtracking.. 		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
List of Practical: <ol style="list-style-type: none"> 1. Write a program to perform operation count for a given pseudo code 2. Write a program to perform Bubble sort for any given list of numbers. 3. Write a program to perform Insertion sort for any given list of numbers. 4. Write a program to perform Quick Sort for the given list of integer values. 5. Write a program to find Maximum and Minimum of the given set of integer values. 6. Write a Program to perform Merge Sort on the given two lists of integer values. 7. Write a Program to perform Binary Search for a given set of integer values recursively and non-recursively. 8. Write a program to find solution for knapsack problem using greedy method. 9. Write a program to find minimum cost spanning tree using Prim's Algorithm. 10. Write a program to find minimum cost spanning tree using Kruskal's Algorithm. 11. Write a program to perform Single source shortest path problem for a given graph. 		

12. Write a program to find solution for job sequencing with deadlines problem.
13. Write a program for all pairs shortest path problem.
14. Write a program to solve N-QUEENS problem.
15. Write a program to solve Sum of subsets problem for a given set of distinct numbers.

Syllabus for BCA: Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Six
Subject: Computer Application		
Course Code: BCA-601	Course Title: Software Engineering	
Course Outcomes:		
CO1: Select and implement different software development process models.		
CO2: Extract and analyze software requirements specifications for different projects.		
CO3: Develop some basic level of software architecture/design.		
CO4: Define the basic concepts and importance of Software project management concepts like cost Estimation, scheduling and reviewing the progress.		
CO5: Apply different testing and debugging techniques and analyzing their effectiveness.		
Credits: 4	MAJOR COURSE	
Max. Marks: 25+75	Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction: Software- Characteristics and Applications, Software Engineering, Software Engineering Layers, Software Process Framework, CMM, Software Quality Attribute and Metrics, Software Development Life Cycle, Software Process Models Water Fall Model, Prototyping Model, RAD Model, Spiral Model, Evolutionary Models, Component-based Development Model.	10
II	Software Requirements Engineering and Analysis Modeling: Software Requirements, Requirement Engineering Process, Elicitation Requirements, Analysis and Negotiating Requirements, Requirement Specification, System Modeling, Requirements Validation, Requirement Management, Creating a Software Requirements Specification Document, IEEE Standards for SRS, Feasibility Study, Elements of Analysis Model, Data Modeling- ER Diagram, Information Modeling- DFD, Behavioral Modeling, Control Specification,	10

Programme/Class: Degree	Year: Third	Semester: Six
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	Process Specification, Data Dictionary, Software Quality Framework, Quality Metrics for Analysis Model.	
III	Software Design and Implementation: Design Process, Principles, and Design Concepts-Abstraction, Architecture, Refinement, Modularity, Data Structure, Information Hiding, Functional Independence, Cohesion, Coupling; Design Documentation, Design Strategies-Top Down and Bottom Up Design; Design Model Data Design Elements, Architectural Design, User Interface Design, Component-Level Design, Deployment-Level Design, Implementation Issues and Programming Support Environment, Quality Metrics for Design Model and Source Code	10
VI	Software Testing: Verification, Validation, Testing Objectives, Unit Testing, Integration Testing, Validation Testing, System Testing, Acceptance Testing, Regression Testing, Test Characteristics, White Box Testing, Basic Path Testing, Control Structure Testing, Black Box Testing, Test Plan, Test Case Design, Quality Metrics for Testing.	10
V	Software Maintenance: Nature and Need of Maintenance, Types of Maintenance (Perceptive, Preventive, Adoptive, Corrective), Cost of Maintenance, Evolution of Software, Software Maintenance Process, Software Maintenance Techniques Reverse Engineering, Reengineering; Factors affecting Software Maintenance, Key Issues in Maintenance, Software Configuration Management, Version and Release Control, Change Control, Configuration Audit, Metrics for Maintenance	10

Suggested Readings:

Text Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Addison Wesley
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer

Reference:

1. K. K. Aggarwal & Yogesh Singh "Software Engineering", New Age International.
2. I. Sommerville, "Software Engineering", Pearson Education.
3. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.
4. Subramanian Chandramouli, Saikat Dutt, ChandramouliSeetharaman, B. G Geetha, "Software Engineering", Pearson Education India

Subject: ComputerApplication		
CourseCode: BCA-602	CourseTitle: .Net Framework with VB.net	
Courseoutcomes: CO 1: Explain the core concepts of the CLR , CLS , .NET features. CO 2: Apply the fundamental concepts in .NET programing CO 3: Apply the fundamental concepts of conditional statement in .NET programing CO 4: Apply the fundamental concepts of in ASP.NET and ADO.NET programing CO 5: Apply the fundamental concepts of SQL connectivity.		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction to .net framework -Features, Common Language Runtime (CLR), Framework Class Library(FCL). Common Language Specification (CLS), Common Type System (CTS), Intermediate Language (IL) and Just-In-Time (JIT) Compilation, Visual Studio.Net – IDE, Languages Supported, Components. VB.Net Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window.	10
II	VB.Net Creating Applications with Visual Basic.NET, Variables, Constants, and Calculations, Making Decisions and Working with Strings, Lists, Loops, Validation, Sub Procedures and Functions, Multiple Forms, Standard Modules, and Menus, Arrays, Timers, Form Controls, File Handling, Exception Handling, Working with Databases, Advanced Database Programming using ADO.net, Classes, Generics, Collections, Inheritance, Custom Controls, Packaging & deployment, Using Crystal Reports.	10
III	Programming in Visual basic: .Net Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then-Else, Nested If, Select Case, Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays-Static and Dynamic. - Creating MDI Parent and Child, Functions and Procedures- Built-In Functions- Mathematical and String Functions, User Defined Functions and Procedures.	10
IV	ASP.NET Building :a Web Application, Examples Using Standard Controls, Using HTML Controls, Validating Form Input Controls using Validation Controls, Understanding Applications and State, Applying Styles, Themes, and Skins, Creating a Layout Using Master Pages, Binding to Databases using Controls, Data Management with ADO.net,	10

Programme/Class:	Creating a Site Navigation Hierarchy, Navigation Controls , Membership and Role Management, Login Controls, Securing Application	Semester: Six
	Year: Third	
	Subject: Computer Application	
V	Databases: Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site. Crystal reports. LINQ: Operators, implementations, LINQ to objects, XML, ADO.NET, Query Syntax. Stored Procedures	10

Suggested Readings:

Text Books:

1. Visual Basic.Net Black Book by Steven Holzner Dreamtech Press
2. The Complete Reference Visual Basic .NET Jeffery R. Shapiro Tata McGraw Hills

Reference Books:

1. Visual studio 2010 - A beginners guide - Joseph Mayo
2. Murach's Beginning Visual basic .Net By Anne Bohem
3. Programming Visual Basic .NET Dave Grundgeiger Publisher: O'Reilly First Edition January 2002

CourseCode:BCA-603		CourseTitle: Cloud Computing
Courseoutcomes: CO 1: Explain the core concepts of the CLR , CLS , .NET features. CO 2: Apply the fundamental concepts in .NET programing CO 3: Apply the fundamental concepts of conditional statement in .NET programing CO 4: Apply the fundamental concepts of in ASP.NET and ADO.NET programing CO 5: Apply the fundamental concepts of SQL connectivity.		
Credits:4		MAJOR COURSE
Max.Marks: 25+75		Min.PassingMarks:40
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing, Cloud Architecture, Types of Clouds, Players in Cloud Computing, issues in Clouds .	10
II	Types of Cloud services, Software as a Service, Platform as a Service, Infrastructure as a Service, Database as a Service, Monitoring as a Service, Communication as services. Service Providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	10
III	Collaborating Using Cloud Services Email Communication over the Cloud, CRM Management, Project Management, Event Management, Task Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks and Groupware	10
IV	Virtualization for Cloud Need for Virtualization, Pros and cons of Virtualization, Types of Virtualizations, System VM, Process VM, Virtual Machine monitor, Virtual machine properties, HLL VM, Hypervisors, Xen, KVM, VMWare, Virtual Box, Hyper-V	10
V	Cloud Security: Infrastructure Security- Network level security, Host level security, Applicationlevel security, Data security, Authentication in cloud computing, Cloud security challenges.	10

SuggestedReadings:

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood
2. "Cloud Computing: A Practical Approach" by Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter

SyllabusforBCA.:Subject:ComputerApplication

Programme/Class: Degree	Year: Third	Semester: Six
Subject: ComputerApplication		
CourseCode:	CourseTitle: VB.Net Lab & Software Engineering	
Courseoutcomes: <ol style="list-style-type: none"> 1. Create Simple application using web controls 2. Work with States of ASP.NET Pages & Adrotator Control 3. Use of calendar control, Treeview control & Validation controls 4. Query textbox and Displaying records & Display records by using databa 		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks:40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 0-0-4		
List of Practical: <ol style="list-style-type: none"> 1. Write a program to generate the factorial of a given number. 2. Write a program to perform money conversion. 3. Write a program to find out roots of the quadratic equation 4. Write a program to convert temperature from Fahrenheit to Celsius or vice versa. 5. Write a program to generate/develop the login control. 6. Write a program to create an Advertisement using Ad rotator. 7. Write a program to display the holiday in calendar. 8. Write a program to display the vacation in calendar. 9. Write a program to display the selected date in the calendar 10. Implement a program that display the difference between two dates. 		
List of S/W practical <ol style="list-style-type: none"> 11. Development of Problem Statements. 12. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents. 13. Preparation of Software Configuration Management and Risk Management related documents. 14. Study and usage of any Design phase CASE tool 15. Performing the Design by using any Design phase CASE tools. 16. Develop test cases for unit testing and integration testing 17. Develop test cases for various white box and black box testing techniques. 		

**SyllabusforBCA(Hons):Subject:Computer
Application**

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject:Computer Application		
Coursecode: BCA-501-H	CourseTitle: Software Project Management	
Courseoutcomes: CO1: Identify project planning objectives, along with various cost/effort estimation models. CO2: Organize & schedule project activities to compute critical path for risk analysis CO3: Monitor and control project activities. CO4: Formulate testing objectives and test plan to ensure good software quality under SEI CO5: - CMM Configure changes and manage risks using project management tools.		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Project Evaluation and Project Planning: Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation–Strategic program Management – Stepwise Project Planning.	08
II	Project Life Cycle and Effort Estimation: Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques–COSMIC Full function points–COCOMOII–a Parametric Productivity Model.	12
III	Activity Planning and Risk Management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation– Creation of Critical paths – Cost schedules.	10
VI	Project Management and Control: Framework for Management and control – Collection of data–Visualizing progress–Costmonitoring– earned Value Analysis –Prioritizing Monitoring– Project tracking– Change control Software. Configuration Management – Managing contracts – Contract Management.	10

V	Staffing in Software Projects: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.	10
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Suggested Readings:

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: "Software Project Management" – Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki — "Effective Software Project Management" – Wiley Publication, 2011.
3. Walker Royce: — "Software Project Management" - Addison-Wesley, 1998.
4. Gopaldaswamy Ramesh, — "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

Referential Books:

1. Koontz Harold & Weihrich Heinz, "Essentials of Management", McGraw Hill 5th Edition 2008.
2. Robbins and Coulter, "Management", Prentice Hall of India, 9th edition.
3. James A. F., Stoner, "Management", Pearson Education Delhi.
4. P. D. Chaturvedi, "Business Communication", Pearson Education

Syllabus for BCA(Hons): Subject: Computer Application

Programme/Class: Degree	Year: Third	Semester: Fifth
Subject: Computer Application		
Coursecode: BCA-502-H	CourseTitle: Fog Computing	
Course outcomes:		
CO1: Become familiar with the concepts of Fog.		
CO 2: Understand the architecture and its components and working of components and its performance.		
CO 3: Explore Fog on security, multimedia and smart data.		
CO 4: Model the fog computing scenario.		
Credits: 4	MAJOR COURSE	
Max.Marks: 25+75	Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction to Fog Computing: Fog Computing, Characteristics, Application Scenarios, Issues and challenges. Fog Computing Architecture: Communication and Network Model, Programming Models, Fog Architecture for smart cities, healthcare and vehicles. Fog Computing Communication Technologies: Introduction, IEEE 802.11, 4G, 5G standards, WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range Technologies.	12
II	Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation.	12
III	Fog computing requirements when applied to IoT: Scalability, Interoperability, Fog-IoT architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, Data Management, filtering, Event Management, Device Management, cloudification, virtualization, security and privacy issues. Integrating IoT, Fog, Cloud Infrastructures: Methodology, Integrated C2F2T Literature by Modeling Technique by Use-Case Scenarios, Integrated C2F2T Literature by Metrics.	10
VI	Exploiting Fog Computing in Health Monitoring: An Architecture of a Health Monitoring IoT Based System with Fog Computing, Fog Computing Services in Smart E-Health Gateways, Discussion of Connected Components. Fog Computing Model for Evolving Smart Transportation Applications: Introduction, Data-Driven Intelligent Transportation Systems, Fog Computing for Smart Transportation, Applications Case Study: Intelligent Traffic Lights Management (ITLM)	15

	System.	
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Suggested Readings:

Text Book:

1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya.
2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing) by Rajkumar Buyya and Satish Narayana Srirama.
3. Amir Vahid Dastjerdi and Rajkumar Buyya, —Fog Computing: Helping the Internet of Things Realize its Potential, University of Melbourne.

Programme/Class: Degree	Year: Fourth	Semester: Seven
Subject: Computer Application		
Coursecode: BCA-503-H	CourseTitle: Data Analytics	
Courseoutcomes: CO1: Explain the importance of and be able to formulate a data analysis problem CO2: Explain various data types, and data formats , and identify and appropriately acknowledge sources of various types of data CO3: Gain an ability to apply mathematical and statistical methods in data science applications CO4: Apply basic data cleaning techniques to prepare data for analysis CO5: Demonstrate proficiency in using appropriate tools and technology to collect, process, transform, summarize, and visualize data.		
Credits: 4	MAJOR COURSE	
Max.Marks: 30+70	Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No .of Lect ures
I	Introduction Of Data Analysis: Evolution of Data Analytics, Data Analytics Overview, Types of Data Analytics -Descriptive Analytics -Diagnostic Analytics - Predictive Analytics -Prescriptive Analytics, Importance and Benefits of Data Analytics. Different Applications of Analytics in Business, Text Analytics and Web Analytics, Skills for Business Analytics..	08
II	Probability : Sample Space, Types of Events, Measures of probability, conditional probability, Bayes' theorem, Random variable, Probability Distributions- Binomial, Poisson and Normal, Sampling Distributions,.	12
III	Statistical Methods: Estimation and Hypothesis Testing- t-test, Analysis of variance (ANOVA) and Chi-square test, Correlation Analysis-Simple Correlation coefficient, Interpretation, Scatter plot. Linear Regression-Simple and Multiple, Polynomial Regression, Logistic Regression- with one variable and with multiple variables, Logistic Regression vs. Linear Regression	
IV	Data Visualization : Introduction to data visualization, Visualization foundations, Introduction to Power BI, Power BI – Advantages and Scalable Options, Power BI Architecture and Data Access, Visualization Techniques for Spatial Data, Geospatial Data, Time-Oriented Data, Multivariate Data, Trees, Graphs, and Networks, Text and Document Visualization, Power Query & M Language.	15
V	Case Study : Importance and types of case studies: case study of Amazon, Twitter, Netflix, Uber, COVID- 19: for understanding business scenarios and how they applied the analytics to improve their decision making, cost reduction, logistics planning and other benefits	15

Suggested Readings:**Text Book:**

1. Kumar, U.D. :Business Analytics – The Science of Data – Driven Decision Making, Wiley.
2. Dr Anil Maheshwari, Data Analytics Made Accessible, Publisher: Amazon.com Services LLC.
3. Johnson, R.A., Miller, I. and Freund, . :Probability and Statistics for Engineers, Pearson..

Referential Books:

1. Gert, H.N., Thorlund, L. and Thorlund, J :Business Analytics for Managers – Taking Business Intelligence Beyond Reporting, Wiley.
2. Data Analytics: Principles, Tools, and Practices: A Complete Guide for Advanced Data Analytics Using the Latest Trends, Tools, and Technologies by Dr. Gaurav Aroraa (Author), Chitra Lele (Author),

Syllabus for BCA(Hons): Subject: Computer Application

Programme/Class: Degree		Year: Third	Semester: Fifth
Subject: Computer Application			
Course Code: BCA-504-H		Course Title: Programming in Python	
Course outcomes:			
CO 1: To introduce the basic features of python programming and impart skills in an industry standard programming language.			
CO 2: Understand fundamental programming concepts of Python programming and its Libraries..			
CO3: Work with common Python data types, like integers, floats, strings as well as pandas Data frames.			
CO4: Use basic flow control including for loops and conditionals.			
CO5: Obtain basic summary statistics from data files.			
Credits: 4		MAJOR COURSE	
Max.Marks: 25+75		Min. Passing Marks: 40%	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			
Unit	Topic		No. of Lectures
I	Introduction of Python: Installing Python in Windows/Linux/Mac OS, Using Python interpreter, Execute a Script, Structuring with Indentation, Editors. Data types and Variables: Variables, Variables v/s identifiers, Naming convention of variables, Keywords. Data Structure: List, Tuples, Sets, Dictionaries		08
II	Input And Output: Input function, Input with raw input(), Output with old string format, Python format function Control Flow: If/Else Statements, For/while Statements, Range() function, Break and continue statements, Else clauses on Loops.		10
III	Functions: Defining Function, Default Argument, Keyword Argument, Arbitrary Arguments List. File Handling: Reading from the file, Writing to the file, Methods of file objects. Error And Expectation: Syntax Errors, Exceptions, Handling Exceptions (try, except)		10
IV	Module: Creating Modules, import a module, Import the names, Executing modules as scripts. Class Concept: Class Syntax, Class Objects, Instance Objects, Method Objects, Class and Instance Variables.		12
V	Advanced Modules: Regular Expressions, date time - date and time libraries, Dealing with Excel, GUI, Web Scrapping. Advanced Modules: Regular Expressions, date time - date and time libraries. Dealing with Excel, GUI, Web Scrapping		10

Suggested Readings:

1. P.K.Sinha&PritiSinha,“Computer Fundamentals”,BPBPublications,2007.
2. Dr.AnitaGoel,ComputerFundamentals,PearsonEducation,2010.
3. T.Budd,ExploringPython,TMH,1st Ed,2011
4. Python Tutorial/Documentation www.python.org2010
5. AllenDowney,JeffreyElkner,ChrisMeyers,Howtothink likeacomputerscientist:
learningwith Python , Freelyavailableonline.2012
6. RoberSedgewick,KWayne-
IntroductiontoProgramminginPython:AninterdisciplinaryApproach"PearsonIndia

SyllabusforBCA(Hons):Subject:Computer Application

Programme /Class: Degree	Year: Third	Semester: Fifth
Subject: Python Lab		
Course Code: BCA-551-H	CourseTitle: Python Lab	
<p>Course outcomes:</p> <p>CO1: To be able to introduce core programming basics and various Operators of Python programming language</p> <p>CO2: To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.</p> <p>CO3: To understand about Functions, Modules and Regular Expressions in Python Programming.</p>		
Credits: 4	CoreCompulsory	
Max.Marks: 25+75	Min.PassingMarks: 50%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 0-0-4		
Unit	Topic	No.of Lectures
I	Write a python script to check whether a given number is even or odd.	
II	Write a Python script to add two integers' values taken from user.	
III	Write a python script to calculate area of circle where radius is taken from user	
IV	Write a program to copy the content of one file to another file.	
V	Write a Python Program to find the sum of series: $1 + 1/2 + 1/3$.	
VI	Write a program to find the sum of n natural numbers.	
VII	Write a program to find factorial of a given number.	
VIII	Write a program to find whether a given number is Armstrong number or not.	
IX	Write a program takes a number and computes the prime factors of the integer	
X	Program to check whether a given number is a palindrome.	

SyllabusforBCA(Hons):Subject: ComputerApplication

Programme/Class: Degree		Year: Third	Semester: Six
Subject: ComputerApplication			
CourseCode: BCA-601-H		CourseTitle: AI & Machine Learning	
Courseoutcomes:			
CO 1. Understand the various characteristics of problem solving agents and apply problem solving through search for AI applications.			
CO 2. Appreciate the concepts of knowledge representation using Propositional logic and Predicate calculus and apply them for inference/reasoning.			
CO 3. Obtain insights about Planning and handling uncertainty through probabilistic reasoning and fuzzy systems. CO4:Use basic flow control including for loops and conditionals.			
Credits: 4		MAJOR COURSE	
Max.Marks: 25+75		Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0			
Unit	Topic	No.o f Lectur es	
I	Introduction to AI: What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of the environment, the structure of agents; Problem-solving: Problemsolving agents; Uninformed search strategies: DFS, BFS; Informed Search: Best First Search, A* search, AO* search, Means End Analysis. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning.	08	
II	Knowledge-based Agents, The Wumpus world as an example world, Logic, Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting, Forward chaining, Backward chaining, Resolution, Truth maintenance systems. Knowledge in Learning, What is learning? Types of Learning,: Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston’s Learning Program, Decision Trees.	10	
III	Introduction to Planning: Blocks World problem, Strips; Handling Uncertainties: Nonmonotonic reasoning, Probabilistic reasoning, Fuzzy logic; Robotics: Fundamentals of Robotics, Robot Kinematics; Computer Vision: Introduction to image processing and classification, object detection.	15	

<p style="text-align: center;">IV</p>	<p>Fundamentals of Machine Learning Introduction to Machine Learning and its importance, Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning, Basic concepts: features, labels, training data, etc., Popular Machine Learning algorithms: Linear Regression, Logistic Regression, Decision Trees, kNearest Neighbors, etc., Evaluation metrics for Machine Learning models: accuracy, precision, recall, F1-score, etc.</p>	<p style="text-align: center;">15</p>
<p style="text-align: center;">V</p>	<p>Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing; Expert Systems: Architecture and role of expert systems, two case studies of Expert Systems; Introduction to Machine learning: Supervised learning, unsupervised learning, reinforcement learning; Neural Networks: Introduction, basics of ANN, Deep Learning with basics of CNN, RNN, LSTM and their applications.</p>	<p style="text-align: center;">15</p>
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall 2. Nilsson Nils J, "Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4. 		

SyllabusforBCA(Hons):Subject:Computer Application

Programme/Class: Degree		Year: Third	Semester: Six
Subject: ComputerApplication			
CourseCode: BCA-602-H		CourseTitle: Cloud Computing and Cyber Security (Cloud)	
Courseoutcomes: CO1: Understand the concepts of Cloud Computing, key technologies, strengths and limitations of cloud computing. CO2: Develop the ability to understand and use the architecture to computeand storage cloud, service and models. CO3: Understand the application in cloud computing. CO4: Understand the various tools and methods used in cybercrime. CO5: Identify risk management processes, risk treatment methods, organization of information security.			
Credits: 4		MAJOR COURSE	
Max.Marks: 25+75		Min.PassingMarks: 40%	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0			
Unit	Topic	No. of Lectures	
I	Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing-issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.	08	
II	Cloud Services: Types of Cloud services: Software as a Service- Platform as a Service–Infrastructure as a Service-Database as a Service - Monitoring as a Service–Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	10	
III	Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.	15	
IV	Introduction to Ethical Hacking: Key issues plaguing the information security world, incident management process, and penetration testing, Footprinting and Reconnaissance: Various types of footprints, footprints tools, and countermeasures.	12	
V	Scanning Network: Network scanning techniques and scanning countermeasure.	10	

Suggested Readings:**Text Books:**

1. Rajkumar Buyya, "Mastering Cloud Computing", Tata Mc. Graw-Hill Education.
2. Rajkumar Buyya, James Broberg & Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", Wiley.
3. K. Kumar, "Cyber Laws: Intellectual property & E Commerce, Security", 1st Edition, Dominant Publisher, 2011.
4. Rodney D. Ryder, "Guideto Cyber Laws", Second Edition, Wadhwa and Company, New Delhi, 2007.

SyllabusforBCA(Hons):Subject:Computer Application

Programme/Class: BCA	Year:Third	Semester:Fifth
CourseCode: BCA-603-H	CourseTitle: Cyber Security	
Courseoutcomes: By the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Understand the importance of cybersecurity and the impact of cyber-attacks on organizations and individuals. 2. Recognize different types of cyber threats and attacks, such as malware, viruses, and ransomware, and understand how to mitigate them. 3. Identify and evaluate various cybersecurity technologies and tools, including intrusion detection and prevention systems, security information and event management, endpoint protection tools, and vulnerability assessment and penetration testing. 4. 4. Develop information security policies and procedures, incident response planning and management, security awareness and training, and physical security considerations to ensure the security of organizational assets. 		
Credits:4	Monor	
Max.Marks: 30+70	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Introduction to Cybersecurity: Definition of Cybersecurity ,Importance of Cybersecurity, Cybersecurity threats and attacks, Overview of Cybersecurity frameworks and standards ,Basic principles of Cybersecurity	6
II	Network Security: Fundamentals of network security, Types of network security threats, Network security protocols and technologies, Network security best practices	7
III	Cybersecurity Technologies and Tools: Intrusion detection and prevention systems (IDS/IPS), Security Information and Event Management (SIEM), Endpoint protection tools ,Vulnerability assessment and penetration testing, Security Operations Center (SOC) tools	6
IV	Future of Cybersecurity: Emerging Cybersecurity threats and trends, Advances in Cybersecurity technologies, Ethical considerations in Cybersecurity	6
V	Cybersecurity Policies and Procedures: Information security policies and procedures, Incident response planning and management, Security awareness and training, Physical security considerations, Compliance and regulatory requirements	6
Suggested Books: <ol style="list-style-type: none"> 1. Ciampa, M. (2021). Security+ guide to network security fundamentals. Cengage Learning. 2. Pfleeger, C. P., & Pfleeger, S. L. (2018). Security in computing. Pearson 		

SyllabusforBCA(Hons):Subject:Computer Application

Programme/Class: BCA	Year: Third	Semester: Sixth
CourseCode: BCA-604-H	CourseTitle: Java Programming	
<p>Courseoutcomes:</p> <p>Objectives:Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries and also be aware of the important topics and principles of software development.</p> <p>1: Identify and analyze classes, objects, members of a class and relationships among them needed for a specific problem.</p> <p>2: Demonstrate the concepts of polymorphism and inheritance.</p> <p>3 : Understand the principles of inheritance, packages and interfaces.</p> <p>4: Understand the fundamentals of object-oriented programming in Java, including defining classes , objects, invoking methods etc and exception handling mechanisms.</p>		
Credits: 4	Major	
Max.Marks: 30+70	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 4-0-0		
Unit	Topic	No.of Lectures
I	Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, package, exception handling) multithreaded programming.	6
II	Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions)	7
III	Networking (datagram socket and TCP/IP based server socket) event handling, JDBC: Introduction, Drivers, Establishing Connection, Connection Pooling.	6
IV	Java Servlets: Introduction, HTTP Servlet Basics, The Servlet Lifecycle, Retrieving Information, Sending HTML Information, Session Tracking, Database Connectivity	6
V	Java Server Pages: Introducing Java Server Pages, JSP Overview, Setting Up the JSP Environment, Generating Dynamic Content, Using Custom Tag Libraries and the JSP Standard Tag Library, Processing Input and Output.	6

Suggested Books:

1: **Java**: The Complete Reference (Ninth Edition): Schildt, Herbert 5th Edition

2: Programming: Black Book

3: Java Programming and Website Design 2011 by Lalit Arora

4: Object Oriented System with Java 2012 by Lalit Arora

SyllabusforBCA(Hons):Subject:Computer Application

Programme/Class: BCA	Year: Third	Semester: Sixth
CourseCode: BCA-651-H	CourseTitle: Java Programming Lab	
Courseoutcomes: 1. To build software development skills using java programming for real world applications. 2. To implement frontend and backend of an application 3. To implement classical problems using java programming.		
Credits: 4	Major	
Max.Marks: 30+70	Min.PassingMarks:40	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek): 0-0-4		
	Topic	
1. Write a JAVA program to implement the concept of inheritance. 2. Write a JAVA program to find the largest number from two numbers. 3. Write a JAVA program of constrauctor. 4. Write a JAVA program using command line argument. 5. Write a JAVA program to implement the concept of interface. 6. Write JAVA program to implement the concept of super. 7. Write a JAVA program to creation single dimensional Array. 8. Write a JAVA program to find out the addition and multiplication of two numbers. 9. Write a JAVA program to create a simple Applet.		
13. QWrite JAVA program to connect Ms-Access database with Java application. 14. Write JAVA program to implement the concept the Multithreading. 15. Write JAVA program tom implements the concept of Exception Handling.		
Suggested Books: 1: Java: The Complete Reference (Ninth Edition): Schildt,Herbert 5 th Edition 2: Programming: Black Book 3: Java Programming and Website Design2011 by Lalit Arora 4: Object Oriented System with Java2012 by Lalit Arora		

Programme/Class: Certificate	Year: First	Semester: First
Subject: ZOOLOGY		
CourseCode: BVAC01	CourseTitle: Indian Knowledge System (IKS)	
Courseoutcomes: By studying this course, students will be able to: <ul style="list-style-type: none"> • Explain the evolution of Indian Knowledge system. • Identify the characteristics of various era's in History of IKS. • Identify the Nature of Indian Knowledge System. • Enlist the key characteristics of IKS. • Identify Key aspects of the epistemology of the Indian Knowledge System. • Explain the knowledge framework & classification. • List the ancient scripts of India. • Outline the influence of ancient sacred texts on Indian Society. • List the ancient scripts of India. • Outline the influence of ancient sacred texts on Indian Society. 		
Credits: 3	Core: Compulsory	
Max.Marks: 30+70=100	Min.Passing Marks: 45	
TotalNo.ofLectures-Tutorials-Practical (inhoursperweek):L-T-P: 3-1-0		
Unit	Topics	TotalNo.of Lectures(60)
I	History of Indian Knowledge System <ul style="list-style-type: none"> • Genesis of Bhartiya Knowledge System • History of IKS 	
II	India's characteristic knowledge & India's epistemology <ul style="list-style-type: none"> • IKS: Nature, Philosophy and Character • India's Epistemology Knowledge Frameworks & Classification 	
III	Ancient Scriptures <ul style="list-style-type: none"> • Ancient Scriptures 	
IV	Ancient Education System <ul style="list-style-type: none"> • Ancient Education • Educating Sciences 	
V	Scientific approaches of IKS & Torch-bearers <ul style="list-style-type: none"> • Khagol Vijnana (Astronomy) • Vastukala (Architecture) • Ayurveda Krishi Vijnana (Agricultural) Practices 	
VI	Scientific approaches of IKS & Torch-bearers <ul style="list-style-type: none"> • Dhatu Vijnana (Metallurgy) • Ganita: Mathematics in India • Yuddha Vidhya (Military Sciences) • Niyuddha Kala (Martial Arts) • Environmental Sciences 	

VII	Literary Aspects of IKS & Torch-bearers. <ul style="list-style-type: none"> • Chandashastra (Prosody) • Bhasa Va Vyakarana (Language and Grammar) • Bharata's Natyashastra (Science of Drama, Dance and Music) 	
VIII	Governance in IKS & Way Forward <ul style="list-style-type: none"> • Science of Consciousness in Ancient India (Cognitive Science) • Anviksiki (Logic and Disputation) • Governance & Public Administration • IKS way forward 	
SUGGESTED READINGS: <ol style="list-style-type: none"> 1. Introduction to Indian Knowledge System: Concepts and Applications, Archak, K.B. (2012). Kaveri Books, New Delhi.ISBN-13:978-9391818203 2. Introduction To Indian Knowledge System: Concepts and Applications, Mahadevan, B.Bhat, Vinayak Rajat,Nagendra Pavana R.N.PHI, ISBN: 9789391818203 3. Glimpse into Kautilya's Arthashastra Ramachandrudu P. (2010), Sanskrit Academy, Hyderabad ISBN:9788380171074 4. "Introduction" in Studies in Epics and Purāṇas, (Eds.), KM Munshi and N Chandrashekara Aiyer Bhartiya Vidya Bhavan 		
SuggestedContinuousEvaluationMethods: TotalMarks:30 One Mid Semester written Test (1x15): Project/Seminar/ Quiz / Presentation/ Assignment: Attendance & Conduct:		15Marks 10Marks 05Marks

Programme/Class:Degree		Year:Second	Semester:Forth
Co-CurricularCourse			
CourseCode:BSEC520404		CourseTitle:FirstAidandFirstAid andHealth	
Courseoutcomes:			
<ul style="list-style-type: none"> Learntheskillneeded toassesstheillorinjured person. LearntheskillstoprovideCPRto infants,childrenandadults. Learntheskillsto handleemergencychildbirth Learnthe Basicsexeducationhelp youngpeoplenavigatethornyquestionsresponsiblyandwithconfidence. Learnthe Basicsexeducationhelp youth tounderstandSexisnormal.It'sadeep,powerfulinstinctatthecoreofoursurvivalasaspecies. Sexualdesire isahealthydrive. Helptounderstand naturalchangesofadolescence LearntheskilltoidentifyMentalHealth statusandPsychologicalFirstAid 			
Credits:2(1Theory+1Practical)		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0			
Unit	Topics		No. ofLecturesTotal= 15Theory+ 30Practical
I	<p>A. BasicFirst Aid</p> <ul style="list-style-type: none"> Aimsoffirstaid& Firstaidand thelaw. Dealingwithanemergency, Resuscitation(basicCPR). Recoveryposition, Initialtoptotoeassessment. HandwashingandHygiene Typesand ContentofaFirstaid Kit <p>B. FirstAIDTechnique</p> <ul style="list-style-type: none"> DressingsandBandages. Fastevacuationtechniques(singlerescuer). Transporttechniques. <p>C. Firstaidrelatedwithrespiratorysystem</p> <ul style="list-style-type: none"> BasicsofRespiration. 		2 (Theory) 10 (Practical)
	<ul style="list-style-type: none"> No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging, Swelling within the throat, Suffocation by smoke or gases and Asthma. <p>D. First aid related with Heart, Blood and Circulation</p> <ul style="list-style-type: none"> Basics of The heart and the blood circulation. Chest discomfort, bleeding. <p>D. First aid related with Wounds and Injuries</p> <ul style="list-style-type: none"> Type of wounds, Small cuts and abrasions Head, Chest, Abdominal injuries Amputation, Crush injuries, Shock <p>E. First aid related with Bones, Joints Muscle related injuries</p> <ul style="list-style-type: none"> Basics of The skeleton, Joints and Muscles. Fractures (injuries to bones). 		

II	<p>F. First aid related with Nervous system and Unconsciousness</p> <ul style="list-style-type: none"> Basics of the nervous system. Unconsciousness, Stroke, Fits – convulsions – seizures, Epilepsy. <p>G. First aid related with Gastrointestinal Tract</p> <ul style="list-style-type: none"> Basics of The gastrointestinal system. Diarrhea, Food poisoning. <p>H. First aid related with Skin, Burns</p> <ul style="list-style-type: none"> Basics of The skin. Burn wounds, Dry burns and scalds (burns from fire, heat and steam). Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke. Frost bites (cold burns), Prevention of burns, Fever and Hypothermia. <p>I. First aid related with Poisoning</p> <ul style="list-style-type: none"> Poisoning by swallowing, Gases, Injection, Skin <p>J. First aid related with Bites and Stings</p> <ul style="list-style-type: none"> Animal bites, Snake bites, Insect stings and bites <p>K. First aid related with Sense organs</p> <ul style="list-style-type: none"> Basic of Sense organ. Foreign objects in the eye, ear, nose or skin. Swallowed foreign objects. <p>L. Specific emergency satiation and disaster management</p> <ul style="list-style-type: none"> Emergencies at educational institutes and work Road and traffic accidents. Emergencies in rural areas. Disasters and multiple casualty accidents. Triage. <p>M. Emergency Child birth</p>	2 (Theory) 10 (Practical)
III	<p>Basic Sex Education</p> <ul style="list-style-type: none"> Overview, ground rules, and a pre-test Basics of Urinary system and Reproductive system. Male puberty — physical and emotional changes Female puberty — physical and emotional changes Male-female similarities and differences Sexual intercourse, pregnancy, and childbirth Facts, attitudes, and myths about LGBTQ+ issues and identities Birth control and abortion Sex without love — harassment, sexual abuse, and rape Prevention of sexually transmitted diseases. 	9 (Theory)
IV	<p>Mental Health and Psychological First Aid</p> <ul style="list-style-type: none"> What is Mental Health First Aid? Mental Health Problems in the India The Mental Health First Aid Action Plan Understanding Depression and Anxiety Disorders Crisis First Aid for Suicidal Behavior & Depressive symptoms What is Non-Suicidal Self-Injury? Non-crisis First Aid for Depression and Anxiety Crisis First Aid for Panic Attacks, Traumatic events Understanding Disorders in Which Psychosis may Occur Crisis First Aid for Acute Psychosis 	2 (Theory) 10 (Practical)

Suggested Readings:

- IndianFirstAidManual-<https://www.indianredcross.org/publications/FA-manual.pdf>
- RedCrossFirstAid/CPR/AEDInstructorManual
- <https://mhfa.com.au/courses/public/types/youthedition4>
- Finkelhor,D.(2009).Thepreventionofchildhoodsexualabuse.Durham,NH:CrimesAgainstChildrenResearchCenter.www.unh.edu/ccrc/pdf/CV192.pdf
- KantorL.&LevitzN.(2017).Parents’viewsonsexeducation inschools:HowmuchdoDemocratsandRepublicansagree?PLoS ONE, 12(7):e0180250.
- Orenstein,P.(2016).Girlsand sex:Navigatingthecomplexnewlandscape.NewYork,NY:Harper.
- Schwiengershausen,E.(2015,May28).TheCut.www.thecut.com/2015/05/most-women-are-catcalled-before-they-turn-17.html
- Wiggins,G.&McTighe,J.(2008).Understandingbydesign.Alexandria,VA:ASCD.
- <https://marshallmemo.com/marshall-publications.php#8>

Suggested Continuous Evaluation Methods:
Assignments, Presentation, Group Discussion, and MCQ

Suggested equivalent online courses:

- <https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online>
- <https://www.firstaidforfree.com/>
- <https://www.coursera.org/learn/psychological-first-aid>
- <https://www.coursera.org/learn/mental-health>

Further Suggestions:.....