VIDYASAGAR UNIVERSITY

BACHELOR OF COMPUTER APPLICATION

THREE YEAR UNDERGRADUATE PROGRAMME

(UNDER CBCS)

(w.e.f. academic year 2022-23)

Vidyasagar University

Paschim Midnapore 721102, West Bengal

REGULATION FOR THE BACHELOR OF COMPUTER APPLICATIONS (BCA)

1. Title and Commencement:

1.1 These Regulations shall be called The Regulations for 'BACHELOR OF COMPUTER APPLICATIONS (BCA)**,** 3-YEAR UNDERGRADUATE DEGREE PROGRAMME (CBCS), 2022-23 UNDER VIDYASAGAR UNIVERSITY'.

1.2 These Regulations shall apply to the students admitted in BCA from the Academic Year **2022 – 2023** onwards.

2. Degree Nomenclature:

Bachelor of Computer Applications (BCA)

3. Duration of the Degree Programme

3.1 The duration of the Programme is **SIX (06)** consecutive **SEMESTERS** of six months each *i. e.,* **THREE (03) YEARS** and will start ordinarily in the month of July of each year.

3.2 A candidate shall have to clear all Semesters maximum within **FIVE (05) YEARS** from the academic year of his/her first admission and registration to the BCA Programme under Vidyasagar University failing which enrolment of the candidate shall stand cancelled.

3.3 Odd semester (i.e. 1st, 3rd and 5th Semester) is from July to December and even semester (i. e. 2nd, 4th and 6th Semester) is from January to June

3. Definitions

Academic Year: The 'Academic Year' shall ordinarily be formed as per Vidyasagar University rules.

Semester: An academic term consisting of not less than 90 instructional days, excluding days of final theory examinations.

Credit Hour: Each credit hour will be equivalent to one-hour lecture of theory or two hours of laboratory work for practical per week. It is also known as semester credit or credit.

Course: A course is a unit of instruction or a segment of subject to be covered in a semester. It has a specific number, title and credits.

Grade Point of a Course: Each course will be evaluated for 100 marks irrespective of the credits (theory or practical or theory and practical combined as per credits) for awarding grade point. The grade point shall be rounded to the second decimal place.

Credit Point of a Course: The product of credit hours and grade point obtained by the student in each course.

Grade Point: It is a numerical grade allotted to each letter grade on a 10-point scale.

Semester Grade Point Average (SGPA): It is a measure of performance of a student in a semester. It is the ratio of total credit points secured by a student in various courses of a semester and the course credits taken during that semester. It shall be expressed up to two decimal points.

Cumulative Grade Point Average (CGPA) : It is a measure of overall cumulative performance of a students' over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal points.

Grade Card or Marksheet: Based on the grade earned, a grade card or marksheet shall be issued after every semester. The grade card shall display the course details (code, title, marks, number of credits, grade secured) along with SGPA and CGPA where applicable.

4. Admission & Registration

4.1 The admission to undergraduate degree programmes in BCA will be governed by the guidelines of the Vidyasagar University and that of the Department of Higher Education, Govt. of West Bengal as laid down from time to time.

4.2 A candidate who has passed the Higher Secondary (10+2) examination of the West Bengal Council of Higher Secondary Education or/and equivalent examination of any University / Board with **Mathematics/ Computer Science/ Computer Applications/ Information Technology related subject** or **Business Mathematics (for Commerce stream)**, are eligible for admission in BCA programme satisfying the other admission criteria laid down by the Govt. of West Bengal and Vidyasagar University.

4.3 The last date of admission to the semester-I (first Year) of the three year BCA programme should not ordinarily exceed the date from the notified date of commencement of semester-I classes. However, in exceptional cases, a candidate may be admitted after the last date of admission with the permission of the University Authority.

4.4 The selection of students for admission will be done as per the merit list. The merit list will be prepared according to percentage of total marks obtained in the subjects of H.S. (10+2) or its equivalent examinations as stated above or through Entrance Examination or as laid down by Vidyasagar University from time to time.

4.5 The candidate will have to register himself/herself with the University as per university rules.

4.6 The candidate will have to enrol himself/herself at each semester for which he/she is eligible for prosecuting his /her studies on paying the requisite fees.

4.7 A candidate shall be allowed to pursue any one of the degree undergraduate programme of the university at a time, not more than one.

5. Attendance

5.1 A student having at least 75% attendance of scheduled theory and practical classes separately shall be allowed to sit for the concerned Semester Examination subject to the fulfilment of other conditions as laid down in the regulations.

5.2 Relaxation in attendance for NCC, NSS and Co-curricular activities is admissible as per University regulations subject to prior approval of College Authority.

6. Course & Curriculum

6.1 Course of Study: BCA degree shall be awarded if a student completes 14 core courses/papers in that discipline**,** 2 Ability Enhancement Compulsory Courses (AECC), 2 Skill Enhancement Courses (SEC), 4 courses/papers from a list of Discipline Specific Elective (DSE) and 4 courses/papers from a list of Generic Elective(GE) papers, respectively.

The distribution of courses in degree programme of BCA is as follows:

Type of Course	No. of paper	Credit distribution
Core Course	14	6x14= 84
Discipline specific Elective (DSE) Course	4	6x4=24
Ability Enhancement Compulsory Course (AECC)	2	2x1=02 4x1=04
Generic Elective (GE) Course	4	6x4=24
Skill Enhancement Course (SEC)	2	2x2=04
	Total	142

6.2 A student will have to do a project (DSE 04) in 6th semester. Project work may be done individually or in groups as per the case and group size cannot exceed more than three (03) members. The project synopsis should contain an introduction to the project which clearly explains the project scope. The project document should include SRS, Data Dictionary, DFD/UML, ERD, file designs and screenshots of outputs. The project work should be of such nature that it proves to be relevant from the point of view of commercial / management / technology / research.

6.3 Medium of Instruction: Medium of instruction shall be English.

6.4 Credits/work-load

i. Lecture 1 credit = 1 Hour Lecture [1 theory period of one hour duration per week]
ii. Tutorial 1 credit = 1 Hour Tutorial [1 tutorial period of one hour duration per week]
iii. Practical 1 credit = 2 Hours Practical [1 practical period of two hours duration per week]

7. Examination and Evaluation System

7.1 Date of Examination:

Exact dates and the schedule of examination shall be notified by the Controller of Examinations, Vidyasagar University. In the event of any unforeseen exigency the Controller of Examinations shall be competent for any adjustment in the prescribed schedule.

7.2 Schedule of Examination:

The schedule of examinations of BCA consists of Internal and External Examinations. End Semester Examination (External) shall be conducted at the end of the academic activities of the respective Semester.

7.3 Marks Distribution:

The final marks of each examination paper shall be as per the syllabus.

7.4 Rules for Examinations:

a) All Examinations in BCA Course shall be held on the compartmental system; each student must pass separately in every paper of the End Semester Examinations. Those who pass in a paper shall not be entitled to sit for exam in that paper again.
b) Non appearance in any paper will count as failure in that paper.
c) Pass marks in all examinations of BCA course shall be **40% of the maximum marks** in each paper.
d) **End Semester Examination:**

i. At the end of each semester, there shall be an Examination there-in after called end-semester examination conducted by the University as per the schedule announced by the Controller of Examinations.

ii. A candidate pursuing BCA programme has to secure minimum of 40% marks (including the marks of Internal Assessment) in each paper to qualify for the next semester. Automatic progression in the next higher semester may apply, i.e., after appearing at semester-I examination, he/ she is allowed to continue semester-II study provided he/she satisfy the clause no. 7.4d (v).

iii. The candidates remaining absent in the end semester theory examination will be marked as **ABSENT** and the candidate shall not be eligible to qualify for marks processing. The

candidate remaining absent in the Internal Assessment will be awarded **ZERO (0)** mark. The marks obtained in Internal Assessment shall be retained for the entire duration of his/her enrolment.

iv. A candidate must obtain atleast **40% marks** of maximum marks **in each theory paper** (including the marks of Internal Assessment) and must obtain atleast **50% marks** of maximum marks **in each practical paper**. Moreover, the candidate has to **secure 40% in aggregate** of that course to pass. Fail in practical shall denote the repeat of that paper (both theory and practical)

v. A student will be provisionally promoted to next semester if he/she does **not have more than two (02) supplementary papers (theoretical)** in the respective pervious odd / even semester Examinations. He/she may appear in those paper(s) in the concerned next End Semester Examination to clear the supple paper.

vi. A candidate shall have to complete each semester examination **within 3 (Three) consecutive chances** including his / her first appearance in the concerned End Semester Examination.

vii. If a candidate does not avail any chance/chances mentioned above within the stipulated period, the chance shall be deemed to have lapsed**.**

viii. If any candidate fails to qualify any semester after three (03) chances his/her candidature of the course will be lapsed/ canceled. A special permission may be sought from the concerned University Authority for re-registration/ admission.

ix. **All Back (supplementary) papers from 1st Semester to 5th Semester must be cleared before being promoted to 6th semester.**

e) **Continuous Internal Assessment:**

i. Internal assessment will be conducted by the internal teacher of the College. It shall be on the basis of tutorials, class tests, seminar presentations, or any combination thereof, evenly distributed over the entire study period. The modalities of such assessment be recorded and documents to be preserved by the respective college and those must be placed before any committee or team constituted by the university for verification.

ii. Marks obtained in the internal assessment will be clubbed with marks obtained in the End Semester Examination before awarding the grade. In case of supplementary in a paper, the internal assessment marks will be retained for next examinations with valid chances.

iii. Submission of marks of internal assessment**:** The marks for **internal assessment** will be clubbed and shall be submitted by the Principals/Teachers-in-Charge/Officer-in-Charge of the colleges to the Controller of Examinations before the commencement of End Semester Examination.

f) **Special Supplementary Examination:**

A Special supplementary examination will be held for students who have supple paper only for 6th Semester, except the R.A. Student. There will be no Special supplementary examination for any practical paper.

7.5 Eligibility criteria of examination and types of assessment:

A candidate shall be eligible for appearing at any of the semester of examination fulfilling the following essential condition:

1. A student must have at least 75% class attendance (theory and practical separately).
2. Unless a student appears for the internal examination, the student should not be permitted to appear for the Semester Final Theory examinations in the course concerned.
3. Student shall have to fill-up the examination form of the University paying the required fees as stipulated by the Vidyasagar University from time to time.
4. Registration is mandatory prior to form fill-up for the 1st Semester Examination.
5. Admit card shall be issued by the Controller of Examinations before the End Semester Examination and is mandatory for appearing at the examination.

7.6 Hour of End Semester Examination:

a. **Theoretical** papers of full marks up to **50,** duration **2** hours.
b. **Theoretical** papers of full marks more than **50,** duration **3** hours.
c. **Practical** papers of full marks up to **50,** duration **3** hours.
d. **Practical** papers of full marks above **50,** duration **5** hour

7.7 Evaluation / Grading System:

a. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

Based on the performance of the students, each student will be awarded Grade in subjects at the end of the semester examination following grading system on the base of TEN (10). On the basis of Cumulative Grade Point Average the student shall be awarded the Division to corroborate with the traditional scoring system.

10 Point scale

Qualification	Letter Grade	% of Marks	Grade Point
Outstanding	O	90-100	10
Excellent	A+	80-89	9
Very Good	A	70-79	8
Good	B+	60-69	7
Average	B	50-59	6
Poor	C	40-49	5
Fail	F	Below40	0
Absent	Ab	Absent	0

Further there shall be another grade 'I' (with point 0) for students for whom disciplinary action remains pending.

The Semester Grade point Average (SGPA) will be computed in each semester as per the following formula:

$$SGPA = \frac{\sum_{i=1}^{n} {}^{*}C_i G_i}{\sum_{i=1}^{n} C_i}$$

C_i = The number of credits allotted for a particular course.

G_i = This is the Grade points corresponding to the grade awarded for the course

i = 1, 2.., n represent the number of courses in which a student is registered in the concerned semester. The SGPA is rounded off to two decimal places.

The Cumulative Grade Point Average (CGPA) will be computed at the end of semester as per the following formula

$$CGPA = \frac{\sum_{i=1}^{n} {}^{*}C_i S_i}{\sum_{i=1}^{n} {}^{*}C_i}$$

${}^{*}C_i$ is the total credits of the corresponding semesters. S_i is the SGPA of the corresponding semesters.

i = 1, 2,...., n represent the number of the course in which a student is registered in the concerned semester. The CGPA is rounded off to two decimal places.

7.8 Cancellation of results: A candidate may apply to the Controller of Examinations for cancellation of his/her result of any semester for improvement of results within 15 days from the publication of results or issue of mark sheet. There will be no provision for canceling results of any single subject/ paper in any case. In all cases, cancellation of results will be counted as one chance lost. Such candidates shall have to surrender their original mark sheet along with the application for cancellation of results by payment of requisite fee as fixed by the University authority.

7.9. Breach of Discipline: In case of breach of discipline by the examinee during the examination, proper action will be taken as per the university rules notified from time to time.

8. Grace Marks: A candidate who fails to obtain 50%, 55% or 60% marks in aggregate at the 6^{th} and final semester a maximum of 5 marks shall be awarded as grace mark and that shall be added in the paper in which the candidate obtains the highest mark in which he/she appears last.

9. Post publication Scrutiny of Answer Script (Self Inspection):

A candidate of BCA. Course may apply for Self Inspection or RTI of his / her one or more answer scripts irrespective of marks by paying requisite fees. Post publication scrutiny (Self Inspection) does not imply re-examination or re-assessment of scripts but involves verification of scripts and records.

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VIDYASAGAR UNIVERSITY

3-Year Degree Curriculum in Bachelor of Computer Application
Under CBCS

Semester - I									
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**			**No. of Hours**		
				IA	**ESE**	**Total**	**L**	**T**	**P**
CC-01 (T+P)	BCACC1	T: Computer Fundamentals and Basic Operating Software P: Software Lab	6	20	80 T:50 P:30	100	3	1	4
CC-02 (T+P)	BCACC2	T: Introduction to Programming P: Programming Lab	6	20	80 T:50 P:30	100	3	1	4
GE-01	BCAGE1	**Choose Any One** a. Basic Mathematics b. Numerical Methods	6	20	80 T:80 -	100	5	1	-
AECC-01	BCAAECC	Communicative English	2	10	40 T:40 -	50	1	1	-
Total in Semester-I			**20**	**70**	**280**	**350**	**12**	**4**	**8**

Semester - II									
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**			**No. of Hours**		
				IA	**ESE**	**Total**	**L**	**T**	**P**
CC-03 (T+P)	BCACC3	T: Digital Logic Design P: Digital Logic Lab	6	20	80 T:50 P:30	100	3	1	4
CC-04 (T+P)	BCACC4	T: Data Structure P: Data Structure Lab	6	20	80 T:50 P:30	100	3	1	4
GE-02 (T)	BCAGE2	**Choose Any One** a: Business Accounting b: E-Business Infrastructure and Management	6	20	80 T:80 -	100	3	1	4
AECC-02	BCAENVS	Environmental Science	4	20	80 T:50 Prj.-30	100	3	1	-
Total in Semester-II			**22**	**80**	**320**	**400**	**12**	**4**	**12**

Semester - III										
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**				**No. of Hours**		
				IA	**ESE**		**Total**	**L**	**T**	**P**
CC-05 (T+P)	BCACC5	T: OOPs using C++ P: C++ Lab	6	20	80 T:50	P:30	100	3	1	4
CC-06 (T+P)	BCACC6	T: Operating System P: Operating System Lab	6	20	80 T:50	P:30	100	3	1	4
CC-07 (T)	BCACC7T	Discrete Mathematics	6	20	80 T:80	-	100	5	1	-
GE-03 (T)	BCAGE3	**Choose Any One** a. Entrepreneurship Development b. IT in Management	6	20	80 T:80		100	5	1	-
SEC-01 (T+P)	BCASEC1	**Choose Any One** a) Web Designing b) XML Programming c) Javascript with Node.js/AngularJs	2	10	40 T:25	P:15	50	1	-	2
Total in Semester-III			**26**	**90**	**360**		**450**	**17**	**4**	**10**

Semester – IV										
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**				**No. of Hours**		
				IA	**ESE**		**Total**	**L**	**T**	**P**
CC-08 (T+P)	BCACC8	T: Computer Networking P: Networking Lab	6	20	80 T:50	P:30	100	3	1	4
CC-09 (T+P)	BCACC9	T: Computer Architecture & Microprocessor P: Architecture & Microprocessor Lab	6	20	80 T:50	P:30	100	3	1	4
CC-10 (T+P)	BCACC10	T: Database Management System P: Database Management System Lab	6	20	80 T:50	P:30	100	3	1	4
GE-04 (T)	BCAGE4	**Choose Any One** a. Information Security b. Digital Marketing Fundamentals	6	20	80 T:80		100	5	1	-
SEC-02 (T+P)	BCASEC2	**Choose Any One** A. R-programming B. Python Programming C. Programming with MATLAB	2	10	40 T:25	P: 15	50	1	-	2
Total in Semester-IV			**26**	**90**	**360**		**450**	**15**	**4**	**14**

Semester - V										
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**				**No. of Hours**		
				IA	**ESE**		**Total**	**L**	**T**	**P**
CC-11 (T+P)	BCACC11	T: Artificial Intelligence P: Artificial Intelligence Lab	6	20	80 T:50	P:30	100	3	1	4
CC-12 (T)	BCACC12	T: Theory of Computer Science	6	20	80 T:80		100	5	1	-
DSE-01 (T+P)	BCADSE1	**Choose Any One :** a) Java Programming b) PHP & .NET c) Android Programming	6	20	80 T:50	P:30	100	3	1	4
DSE-02 (T)	BCADSE2	**Choose Any One :** a) Mobile Computing b) Cyber Security and Law c) Internet of Things (IoT)	6	20	80 T:80		100	5	1	-
Total in Semester-V			**24**	**80**	**320**		**400**	**16**	**4**	**8**

Semester - VI										
Course Type	**Course Code**	**Course Title**	**Total Credit**	**Marks**				**No. of Hours**		
				IA	**ESE**		**Total**	**L**	**T**	**P**
CC-13 (T+P)	BCACC13	T: Computer Graphics P: Graphics Lab	6	20	80 T:50	P:30	100	3	1	4
CC-14 (T+P)	BCACC14	T: Software Engineering and Project Management P: Software Project Lab	6	20	80 T:50	P:30	100	3	1	4
DSE-03 (T)	BCADSE3	**Choose Any One :** a) Image Processing & Pattern recognition b) Cloud Computing c) Data Mining	6	20	80 T:80	-	100	6	-	-
DSE-04 (Project)	BCADSE4P	A. Project B. Grand Viva C. Seminar Presentation	6	-	100 Prj:100		100	-	-	12
Total in Semester-VI			**24**	**60**	**340**		**400**	**12**	**2**	**20**

Note:
BCA = Bachelor of Computer Application, CC = Core Course, AECC = Ability Enhancement Compulsory Course, SEC = Skill Enhancement Course, GE = Generic Elective, DSE = Discipline Specific Elective, IA = Internal Assessment, ESE= End-Semester Examination, T = Theory, P =Practical
L-T-P = Lecture - Tutorial - Practical

List of Core courses (CC) and Electives

Core Course (CC)

BCACC1T: Computer Fundamentals and Basic Operating Software.
BCACC1P: Software Lab (Windows, Word, Excel, and PowerPoint).
BCACC2T: Introduction to Programming
BCACC2P: Programming Lab
BCACC3T: Digital Logic Design
BCACC3P: Digital Logic Lab
BCACC4T: Data Structure
BCACC4P: Data Structure Lab
BCACC5T: OOPs using C++
BCACC5P: C++ Lab
BCACC6T: Operating System
BCACC6P: Operating System Lab
BCACC7T: Discrete Mathematics
BCACC8T: Computer Networking
BCACC8P: Networking Lab
BCACC9T: Computer Architecture & Microprocessor
BCACC9P: Architecture and Microprocessor Lab
BCACC10T: Database Management System
BCACC10P: Database Management System Lab
BCACC11T: Artificial Intelligence
BCACC11P: Artificial Intelligence Lab
BCACC12T: Theory of Computer Science
BCACC13T: Computer Graphics & Multimedia
BCACC13P: Graphics and Multimedia Lab
BCACC14T: Software Engineering and Project Management
BCACC14P: Software Project Management Lab

Discipline Specific Electives (DSE)

BCADSE1.1 (T+P): Java Programming.
Or
BCADSE1.2 (T+P): PHP & .NET
Or
BCADSE1.3 (T+P): Android Programming

BCADSE2.1 (T): Mobile Computing
Or
BCADSE2.2 (T): Cyber Security and Cyber Laws
Or
BCADSE2.3 (T): Internet of Things (IoT)

BCADSE3.1 (T): Image Processing & Pattern recognition
Or

BCADSE3.2 (T): Cloud Computing
Or
BCADSE3.3 (T): Data Mining

BCADSE4 (P): Project

Skill Enhancement Course (SEC)

BCASEC1.1 (T+P): Web Designing
Or
BCASEC1.2 (T+P): XML Programming
Or
BCASEC1.3 (T+P): Javascript with Node.js/AngularJs

BCASEC2.1 (T+P): R-programming
Or
BCASEC2.2 (T+P): Python Programming
Or
BCASEC2.3 (T+P): Programming with MATLAB

Generic Electives (GE)

BCAGE1.1 (T): Basic Mathematics
Or
BCAGE1.2 (T): Numerical Methods

BCAGE2.1 (T): Business Accounting
Or
BCAGE2.2 (T): E-Business Infrastructure and Management

BCAGE3.1 (T): Entrepreneurship Development
Or
BCAGE3.2 (T): IT in Management

BCAGE4.1 (T): Information Security
Or
BCAGE4.2 (T): Digital Marketing Fundamentals

Ability Enhancement Compulsory Course (AECC)

BCAAECC (T): Communicative English
BCAENVS (T): Environmental Science

Core Course (CC)

Core Course (CC)-01 **Credits: 06**

BCACC1T: Computer Fundamentals and Basic Operating Software **Credits: 04**

GROUP-A

UNIT-I Overview:
A brief introduction of computer generation. Types of computer (Micro, Mini, Mainframe, Super), Machine language & Assembly language, High level language, Type of Software.

UNIT-II Computer Basic:
Need and application of computers, hardware and software, Architecture ofComputer System, The Central Processing Unit, Memory Unit, Concept of algorithm and flow charts.

UNIT-III Input/output units:
Keyboard, Mouse, Printers, and Monitors etc.

UNIT-IV
Number System: Positional and Non-Positional Number System, Decimal, Binary, Octal and Hexa-decimal Number System, Converting from one number system to another.
Binary Arithmetic: Binary Addition, Subtraction, Multiplication and Division. 1,s complement 2,s complement.
Representation of characters: BCD code, EBCDIC, ASCII, Representation integers, fractions in computersystem.Floating and normalized floating point representation of signed number.

GROUP-B

UNIT-I Computers memory:
Memory organization and comparison of different type of memories including primary and secondary memory.

UNIT-II Operating Software: Application Software, System Software
What is Operating System? Functions of Operating System, Different type of operating system like DOS, UNIX, WINDOWS, etc. Multiprogramming and Multi-Tasking.

UNIT-III Internet & E-mail:
WWW, Email, FTP, HTML, computer networks (overview of ISO OSI model), multiplexing, LAN, WAN, and other Network topologies. Net Banking, E-Commerce, Current trends on Internet, Web Brower, Network Setup.

Reference Books:

1. *Raja Raman. V: Fundamentals of computers, PHI*
2. *Introduction to Computer Science, ITL Education Solutions Limited, pearson education.*
3. *Computer Fundamentals, Anita Goel*
4. *Foundations of Computer Science By Ashok Arora*

BCACC1P: Software Lab (Windows, Word, Excel, and PowerPoint) **Credits 02**

Windows

Lesson 1: Accessing Windows 10

Get Started with Windows
Navigate the Windows 10 Desktop
Use the Start Menu
Use Windows Universal Apps
Multitask with Open Apps
Install Apps from Windows Store

Lesson 2: Working with Files and Folders

Manage Files and Folders with File Explorer
Cut/Copy the contents of one folder to another folder
Store and Share Files with OneDrive

Lesson 3: Customizing the Windows 10 Environment

Customize the Start Screen
Customize the Desktop and Lock Screen

Lesson 4: Installing and Removing Devices

Manage Printers, Camera, Projector
Manage Peripheral Devices

Lesson 5: Use of internet and email

MS-Word

Lesson 1:

- Starting Microsoft Word
- Opening a New Document
- Saving a Document
- Closing a Document and exiting Word

Lesson 2:

- Basic Editing
- The Cursor
- Inserting Text
- Deleting Text
- Moving Text
- Undo and Redo
- Wrap Text

Lesson 3:

- Formatting
- Selecting Text
- Applying a Font
- Changing Font Size
- Font Attributes
- Font Color
- Clear Formatting
- Text Alignment
- Cut, Copy and Paste
- Copying and Moving Text and Object
- Zoom
- Page View

Lesson 4:

- Paragraph Formatting
- Changing Paragraph Alignment
- Indenting Paragraphs
- Add Borders or Shading to a Paragraph
- Bulleted and Numbered Lists
- Creating a Nested List
- Apply Paragraph Styles
- Creating Links within a Document
- Change Spacing Between Paragraphs and Lines

Lesson 5:

- Tables
- Creating Tables
- Creating a table by highlighting the boxes
- Create a table by using the Insert Table command
- Drawing a Table
- Converting text into a table
- Entering Text
- Table Tools
- Inserting rows and column
- Merge and split table cells

Lesson 6:

- Find and replace text
- Spell Check
- Auto Correct
- Check Word Count

Lesson 7:

- Page Formatting
- Page Margins
- How to Change the Orientation, Size of the Page, or Size of the Columns
- Apply a Page Border and Color
- Insert Headers and Footers (Including Page Numbers)
- Create a Page Break
- Insert a Cover Page
- Insert a Blank Page
- Print and print properties

Lesson 8:

- Inserting Graphics, Pictures, and Table of Contents
- Inserting Special Characters into Your Document
- Inserting Equations
- How to Insert Pictures, and Smart Art
- Resizing Graphics
- Watermarks
- Mail Merge

MS Excel

Lesson 1:

- Opening a Blank or New Workbook, General Organization
- Instruction on opening a blank or new workbook
- General organization of Excel
- Saving, Page Setup, and Printing

- Page Setup
- Margins
- Orientation
- Paper Size

Lesson 2:

Highlights and Main Functions

- Home
- Insert
- Page Layout
- Data
- Review
- View

Lesson 3:

Working with Data:

- Entering ,Editing
- Copy,Cut, Paste, Paste Special
- Formatting Data
- Marge cells

Lesson 4:

- Manipulating Data
- Data Names and Ranges
- Filters and Sort
- Data from External Sources
- Copying and pasting from within the same and another worksheet.

Lesson 5:

- Basic Formulas and Use of Functions
- Using formulas and functions to manipulate and analyze data.

Lesson 6:

- Data Analysis Using Charts and Graphs
- Inserting a chart
- Types of Chart , 2D Chart ,3D Chart
- Colouring a chart
- Using a chart in a word document
- Editing a chart

Lesson 7:

- Using Headers and Footers
- Headers include text, numbers, and other content that displays at the top of each printed page.

MS Power Point

Lesson 1:

- Create a new presentation.
- Modify presentation themes.
- Add and edit text to slides.
- Add new slides to a presentation.
- Insert clipart images and shapes to slides.
- Insert and modify tables and charts.
- Insert and edit animations and slide transitions.

Lesson 2:

- Introduction to the basics of a slide show and presentation
- Inserting an animation
- Inserting sound and video to a slide presentation.

- Inserting a movie file
- Managing slide show and animation

Reference Books:

1. *Raja Raman. V: Fundamentals of computers, PHI*
2. *Introduction to Computer Science, ITL Education Solutions Limited, pearson education.*
3. *Computer Fundamentals, Anita Goel*
4. *Foundations of Computer Science By Ashok Arora*

Core Course (CC)-02 **Credits: 06**

BCACC2T: Introduction to Programming **Credits: 04**

UNIT-I Introduction:

Basics of programming environment, the concept of compiled program, text editors, and debuggers. Basic Program Design, Algorithms, Flow Chart.

Scope of C Language. Distinction and similarities with other HLLs Special features andApplication areas.

Elements of C: Character Set, C tokens,Keywords and identifiers, Data Types ,Constants and Variables, Structure of a C program.

Operators: unary, binary, ternary , Operator precedence

Console Input/Output:Types of IO ,Console IO,Unformatted console IO: getchar(), putchar(), gets(), puts(),Formatted IO:scanf(), printf(),Symbolic Constant,PreprosessorDirectives,Escape sequences.

UNIT-II Control Statements:

Statements and blocks, if statement, if else statement, nested if else statements, the else if ladder, go to statement, switch statement.

Loop Control Structure: while statement, do. While statement, for statement, the break and continue statements.

UNIT-III Arrays:

Basic Concepts, Memory Representation, One Dimensional Array, Two Dimensional.

UNIT-IV Functions:

Basic concept, Declaration and prototype, Calling Arguments, Scope rules, Recursion, Storage classes, Library of functions, macro.

UNIT-V Pointers:

Basic Concepts, &, * Operator, Pointer expression: assignment, pointer arithmetic, Dynamic Memory Allocation, Pointer V/S Array, Array of Pointer, Pointer V/S Function. , Call by value and call by reference, String Handling.

UNIT-VI Structure and Union:

Structure, Union and Enumerated Data Types: Basic Concepts, Declarations and Memory Map,Elements of Structures, Structure V/S Function, Structure V/S Array, Union, Enumerated data Types: TypeDef, Enum Self-referential structures

UNIT-VII: File Handling:

Types of Files File Organization Opening, Reading, Writing, Closing Text and binaryfile

BCACC2P: Programming Lab **Credits: 02**

1. WAP to check a year is Leap year or not.
2. WAP to solve the following Quadratic equation

   $Ax^2 + Bx + C = 0$
3. WAP to print the sum and product of digits of an integer.
4. WAP to find the reverse a number and then check the number is palindrome or not.
5. WAP to compute the sum of the first n terms of the following series

   S = 1+1/2+1/3+1/4+……
6. WAP to compute the sum of the first n terms of the following series

   S =1-2+3-4+5…….
7. WAP to find the value of cosxfrom the following Cos series:

   $\text{Cosx} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - .....\infty$
8. WAP to find the GCD and LCM of two numbers.
9. WAP to display Amstrong numbers between the range a to b.
10. WAP to display Strong numbers between the range a to b.
11. WAP to convert a Decimal number into its equivalent Binany number.
12. WAP to convert a Binary number into its equivalent Decimal number.
13. WAP to convert a Binany number into its equivalent Octal number.
14. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
15. WAP to compute the factors of a given number.
16. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
17. WAP to count number of vowels, consonants, digits and blank spaces in a line of text.
18. Write a macro that swaps two numbers. WAP to use it.
19. Write a program in which a function is passed address of two variables and then alter its contents.
20. WAP to print a triangle of stars as follows (take number of lines from user):

```
    *
   ***
  *****
 *******
*********
```

21. WAP to print the pyramid of numbers as follows(take number of lines from user):

```
        1
      1 2 1
    1 2 3 2 1
  1 2 3 4 3 2 1
1 2 3 4 5 4 3 2 1
```

22. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
23. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
24. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

25. WAP to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array
    iv) Print the maximum and minimum element of array
    v) Remove the duplicates from the array
    vi) Print the array in reverse order
26. WAP to arrange the list of n numbers in ascending order.
27. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
28. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
29. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat() function.
    c) Concatenate two strings using strcat() function.
    d) Compare two strings
    e) Calculate length of the string (use pointers)
    f) Convert all lowercase characters to uppercase
    g) Convert all uppercase characters to lowercase
    h) Calculate number of vowels
    i) Reverse the string
30. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
31. Write a program to retrieve the student information from file created in previous question and print it in following format:

    Roll No. Name Marks
32. Copy the contents of one text file to another file, after removing all whitespaces.
33. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

Reference Books:

1. *C Programming, Stephen Kochan*
2. *Programming with C, Schaum's Series*
3. *C Programming , V. Balaguruswami*
4. *Let Us C, YashwantKanetkar*
5. *Programming in C: A Practical Approach, Ajay Mittal*

Core Course (CC)-03 — Credits 06

BCACC3T: Digital Logic Design — Credits 04

UNIT-I Number systems:

Positional number systems; Binary, Octal, Hexadecimal and Decimal number systems; conversion of a number in one system to the other; Representation of signed numbers-signed magnitude, one's complement, 2's complement representation techniques, Merits of 2's complement representation

scheme; Various binary codes- BCD, excess -3, Gray code, ASCII, EBCDIC, Parity bits; Binary arithmetic- addition, subtraction, multiplication and division of unsigned binary numbers.

UNIT-II Boolean Algebra:
Fundamental of Boolean Expression: Definition of Switching Algebra, Basic properties of Switching Algebra, Huntington's Postulates, Basic Logic gates: (OR, AND, NOT); Universal Logic Gates: (NAND & NOR); Basic logic operations: logical sum (OR), logical product (AND), complementation (NOT), Anti coincidence (EX-OR) and coincidence (EX-NOR) operations: Truth tables of Basic gates; Boolean Variables and Expressions; Demorgan's theorem; Boolean expressions Simplification-Algebraic technique, Karnaugh map technique, 3 variable and 4 variable Karnaugh map.

UNIT-III Combinational Circuits:
Half Adder, Full Adder (3-bit), Half Subtractor, Full Subtractor (3-bit) and construction using Basic Logic Gates (OR, AND, NOT) and Universal Logic Gates (NAND & NOR), Multiplexer, Encoders, Demultiplexer and Decoder circuits, Seven Segment Display. BCD adder/ subtractorcomperator; parity generators, code converters, priority encoders.

UNIT-IV Sequential circuits:
Latch, RS, D, JK, T Flip Flops; Race condition, Master Slave JK Flip Flop; Registers: Serial Input Serial Output (SISO), Serial Input Parallel Output (SIPO), Parallel input Serial Output (PISO), Parallel Input parallel Output (PIPO), Universal Shift Registers; Counters: Asynchronous Counter, Synchronous Counter.

BCACC3P: Digital Logic Design Lab **Credits 02**

Combinational Circuits & Sequential Circuits:
1. Implementation of different functions using Basic and Universal Logic gates, SOP, POS
2. Study and prove De-Morgan's Theorem.
3. Implementation of Basic gates using NAND and NOR gates
4. Implementation of half and Full Adder (3-bit) using basic logic gates and Universal logic gates (NAND & NOR).
5. Implementation of half and Full Subtractor (3-bit) using basic logic gates and Universal logic gates (NAND & NOR).
6. Design 2 to 4 decoder using basic / universal logic gates.
7. Design and implement a 8:1 multiplexer.
8. Design and implement a 3×8 decoder.
9. Design and implement a 8 bit parity generator.
10. Design and implement a D flip-flop.
11. Design and implement a J. K. flip-flop.
12. Design and implement a 4 bit synchronous counter.

Reference Books:

1. *Digital Principles and Applications: Malvino and Leach*
2. *Modern Digital Electronics : R.P. Jain*
3. *Digital Circuits & Design – S.Salivahanan, S.Arivazhagan – Vikas Publishing House Pvt Ltd.*
4. *Digital logic & Computer Design- M.Mano- Prentice Hall of India.*
5. *Fundamental of Digital Circuits by AAnnand Kumar PHI*

Core Course (CC) - 04 — Credits 06

BCACC4T: Data Structure — Credits 04

1. **Arrays:** Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation), Row major and column major operation (2D).
2. **Stacks:** Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack
3. **Linked Lists:** Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists;
4. **Queues:** Array and Linked representation of Queue, De-queue, Priority Queues
5. **Recursion:** Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)
6. **Trees:** Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees), Tree traversal techniques, Heap Sort.
7. **Searching and Sorting:** Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Bubble Sort, Quick Sort and Merge sort, Comparison of Sorting Techniques.
8. **Hashing:** Hashing technique, Collision resolution, chaining Different types of hash function.

BCACC4P: Data Structure Lab — Credits 02

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Perform Stack operations using Linked List implementation.
6. Perform Stack operations using Array implementation. Use Templates.
7. Perform Queues operations using Circular Array implementation. Use Templates.
8. WAP to scan a polynomial using linked list and add two polynomial.
9. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration
10. WAP to display fibonacci series (i)using recursion, (ii) using iteration
11. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
12. WAP to create a Binary Search Tree and include following operations in tree:
    (a) Insertion (Recursive and Iterative Implementation)
    (b) Deletion by copying
    (c) Deletion by Merging
    (d) Search a no. in BST

(e) Display its preorder, postorder and inorder traversals Recursively
(f) Display its preorder, postorder and inorder traversals Iteratively

13. WAP to implement Diagonal Matrix using one-dimensional array.
14. WAP to implement Lower Triangular Matrix using one-dimensional array.
15. WAP to implement Upper Triangular Matrix using one-dimensional array.

Reference Books:

1) *Data Structure using C- A.M. Tanenbaum(PHI)*
2) *Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson Freed, Silicon Pr.*
3) *Data Structures: A Pseudocode Approach with C, Richard F. Gilberg and Behrouz A. Forouzan, Cengage Learning*
4) *Data Structures In C, Noel Kalicharan, CreateSpace Independent Publishing Platform.*
5) *Adam Drozdek, Data Structures and algorithm in C, Cengage Learning.*
6) *The C Programming Language, Brian W. Kernighan and Dennis Ritchie, Prentice Hall.*
7) *SartajSahni, Data Structures, Algorithms and applications in C++, niversities Press, 2011.*
8) *Classic Data Structures, D. Samanta. PHI*
9) *Data Structures by S Lipschutz, Schaum's Outlines*

Core Course (CC)-05 — Credits 06

BCACC5T: OOPs using C++ — Credits 04

UNIT-I Introduction to OOPs and C++ Element:
Introduction to OOPs, Features &Advantages of OOPs, Different element of C++ (Tokens, Keywords, Identifiers, Variable, Constant, Operators, Expression, String).

UNIT II Program Control Statements:
Sequential Constructs, Decision Making Construct, Iteration / LoopConstruct, Arrays, Functions (User defined Function, Inline Function, Function Overloading), User Defined Data Types (Structure, Union and Enumeration).

UNIT III Class, Object, Constructor & Destructor.
Class, Modifiers (Private, Public & Protected), DataMember, Member Function, Static Data Member, Static Member Function, Friend Function, Object, Constructor (Default Constructor, Parameterized Constructor and Copy Constructor), Destructor.

UNIT IV Pointer, Polymorphism & Inheritance:
Pointer (Pointer to Object, this Pointer, Pointer to Derive Class), Introduction to Polymorphism (Runtime Polymorphism, Compile time Polymorphism), Operator Overloading, Virtual Function, Inheritance (Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance), Virtual Base Class, Abstract Class.

UNIT V File Handling, Exception Handling:
Files I/O, Exception Handling (Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Re-throwing an Exception).

BCACC5P: C++ Lab **Credits 02**

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. Write a C++ program to print the given number in reverse order.
3. Write a C++ program to print first 100 non-Fibonacci numbers.
4. Write a C++ program to convert a decimal number into a hexadecimal number.
5. Write a C++ program to search an element of an array using binary search technique.
6. Write a C++ program to calculate compound interest in a bank using default arguments.
7. Write a C++ program to display the student details using classes and object as array.
8. Write a C++ program to implement stack using array.
9. Write a C++ program for matrix multiplication using dynamic memory allocation, copy construction and overloading of assignment operator.
10. Write a C++ program to read a two dimensional matrix and display its transpose.
11. Write a C++ program to implement inline function.
12. Write a C++ program to implement constructor and destructor.
13. Write a C++ program to implement the functionalities of a copy constructor.
14. Write a C++ program to display the account number and balance using constructor overloading.
15. Write a C++ program to find the volume of cube, rectangle and cylinder using function overloading.
16. Write a C++ program to overload operator ++ and operator - using friend functions.
17. Write a C++ program to add two complex numbers using binary operator overloading.
18. Write a C++ program to implement single inheritance and multilevel inheritance.
19. Write a C++ program to draw a rectangle, square and circle using multiple inheritance with virtual function.
20. Write a C++ program to implement hybrid inheritance.
21. Write a C++ program to display student details using virtual base class.
22. Write a C++ program to implement pure virtual function.
23. Write a C++ program to read and write n numbers from a file.
24. Write a C++ program for bubble sort using template.

Reference Books:

1. *E. Balaguruswami-Object Oriented programming with C++*
2. *Kris James-Success with C++*
3. *David Parsons-Object Oriented programming with C++*
4. *D. Ravichandran-Programming in C++*
5. *Dewhurst and Stark-Programming in C++*

Core Course (CC) -06 **Credits 06**

BCACC6T: Operating System **Credits 04**

UNIT-I Introduction: Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

UNIT-II System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

UNIT-III Process Management:
Processes - Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication. Threads: overview, benefits of threads, user and kernel threads. CPU scheduling: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, and priority) and algorithm evaluation, multi-processor scheduling. Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

UNIT-IV Deadlocks:
System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

UNIT-V Storage Management:
Memory Management: Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory.

UNIT-VI I/O Management:
I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

UNIT-VII Disk Management:
Disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

BCACC6P: Operating System Lab **Credits 02**

C/C++ programs:
1. Write a program (using *fork()* and/or *exec()* commands) where parent and child execute:
Same program, same code. Same program, different code.
Before terminating, the parent waits for the child to finish its task.
2. Write a program to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behavior of Linux kernel including information on configured memory, amount of free and used memory(memory information).
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to calculate sum of n numbers using *thread* library.
10. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Reference Books:

1. *Milenkovie M., "Operating System: Concept & Design", McGraw Hill.*
2. *Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.*

3. *Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.*
4. *Dhamdhere: Operating System TMH*
5. *Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.*
6. *Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.*

Core Course (CC) -07 — Credits 06

BCACC7T: Discrete Mathematics — **Credits 06**

UNIT-I Set theory, Relations and functions:
Set notations and description, subsets, basic set operations. Venn diagrams, laws of set theory, partition of sets, basic definitions of relations and functions, properties of relations; injective, surjective and bijective functions, composition.

UNIT-II Combinations:
Rule of products, permutations, combinations. Algebra of Logic: Propositions and logic operations, truth tables and propositions generated by set, equivalence and implication laws of logic, mathematical system, and propositions over a universe, mathematical induction. Recursion and recurrence: The many faces of recursion, recurrence, relations, and some common recurrence relations, generating functions.

UNIT-III Algebric Structures:
Table of operation, properties of binary operations, semigroup, subsemigroup, free semigroup, product of semigroup, congruence relation, monoid, submonoid, group, subgroup, cyclic group, coset, order of group, order of element, normal subgroup, homomorphisms, Isomorphism, Automorphism, Rings, Types of rings, subrings, Integral domain, Field.

UNIT-IV Posets, Lattices and Boolean Algebra:
Poset, Hasse Diagram, Lattices, sublattics, Boolean Algebra, Boolean Expression, Principal of Duality, K-Map, Simplification using K-Map.

UNIT-V Graph theory:
Various types of graphics, simple and multigraphs, directed and undirected graphs, Eulerian and Hamiltonian graph, graph connectivity, traversals, trees, spanning trees, rooted trees, binary trees.

Reference Books:

1. *Discrete Mathematics and Graph Theory, Satyanarayana& Prasad.*
2. *Discrete Mathematics with Graph Theory, 3rd ed., Goodaire&Parmenter.*
3. *Discrete Mathematics and Graph Theory, 2nd ed., Biswal.*
4. *Discrete Mathematics, RajendraAkerkar and RupaliAkerkar.*

Core Course (CC) -08 — Credit 06

BCACC8T: Computer Networking — **Credit 04**

UNIT-I Introduction to Data Communications and Network Models:

Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).

UNIT-II Signal Conversion:

Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to analog Conversion, Analog-to-analog Conversion. Transmission Media: Guided Media, Unguided Media, Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual-Circuit Networks, and Structure of a Switch.

UNIT-III Error Detection and Correction:

Checksum, CRC, Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding window Protocol, Go Back N, Selective Repeat) HDLC, Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).

UNIT-IV Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process-Process Delivery: UDP, TCP.

Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), **Network Security:** Authentication, Basics of Public Key and Private Key, Digital Signatures and Certificates (Fundamental concepts only).

BCACC8P: Networking Lab **Credit 02**

Use C/C++/ any Network Simulator

1. Simulate Even Parity generator and checker.
2. Simulate two-dimensional Parity generator and checker.
3. Simulate checksum generator and checker.
4. Simulate Hamming code method.
5. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
6. Simulate and implement stop and wait protocol for noisy channel.
7. Simulate and implement go back n sliding window protocol.
8. Simulate and implement selective repeat sliding window protocol.
9. Simulate and implement distance vector routing algorithm.

Reference Books:

1. *Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.*
2. *Computer Networks, A. S. Tanenbaum, 4th edition, Pearson Education.*
3. *Data Communication & Network, Dr. Prasad, Wiley Dreamtech*
4. *Data & Computer Communications, Stallings, PHI*

Core Course (CC) -09 Credit 06

BCACC9T: Computer Architecture & Microprocessor **Credit 04**

UNIT-I Basic Computer Architecture: Introduction:

History of Computer architecture, Overview of computer organization, Memory Hierarchy and cache, Organization of hard disk.

Instruction Codes: Stored Program Organization-Indirect Address, Computer Registers, Common bus system, Instruction set, Timing and Control-Instruction Cycle

UNIT-II Central Processing Unit:
Basic Computer Design of Accumulator: Control of Ac Register, ALU Organization; Control Memory-Address Sequencing; Conditional Branching, Mapping of Instruction-Subroutines; Hardware and Microprogram Control Unit. General Register Organization: Control Word, Stack Organization and Instruction; Formats-Addressing Models.

UNIT-III Fundamental of Microprocessor:
Introduction to Microprocessors, Microprocessor systems with bus organization, Microprocessor architecture and operation, 8085 Microprocessor and its operation, 8085 instruction cycle, machine cycle, T states, Addressing modes in 8085

UNIT-IV Introduction to Assembly Language Programming:
Assembly Language Programming Basics, Classification of Instructions and Addressing Mode, 8085 Instruction Sets, Assembling, Executing and Debugging the Programs, Developing Counters and Time Delay Routines, Interfacing Concepts

BCACC9P: Architecture & Microprocessor Lab **Credit 02**

1. Write a program for 32-bit binary division and multiplication
2. Write a program for 32-bit BCD addition and subtraction
3. Write a program for linear search and binary search.
4. Write a program to add and subtract two arrays
5. Write a program for binary to ascii conversion
6. Write a program for ascii to binary conversion
7. To write an ALP program to display the keyboard status using 8086.
8. To write an ALP program for displaying the Digital clock.
9. To write and implement the program for stepper motor using 8085
10. To write a program to Print RAM size and system date using 8086.
11. To write an ALP program for password checking using 8086.
12. To write a Program using 8086 for Copying 12 Bytes of Data from Source to Destination & Verify.
13. To search the character in a string using 8086
14. To sort the given number in ascending order using 8086.
15. To convert a given binary to BCD.
16. To write an assembly language program to convert an 8 bit binary data to BCD using 8085 microprocessor kit.

Reference Books:

1. *Ramesh S. Gaonkar: Microprocessor Architecture, Programming, and Applications with 8085, prentice Hall*
2. *Morris Mano: Computer system Architecture, Third Edition, prentice Hall*
3. *Douglas V. Hall: Microprocessor and Interfacing programming and Hardware, McGraw Hill*

Core Course (CC)-10 **Credit 06**

BCACC10T: Database Management System **Credit 04**

UNIT-I Introduction:
Introduction to Database and Database Users, Database System Concepts and Architecture: data Models, schema, and instances

UNIT-II Conceptual Modelling and Database Design:
Entity Relationship (ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity-Relationship (EER) Model.

UNIT-III: Normalization:
Functional Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT-IV Structure Query Language (SQL):
Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.

UNIT-V Transaction Processing:
Introduction to Transaction Processing, Transaction and System Concepts, Properties of Transactions, Recoverability, Serializability, Concurrency Control Techniques, Locking techniques for Concurrency Control, Concurrency Control based on Time-Stamp Ordering.

BCACC10P: Database Management System Lab **Credit 02**

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		NULL

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of Rs.1500 and Rs.2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is 'A'.
14. Query to display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Mangers Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns <Salary> monthly but wants <3*Current Salary>. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Department Name of all employees who have an 'A' in their name.
25. Query to display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees Name who do not have a manager.
27. Query to display Name, Department No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
30. Query to display the number of employees performing the same Job type functions.

31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

Reference Books:

1. *Fundamentals of Database Systems, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson Education*
2. *An Introduction to Database System, Date C. J. - Pearson Education, New Delhi – 2005*
3. *Data Base System Concepts, Korth, TMH*
4. *An Introduction to Database System, Bipin Desai, Golgotia Publication*
5. *Fundamental of Database System, Navathe*
6. *Database Management System, ArunMazumder*
7. *AtoZ Database Management System, Ezeded*

Core Course (CC)-11 — Credit 06

BCACC11T: Artificial Intelligence — Credit 04

UNIT-I Introduction:
Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.

UNIT-II Problem Solving and Searching Techniques:
Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

UNIT-III Knowledge Representation:
Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs. Programming in Logic (PROLOG)

UNIT-IV Dealing with Uncertainty and Inconsistencies:
Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

UNIT-V Understanding Natural Languages:
Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

BCACC11P: Artificial Intelligence Lab **Credit 02**

List of Practical:

1. Write a prolog program to calculate the sum of two numbers.
2. Write a prolog program to find the maximum of two numbers.
3. Write a prolog program to calculate the factorial of a given number.
4. Write a prolog program to calculate the nth Fibonacci number.
5. Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n'th element into every list at all levels.
6. Write a Prolog program to remove the Nth item from a list.
7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every n'th item from every list at all levels.
8. Write a Prolog program to implement append for two lists.
9. Write a Prolog program to implement palindrome(List).
10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog program to implement GCD of two numbers.
17. Write a prolog program that implements Semantic Networks/Frame Structures

Reference Books:

1. *DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.*
2. *Russell &Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.*
3. *Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.*
4. *W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.*
5. *Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.*

Core Course (CC)-12 **Credit 06**

BCACC12T: Theory of Computer Science **Credit 06**

1. Languages: Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar

2. Finite Automata and Regular Languages: Regular Expressions, Transition Graphs, Deterministics and non-deterministic finite automata, NFA to DFA Conversion, Regular languages

and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

3. Context free languages and PDA: Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.

4. Turing Machines and Models of Computations: Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive language unsolvability problems.

Reference Books:

1. *Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996*
2. *Lewis & Papadimitriou, Elements of the theory of computation , PHI 1997.*
3. *Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation,3rd*
4. *Edition, Pearson Education. 2006*
5. *P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jone*
6. *Bartlett, 2006*

Core Course (CC) -13 — Credit 06

BCACC13T: Computer Graphics — Credit 04

UNIT-I Development of Computer Graphics:

Basic graphics system and standards, Raster scan and random scan, graphics; Continual refresh and storages display, display processors and character generator, Color display techniques, Frame buffer and bit operations, concepts in raster graphics.

UNIT-II Scan Conversion & Filling:

Points, Line and Curves; Scan Conversion; Line drawing algorithms; circle and ellipse generation; Polygon filling; Conic-section generation, Aliasing & Ant-aliasing

UNIT-III Two-dimensional representation:

Basic transformations; Co-ordinate systems; Windowing and Clipping; Segments; Interactive picture-construction techniques; interactive input-output device

UNIT-IV Three-dimensional representation:

3-D representation and transformations; 3-D viewing; Algorithm for 3-D volumes, spline curves and surface; Fractals; Hidden line and surface rendering, and animation, projection.

BCACC13P: Graphics Lab — Credit 02

1. Write a program to implement Bresenham‘s line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).

6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

Reference Books:

1. *Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH*
2. *Computer Graphics, Hearn & Baker, PHI*
3. *Introduction to Computer Graphics, A. Mukherjee, VIKAS*
2. *Fundamentals of Computer Graphics & Multimedia, Mukherjee, PHI*
3. *Computer Graphics, Bhandari& Joshi, EPH*

Core Course (CC) -14 — Credit 06

BCACC14T: Software Engineering and Project Management — Credit 04

UNIT-I:
Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model.

UNIT-II:
System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. [5L] System Design – Problem Partitioning, Top-Down And Bottom-Up design; Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. Coding & Documentation - Documentation.

UNIT-III:
Structured Programming, OO Programming, Information Hiding, Reuse, System Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment. , Validation & Verification Metrics, Monitoring & Control.

UNIT-IV:
Software Project Management – Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.

CASE TOOLS: Concepts, use and application.

BCACC14P: Software Project Management Lab — Credit 02

Sample Projects with SRS:

1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers
2. DTC Route Information: Online information about the bus routes and their frequency and fares
3. Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System

9. Parking Allocation System
10. Wholesale Management System

Reference Books:

1. *Software Engineering: A Practitioner's Approach by R.S. Pressman, McGraw-Hill.*
2. *An Integrated Approach to Software Engineering by P. Jalote, Narosa Publishing House.*
3. *Software Engineering by K.K. Aggarwal and Y. Singh, New Age International Publishers.*
4. *Software Engineering by I. Sommerville, Addison Wesle.*
5. *Software Engineering for Students by D. Bell, Addison-Wesley.*
6. *Fundamentals of Software Engineering by R. Mall, PHI*

Discipline Specific Electives (DSE)

Discipline Specific Electives (DSE) - 01 **Credit 06**

BCADSE1.1 (T+P): Java Programming **Credit 06**

BCADSE1.1T: Java Programming **Credit 04**

UNIT-I Introduction to Java:
Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

UNIT-II Arrays, Strings and I/O:
Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

UNIT-III Object-Oriented Programming Overview:
Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT-IV Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT-V Exception Handling, Threading, Networking and Database Connectivity
Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using

java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

UNIT-VI Applets and Event Handling:

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds.Event Handling Mechanisms, Listener Interfaces, Adapterand Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

BCADSE1.1P: Java Programming Lab **Credit 02**

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and String Buffer classs like set Charat (set Length (), append (), insert (), concat ()and equals ().
9. Write a program to create a class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

23. Write a program to create URL object, create a URL Connection using the open Connection () method and then use it examine the different components of the URL and content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
26. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouse Clicked (), mouse Entered (), mouse Exited (), mouse Pressed, mouse Released () and mouse Dragged ().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main () function.
30. Write a program to demonstrate the use of push buttons.

Reference Books:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley "The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition, Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 1 ,9th Edition, Printice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

OR

BCADSE1.2 (T+P): PHP & .NET **Credit 06**

BCADSE1.2T: PHP & .NET **Credit 04**

Introduction to PHP:

- PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.)
- PHP with other technologies, scope of PHP
- Basic Syntax, PHP variables and constants
- Types of data in PHP , Expressions, scopes of a variable (local, global)
- PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator.
- PHP operator Precedence and associativity

Handling HTML form with PHP:

- Capturing Form Data
- GET and POST form methods
- Dealing with multi value fields
- Redirecting a form after submission

PHP conditional events and Loops:

- PHP IF Else conditional statements (Nested IF and Else)
- Switch case, while ,For and Do While Loop

- Goto , Break ,Continue and exit

PHP Functions:

- Function, Need of Function , declaration and calling of a function
- PHP Function with arguments, Default Arguments in Function
- Function argument with call by value, call by reference
- Scope of Function Global and Local

GUI Environment:

Introduction to graphical user interface (GUI), programming language (procedural, object oriented, event driven), the GUI environment, compiling, debugging, and running the programs.

Controls:

Introduction to controls textboxes, frames, check boxes, option buttons, images, setting borders and styles, the shape control, the line control, working with multiple controls and theirproperties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls.

Operations:

Data types, constants, named & intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data.

Decision Making:

If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not.

Forms Handling:

Multiple forms creating, adding, removing forms in project, hide, show method, load, unload statement, me keyword, referring to objects on a different forms.

BCADSE1.2P: PHP & .NET Lab **Credit 02**

Software Lab Based on PHP:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.
Sample string: 'The quick " " brown fox'
Expected Output: Thequick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

14. Write a simple PHP program to check that emails are valid.
15. WAP to print first n even numbers.
16. $color = array('white', 'green', 'red")
Write a PHP script which will display the colors in the following way :
Output :

- white, green, red,
- green
- red
- white

17. Using switch case and dropdown list display a “Hello” message depending on the language selected in drop down list.
18. Write a PHP program to print Fibonacci series using recursion.
19. Write a PHP script to replace the first 'the' of the following string with 'That'.
Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

Software Lab Based on Visual Basic:
Practical exercises based on concepts listed in theory using VB.
1. Write a VB application to compute the sum of two variables.
2. Write a VB application to compute the factorial of a number n.
3. Write a VB application to compute the Fibonacci series of a number n.
4. Write a VB application to compute the series of prime numbers till number n.
5. Write a VB application to compute the maximum of three numbers.
6. Write a VB application to compute the sum of odd numbers and even numbers in an array of n integers.
7. Write a VB application to compare the strings.
8. Write a VB application to make a calculator.
9. Write a VB application to choose your hobbies from a list.
10. Write a VB application to illustrate the use of color radio button.
11. Write a VB application to illustrate the use of color scroll bar form.
12. Write a VB application to illustrate the use of color scroll bar label text.
13. Write a VB application to illustrate the use of color text box.
14. Write a VB application to show a timer.

Reference Book:

1. *Programming in Visual Basic 6.0 by Julia Case Bradley, Anita C. Millispangh (Tata Mcgraw Hill Edition 2000 (Fourteenth Reprint 2004)*

OR

BCADSE1.3 (T+P): Android Programming **Credit 06**

BCADSE1.3T: Android Programming **Credit 04**

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.
Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.
Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.
User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, and Dialog.
Database: Understanding of SQLite database, connecting with the database.

BCADSE1.3P: Android Programming Lab **Credit 02**

Software Lab Based on Android Programming:
1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the emulator. Also display "Hello World" in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

Reference Book:
1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
Online Reading / Supporting Material:
1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

Discipline Specific Electives (DSE) - 02 **Credit 06**

BCADSE2.1T: Mobile Computing **Credit 06**

Introduction: Introduction to wireless networks and mobile computing – Characteristics, Issues and challenges.
Wireless Transmission: Fundamentals of wireless transmission - Medium Access Control Protocols, Different types of multiple access techniques and their characteristics.
Cellular Communication: Cellular concept, Overview of different Generations.

Mobile: Mobile IP, Mobile transport layer - Mechanisms for improving TCP performances on wireless links, , Overview of Security in mobile environments.
Wireless: Overview of Wireless LAN IEEE 802.11 series, Overview of Bluetooth, Overview of Wireless Sensor Networks.
Wireless application Environments: WAP, WML, Push Architecture, Push/Pull Services Mobile Adhoc Networks – Characteristics, Routing protocols.

Reference Books:

1. Mobile Computing, Raj Kamal, Oxford
2. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
3. Mobile Communications, Jochen Schiller, Pearson Education
4. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.

OR

BCADSE2.2 (T): Cyber Security and cyber Laws **Credit 06**

BCADSE2.2 T: Cyber Security and cyber Laws **Credit 04**

1. Introduction: Security, Attacks, Computer Criminals, Security Services, Security Mechanisms.
2. Cryptography: Substitution ciphers, Transpositions Cipher, Confusion, diffusion, Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates.
3. Program Security: Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks,Covert channels, Control against program.
4. Threats: Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication.
5. Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security.
Security in Networks: Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails
Administrating Security: Security Planning, Risk Analysis, Organisational Security Policy, Physical Security.
Ethical issues in Security: Protecting Programs and data, Information and law.

OR

BCADSE2.3 T: Internet on Things (IoT) **Credit 06**

Introduction to IOT: Defining IOT, Characteristics of IOT, Physical design of IOT, Logical design of IOT, Communication models of APIs, Functional blocks of IOT.

IOT Architecture: M2M, Web of Things, IOT Protocol Architectures, IOT Protocols, The 6LowPAN, SDN

IOT Platform Overview: Hardware Platform: Raspberry pi, ARM Cortexprocessors, Arduino Intel Galileo boards, Introduction to cloud computing and Fog computing.

Developing IOTs: Introduction to Python, IOT tools, developing applications through IOT tools. Implementing IOT concepts with Python.

Case Study & Advanced IOT Application: IOT application in home infrastructures, Building security, Industries, Home applications etc. Use of Big data and Visualization in IOT, Industry 4.0 concepts.

Discipline Specific Electives (DSE) - 03 — Credit 06

BCADSE3.1T: Image Processing & Pattern recognition — Credit 06

UNIT-I: Image definition and its representation, Pixels, Co-ordinate conventions, Image formats (Study of the image matrix), neighbourhood metrics, Sampling and quantization, Types of distance measure (concept only).

UNIT-II Spatial Domain: Image enhancement techniques in spatial domain, Contrast stretching, Histogram Processing, Noise smoothing, Sharpening, Pixel Classification.

UNIT-III Thresholding: Grey level thresholding, global/ local thresholding, Iterative thresholding, Edge detection operators, Region growing, Split/ merge techniques, Image feature/ primitive extraction, Background correction, Color enhancement

UNIT-IV Image restoration: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Restoration from projections, Hough transform, Huffman coding, Segmentation

UNIT-V Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, local processing, Regional processing, and Region-based segmentation.

Reference Books:

1. *R C Gonzalez , R E Woods, Digital Image Processing, 3rd Edition, Pearson Education.2008.*
2. *A K Jain, Fundamentals of Digital image Processing, Prentice Hall of India.1989.*
3. *K R Castleman, Digital Image Processing, Pearson Education.1996*
4. *Schalkoff, Digital Image Processing and Computer Vision, John Wiley and Sons.1989.*
5. *Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.*

OR

BCADSE3.2 T: Cloud Computing — Credit 06

UNIT-I: Overview of Cloud Computing
Definition and essential characteristics of cloud computing; A brief history and evolution of cloud; Key considerations for cloud computing; Key cloud service providers and their services

UNIT-II: Cloud Computing Service and Deployment Models Overview of Cloud Service Models; Infrastructure-as-a-Service; Platform-as-a-Service; Software-as-a-Service; Public Cloud; Private Cloud; Hybrid Cloud

UNIT-III: Components of Cloud Computing Overview of Cloud Infrastructure; Virtualization and Virtual Machines ; Types of Virtual Machines; Bare Metal Servers; Secure Cloud Networking.

UNIT IV: Cloud Computing Storage and Content Delivery Networks Basics of Cloud Storage; File Storage; Block Storage; Object Storage Overview Object Storage - Tiers and APIs; Content Delivery Networks

UNIT V: Emergent Trends, Cloud Native, DevOps, and Application Modernization
Hybrid Multi-cloud; Microservices; Serverless Computing; Cloud Native DevOps on the Cloud; Application Modernization

UNIT VI: Cloud Security, Case Studies- What is Cloud Security; Identity and Access Management; Cloud Encryption Cloud Monitoring Basics and Benefits; Case Studies in GOOGLE CLOUD

Reference Books:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

OR

BCADSE3.3 T: Data Mining **Credit 06**

UNIT– I Introduction to Data Mining:
Introduction, what is Data Mining, Types of Data Mining, Advantages of Data Mining, disadvantages of Data Mining, Data Mining Applications, Challenges, Data Mining Techniques, KDD, Data Mining Tasks, Data Pre-processing, Data Cleaning, Discretization, Measures of Similarity and Dissimilarity-Basics.

UNIT– II Association Rules:
Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT–III Classification:
General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision Trees-Decision tree Construction, Algorithm for Decision tree Induction; Naive-Bayes Classifier; K- Nearest neighbour classification-Algorithm and Characteristics.

UNIT–IV Clustering:
Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering-K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative ,Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection.

UNIT–V Web and Text Mining:
Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

Reference Books:

1. Data Mining - Concepts and Techniques 3rd Edition Jiawei Han, Micheline Kamber, Jain Pei
2. Data Mining - Introductory and Advanced Topics Dunham Margaret H.
3. Data Mining TechniquesPujari A. K.

Discipline Specific Electives (DSE) - 04 **Credit 06**

BCADSE4P: Project **Credit 06**

1) Project dissertation
2) Grand Viva
3) Seminar Presentation

Skill Enhancement Course (SEC)

Skill Enhancement Course (SEC)- 01 **Credit 02**

BCASEC1.1 (T+P): Web Designing **Credits 02**

BCASEC1.1 (T): Web Designing **Credits 01**

UNIT-I: Introduction to Internet Basic- The Basic of the Internet, Concepts of Domain, IP Addressing, Resolving Domain Names, Overview of TCP/IP and its Services, WWW.

UNIT-II: Designing Pages with HTML-Introduction to HTML, Essential Tags, Deprecated Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchorsand URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and e-Mailing, Creating Table, Frame, Form and Style Sheet.

UNIT-III: DHTML-Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

UNIT-IV: Java Script-Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

UNIT-V: Front Page-Front Page Basics , Web Terminologies, Phases of Planning and Building Web Sites, The FTP, HTTP and WPP, Features, Front Page Views, Adding Pictures, Backgrounds, Links, Relating Front Page to DHTML.

BCASEC1.1 (P): Web Designing Lab **Credits 01**

Practical on HTML

1. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
2. Create your class time table using table tag.
3. Create user Student feedback form (use textbox, text area, checkbox, radio, button, select box etc.)
4. Create a web page using frame. Divide the page into two parts with Navigation links on left hand side of page (width=20%) and content page on right hand side of page (width = 80%). On clicking the

navigation Links corresponding content must be shown on the right hand side.
5. Write html code to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.
6. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.

Practical on CSS
7. Design a web page of your home town with an attractive background color, text, color, an Image, font etc. (use internal CSS).
8. Use Inline CSS to format your resume that you created.
9. Use External CSS to format your class timetable as you created.
10. Use External, Internal, and Inline CSS to format college web page that you created.

Practical on JavaScript
11. Develop a JavaScript to display todays date.
12. Develop simple calculator for addition, subtraction, multiplication and division operation using JavaScript
13. Create HTML Page with JavaScript which takes Integer number as input and tells whether the number is ODD or EVEN.
14. Create HTML Page that contains form with fields Name, Email, Mobile No, Gender, Favourite Colour and a button now write a JavaScript code to combine and display the information in text box when the button is clicked.

Practical on PHP
15. Server side scripts and validation arrays for a simple log-in page of website.

Reference Books:

1. *HTML Black Book-Steven Holzner-Dreamtech Press.*
2. *HTML, Java Script, DHTML, PERL, CGI-Evan Bayross-BPB.*

OR

BCASEC1.2 (T+P): XML Programming **Credits 02**

BCASEC1.2 (T): XML Programming **Credits 01**

Introduction: Understanding Mark-up Languages, Introduction to XML and its Goals.
XML Basics: XML Structure and Syntax, Document classes and Rules.
Other XML Concepts: Scripting XML, XML as Data, Linking with XML.
XML with Style: XSL-Style Sheet Basics, XSL basics, XSL style sheets.

BCASEC1.2 (P): Software Lab Based on XML **Credits 01**

Exercise 1: Information Structure
In this exercise, student will practice identifying the structure of an information object. For the sample document provided below:
Label the information structures you see, including containing structures.

Draw a tree representation of the structure.

Exercise 2: Deconstructing an XML Document
In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise 1. For the sample XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:
<book>
<coverInfo>
<title>The XML Handbook</title>
<author>Charles F. Gold farb</author>
<author>Paul Prescod</author>
<edition>Second</edition
<description>The definitive XML resource: applications, products, and technologies. Revised and expanded— over600 new pages.
</description>
</coverInfo>
</book>

Exercise 3: Creating XML Markup
In this exercise, create some XML markup based on the tree representation from Exercise#1 above, and the content from the original sample document.

Exercise 4: Well-Formedness
This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any One answers.
<list><title>The first list</title><item>An item</list>
<item>An item</item><item>Another item</item>
<para>Bathing a cat is a <emph>relatively</emph>easy task as long as the cat is willing.</para>
<bibl><title>How to Bathe a Cat<author></title>Merlin Bauer<author></bibl>

Exercise 5: Well-Formedness
This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.
<PROCEDURE><TITLE How to Bath a Cat</TITLE>
<OVERVIEW>
This procedure tells you how to bathe a cat. <WARNING></OVERVIEW>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start.</WARNING><EQUIPEMENT><ITEM>HockeyMask<ITEM>PaddedFull-bodyKevlarArmor</ITEM><ITEM>Tubfullofwarmwater</ITEM><ITEM>Towels</ITEM><ITEM>FirstAidkit</ITEM><ITEM>CatShampoo</ITEM><EQUIPMENT><INSTRUCTIONS><STEP>

Locate the cat, who by no wishiding under the bed.</STEP><STEP>Place the cat in the tub ofwater.</STEP><ITEM> Using the First Aid kit, repair the damage to your head and arms.</STEP> <STEP>Place the cat back in the tub and hold it down.</STEP><STEP>Wash it really ast, then make an effort to dry it with the towels.</STEP><STEP>Decide not to do this again.</STEP> </INSTRUCTIONS>

Reference Books:

1. *XML in action web technology by William J. Pardi*
2. *Step by Step XML by Michael J. Young*

OR

BCASEC1.3 (T+P): JavaScript with Node JS /Angular JS **Credit 02**

BCASEC1.3 (T): JavaScript with Node JS /Angular JS **Credit 01**

Introduction to Java Script: JavaScript Statements, Keywords, Functions, JavaScript Programs, Operators, Function Parameters, Function Return Types, Data Types, Primitive Types.
Working with Objects:Object Oriented Programming, Object Creation, Adding Properties of Objects, Adding Methods of Objects, JavaScript Conditional Statements, JavaScript Loops & Iteration, Enumerating Properties, Callbacks, JSON.
Introduction to Node JS: What is Node JS, Nodejs Process Mode, Advantages of Node JS, Traditional Web Server Model.
Setup Development Environment: Install Nodejs on Windows, Working in REPL, Node JS Console.
Node JS Modules: Functions, Buffer, Module, Core Modules, Local Modules, Modules Types, Modules Exports.
Node Package Manager: What is NPM, Installing Packages Locally, Adding dependency in package json, installing package globally, Updating packages.
Creating Web Server: Creating Web Server, Handling http requests, Sending Requests.
File System: Fs.read File, Writing a File, Writing a file asynchronously, Opening a file, Deleting a file, Other IO Operations. Debugging Node JS Application: Core Node JS Debugger.
Events:Event Emitter class, Returning event emitter, Inheriting Events.
Express JS: Configuring Routes, Working with Express.
Serving Static Resources:Serving Static Files, Working with Middle Ware.
Database Connectivity:Connecting String, Configuring, Working with Select Command, Updating Records, Deleting Records.
Angular JS Basics: What is Angular JS? Why Angular JS?, Features of Angular JS, Model-View-Controller, Why MVC matters, MVC The Angular JS way, My First Angular JS app.
Angular Expressions: All about Angular Expressions, How to use expressions, Angular vs JavaScript.
Filters: Built-In Filters, Using Angular JS Filters, Creating Custom Filters.
Directives: Introduction to Directives, Directive Lifecycle, Using Angular JS built-in directives, Binding controls to data,Matching directives, Creating a custom directive.
Controllers: Role of a Controller, Controllers & Modules, Attaching Properties and functions to scope, Nested Controllers, Using Filters in Controllers, Controllers in External Files.
Angular JS Modules: Introduction to Angular JS Modules, Bootstrapping Angular JS.
Angular JS Forms: Working with Angular Forms, Model Binding, Form Controller, Validating Angular Forms, Forms Events, UpdatingModels with a Twist, error object.
Scope: What is scope, Scope Life cycle, Two-way data binding, Scope Inheritance, Scope

Inheritance, Scope &Controllers, Scope & Directives, apply and watch, Root scope, Scope Broadcasting, Scope Events.
Dependency Injection & Services:What is Dependency Injection, Using Dependency Injection, What are services, Creating Services, Factory, Service &Provider, Using Angular JS built in services.
Single Page Application (SPA):What is SPA, Pros and Cons of SPA, Installing the ngRoute module, Configure routes, Passing Parameters, Changing location, Resolving promises, Creating a Single Page Apps.
Angular JS Animation: Animate Module, CSS Transforms, CSS Transitions, Applying Animations.

BCASEC1.3 (P): JavaScript with Node JS /Angular JS **Credit 01**

Sample Practical Questions:

1. Write a JavaScript program to convert a temperature from Celsius to Fahrenheit and vice -versa.
2. Write a JavaScript program to check whether a given number is prime or not.
3. Write a JavaScript program to determine whether a given year is a leap year or not.
4. Write a JavaScript program to print Fibonacci series up to a given limit.
5. Write a JavaScript program to convert a given decimal number to its binary equivalent.
6. Create a web server using Node.js that can handle http request and response.
7. Write a program in Node.js that can write to a file asynchronously.
8. Write an event emitter class in Node.js and use it in the program.
9. Write a Node.js program that can connect to a database and can select, update, and delete records from the database.
10. Create a simple web server using Express framework that can handle http request and response.
11. Write a simple program in Angular JS that shows the concept of services and dependency injection.
12. Write an Angular JS program that shows data flows inside a form using any type of form models.
13. Create a single page application using Angular JS.
14. Create an animated web application using Angular JS.

Skill Enhancement Course (SEC)- 02 **Credit 02**

BCASEC2.1 (T+P): R-programming **Credit 02**

BCASEC2.1T: R-programming **Credit 01**

Introduction: Overview and History of R, Getting Help, Data Types, Subsetting, Vectorized Operations, Reading and Writing Data.
Control Structures, Functions, lapply, tapply, split, mapply, apply, Coding Standards. Scoping Rules, Debugging Tools, Simulation, R Profiler.

BCASEC2.1P: R-programming Lab **Credit 01**

1. Write a program that prints ‘Hello World’ to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.

6. Write a function that tests whether a string is a palindrome.
7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search.
9. Implement binary search.
10. Implement matrices addition, subtraction and Multiplication

Reference Book:

1. *W. N. Venables, D. M. Smith, An Introduction to R, R-core team,2015*

OR

BCASEC2.2 (T+P): Python Programming **Credit 02**

BCASEC2.2T: Python Programming **Credit 01**

UNIT-I Overview of Programming: Structure of a Python Program, Elements of Python

UNIT-II Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

UNIT-III Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

BCASEC2.2P: Python Programming Lab **Credit 01**

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.
2. Write a Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:

Grade A: Percentage >=80
Grade B: Percentage>=70 and <80
Grade C: Percentage>=60 and <70
Grade D: Percentage>=40 and <60
Grade E: Percentage<40

3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Write a Program to display the first n terms of Fibonacci series.
5. Write a Program to find factorial of the given number.
6. Write a Program to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
7. Write a Program to calculate the sum and product of two compatible matrices.

Reference Books:

1. *T. Budd, Exploring Python, TMH, 1st Ed, 2011*
2. *Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012*

OR

BCASEC2.3 (T+P): Programming with MATLAB **Credit 02**

BCASEC2.3 (T): Programming with MATLAB **Credit 01**

MATLAB Basics: The MATLAB environment - Basic computer programming - Variables and constants, operators and simple calculations - Formulas and functions - MATLAB toolboxes
Matrices and vectors: Matrix and linear algebra review - Vectors and matrices in MATLAB - Matrix operations and functions in MATLAB
Computer programming: Algorithms and structures - MATLAB scripts and functions (m-files) - Simple sequential algorithms -Control structures
MATLAB programming and Numerical Simulations: Matlab Programming. Reading and writing data, file handling - Personalized functions - Toolbox structure - MATLAB graphic functions. Numerical simulations. Numerical methods and simulations -Random number generation – Monte carlo methods

BCASEC2.3 (P): Programming in MATLAB Lab **Credit 01**

1. Write a program to assign the following expressions to a variable A and then to print out the value of A.
a) (3+4)/(5+6)
b) 2π2
c) √2
d) (0.0000123 + 5.67 × 10−3) × 0.4567 × 10−4

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32.
Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:
a. 2, 4, 6, 8, 10
b. 1/2, 1, 3/2, 2, 5/2
c. 1, 1/2, 1/3, 1/4, 1/5
d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2, 0.5, 1.3]; while the numbers of each product are [3, 2, 1, 5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The identity matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,...,√Nth entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:

a. FtoC(96)
b. lookfor Fahrenheit
c. help FtoC

10. Write a program to input 2 strings from the user and to print out

a. the concatenation of the two strings with a space between them,
b. a line of asterisks the same length as the concatenated strings, and
c. the reversed concatenation.

Reference Books:

1. *Hanselman Mastering Matlab, Pearson*
2. *RudrapratapMatlab, Oxford*
3. *Bansal , Matlab, Pearson*
4. *Navas Lab Primer through Matlab, PHI*

Generic Electives (GE)

Generic Electives (GE)- 01 **Credit 06**

BCAGE1.1T: Basic Mathematics **Credit- 06**

Unit-I: Logarithm and Indices

- Logarithm: Common Logarithm, Characteristics and mantissa, Antilogarithm
- Indices: Concepts, Properties, Laws

Unit-II: Complex Numbers

- Introduction Operations on Complex numbers: Addition, subtraction, multiplication, division, conjugate, modulus, reciprocal
- De Moiveor's Theorem
- n^{th} roots of complex number: Basic properties, Square roots, Cube roots of unity

Unit-III: Matrices and Determinants

- Types of matrices, Properties of matrix, solving non homogeneous equations by Matrix inverse method
- Determinants: Definition and order, Types, fundamental concepts, cramer's rule

Unit-IV:

- **Series**: Arithmetic Progression, Geometric Progression, Harmonic Progression
- **Limits & Continuity**: Introduction, Ordered pairs, Cartesian product, Relation, Function type, Continuity of a function

- **Vectors**: Vectors in plane Cartesian coordinates Vectors in space, Dot products, Cross products

Suggested Readings:

1) *Elementary Engineering Mathematics -B S Grewal*
2) *Calculus – Thomas Finney*
3) *Mathematical Techniques – Maria Ester RebeloAbranches*
4) *Mathematics for computer- Neeta Mazumda*

OR

BCAGE1.2T: Numerical Methods **Credit- 06**

1) **Introduction:** Introduction to various kinds of errors.
2) **Interpolation:** Newton forward & backward, Lagrange.
3) **Numerical Integration:** Trapezoidal Rule, Simpson's 1 /3 Rule, Simpson's 3 /8 Rule.
4) **Numerical solution of a system of linear equation:** Gauss elimination, Gasuss Jacobi, Gauss Seidel.
5) **Solutions of Algebraic Equation:** Bisection, Regula-falsi, Newton Raphson.
6) **Solutions of Ordinary Differential Equation:** Taylor Series, Euler's method, RungeKutta.

Suggested Readings:

1. *Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.*
2. *Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.*
3. *Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.*

Generic Electives (GE)- 02 — Credit 06

BCAGE2.1T: Business Accounting **Credit- 06**

Unit-I: Introduction to Accounting

- Definition, scope of accounting
- Accounting as financial information system
- Accounting Principles
- Accounting Standards

Unit-II: Accounting procedure

- Transaction/event, Classification of accounts voucher
- Preparation of vouchers
- Journal/ subsidiary books
- Types of subsidiary books Ledger accounts and trial balance

Unit-III: Depreciation accounting, Capital & Revenue

- Expenditure & receipts
- Methods of depreciations
    - Straight-line method
    - Reducing method
    - Sinking fund method
    - Annuity Method
    - Machine hour rate method

- Depletion method

Unit-IV: Company Final Accounts

- Preparation of trading a/c
- Profit & Loss a/c
- Balance sheet
- Accounting for issue of shares

Suggested Reading:

1) *Advanced Accounting Vol-I, S.BN. Maheshwari*

OR

BCAGE2.2T: E-Business Infrastructure and Management **Credit- 06**

Unit-I: E- Business / E- Commerce

- E- Business/ E-Commerce and the Emerging Digital Firm:Internet Technology and The Digital Firm, New Business Models & Value Propositions
- E- Commerce:Categories of Electronic Commerce, Customer – Centered Retailing, E – Commerce Payment Systems.
- Windows on Management-Customer Communities, B2B Electronic Commerce, Efficiencies and Relationships, Window on Organization-Covisint: The Vision and The Reality,

Unit-II: Digital / Electronic Markets & Solutions

Electronic Markets Defined, Functions of Electronic Markets, How Do Electronic Markets Differ From Traditional Market?, Effects Of Electronic Markets, Electronic Market Success Factors, E-Market Technology Solutions.

Unit-III: E-Business technological Infrastructure and Management

- Basic Infrastructure, Web Technologies and application, Collaborative Technology, the role of enterprise Information Systems in e-Business.
- The new IT Infrastructure for the Digital Firm: Enterprise Networking and Internetworking, Standards and connectivity for the Digital Integration, Technology and Business Standards.

Unit-IV: Support Technology for Electronic Business

- Web Server and Electronic Commerce servers, How to Integrate the wireless Web into Business strategy, Customer Tracking and Personalization Tools, Web content Management Tools, Web site Performance Monitoring Tools, Web Hosting Services, The Challenge of Managing the IT Infrastructure and Solutions.

Suggested Readings:

1) *Michael P. Papazoglou , Pieter M.A. Ribbers, E-Business Organizational and Technical Foundations, Wiley India Edition.*
2) *Waman S Jawadekar, Management Information Systems- A Digital-Firm perspective ,4th edition,TMH*
3) *Kenneth C Laudon, Jane P.Laudon Managing The Digital Firm , , Pearson Education, Eighth Edition*

<u>Generic Electives (GE)- 03</u> **Credit 06**

BCAGE3.1T: Entrepreneurship Development **Credit- 06**

Unit-I: Entrepreneurship development

- Definition, role of small scale industries in the national economy.

- Characteristics and types of small scale industries; demand-based and resources- based ancillaries.
- Government policy(s) for small scale industries; stages in starting a small scale industry.

Unit-II: Project identification, planning and control

- Assessment of viability, formulation, evaluation, financing.
- Field-study, preparation of project report, demand analysis, material balance and output methods, and benefit cost analysis.
- The financial functions, cost of capital approach in project planning and control
- Laws concerning entrepreneurship.
- Role of various national and state agencies which render assistance to small scale industries.

Unit-III: Case study

- Case study of starts-up firms on IT/software development/Mobile applications.
- Special reference on IT Parks, Industrial Park etc.
- Successful start-up ventures with indigenous recourses.

Suggested Readings:

1. *Bhattacharya S.N- Entrepreneurship Development in India & the South East countries – Metropolitan Book Comp.*
2. *Desai Arvind – Environment & Entrepreneurship – New Delhi, Ashish Publishing House - New Delhi*
3. *Dr. DeshpandeManohar – Entrepreneurship of Small Scale Industries – Deep & Deep Publication, New Delhi*
4. *Drucker Peter – Innovation & Entrepreneurship Affiliated East-West Press Pvt. Ltd.,- New Delhi*
5. *Khan M.A - Entrepreneurial Development Programmes in India – Kanishka Publishing House, New Delhi.*

OR

BCAGE3.2T: IT in Management **Credit- 06**

Unit-I: Information System and business applications

- EInformation system Infrastructure and architecture
- Role of Information systems in Business Today
- Software and hardware platform to Improve Business Performance,
- Roles of IT in E-commerce, M-commerce,

Unit-II: Impact of IT on organization

Impact of Information Technology on organization - Concept of IT Enabled Modern Organizations, Strategic Issues of Information Technology in IT companies. Creating and Sustaining a Competitive Edge, Integrating Technology with the Business Environment, Managing Information Technology.

Unit-III: IT for Governance and Societal Implications

- Governance concept, IT Governance, Internet governance, E-governance and internal IT processes.
- IT application in Administrative control and Social Responsibilities

Suggested Readings:

1. *Henry C. Lucas, Information technology for Management, McGraw Hill*
2. *Publications, 7th Edition*
3. *Information Technology For Management – Transforming Organizations in Digital Economy by EFRAIM Turban, Dorothy Leidner (WILEY Student Edition)*
4. *Information Technology For Management by B. MuthuKumaran (OXFORD University Press)*

5. *Information Technology For Management by Dr. CH. Seetha Ram.*
6. *Technology Acquisition ,A guided approach to technology acquisition and protection decision by Mortara and Ford.*
7. *Business Intelligence: Practices, Technologies, and Management- RajivSabherwal, Irma Becerra-Fernandez*
8. *Managing and using Information Systems, K E Pearlson, C S Saunders, Wiley India*

Generic Electives (GE)- 04 — Credit 06

BCAGE4.1T: Information Security — Credit- 06

Unit-I: Authentication

Types of Authentication- Password-based authentication, address-based authentication, cryptographic authentication, smart cards, biometrics, mutual authentications, reflection attacks, Message Digest: MD5, SHA, MAC, HMAC, Digital Certificate process, KDC-working, multi domain KDC, Kerberos.

Unit-II: Internet Security

Transport Layer Security: SSL, SET Email Security: PGP, S/MIME, Comparison, IP security: IPSec, Web Services Security: XML, SOAP, WSDL and UDDI, SSl, WSSecurity, SAML, Ws-Trust, WS-Security Policy.

Unit-III: Intrusion Prevention and Detection

Introduction, Intrusion Detection Systems , Prevention versus Detection, Types of Intrusion Detection systems, DOS attacks, Flooding Attacks, DdoS Attack Prevention/Detection, Defences Against Denial-of-Service Attacks, Malware Detection

Unit-IV: Database Security

The need for Database Security, Database Access Control, Inference, Statistical Databases, Database Encryption,

Unit-V: Firewalls

Characteristics, Packet filters, Application Level Gateways, Circuit Level Gateways, Firewall Architectures, Trusted System

Suggested Readings:

1. *AtulKahate, Cryptography and Network Security, McGraw Hill*
2. *Bernard Menezes , Network Security sand Cryptography, CENGAGE Learning*
3. *V. K. Pachghare , Cryptography and Information Security, PHI Learning Pvt. Ltd.*

OR

BCAGE4.2T: Digital Marketing Fundamentals — Credit- 06

Unit-I: Fundamentals of Digital Marketing

Marketing in the digital world; Integrated marketing- The Phygital; Global trends in Digital Marketing; Digital channels- Paid, Owned and Earn; Fundamentals on the primary asset- your website; Careers in digital marketing; Skill development in digital marketing

Unit-II: AdWords Fundamentals

Understanding Pay-per-click Advertisement; Significance and evolution of AdWords in PPC Bing Ads V/s Google Ads- overview; AdWords Certification- Overview, Benefits and Preparation; Google Ad Networks; Different Ad Formats; Keywords - significance and planning; Using Keyword Planner and other tools; Keyword matches and their usage; Campaign Structure and Organisation Quality, Rank and Relevance of Ads.

Unit-III: Search & Display Advertising with Adwords

Search with Adwords

Keywords - planning, matching and combination; Specifications of an Ad and how to put it to good use; Managing Invalid Clicks; Ad extensions and usage; Dynamic search ads; Landing page - your virtual front; Campaign Experiment; Opportunities Tab; AdWords APIs; AdWords editor- Benefits and usage; Managing multiple accounts

Display with Adwords

Google Display Network and Partnerships; Double Click Ad Exchange and AdSense Campaign Creation and Structuring for display; Keyword and targeting through display network; Campaign Metrics, Analysis and optimization

Unit-III SEO Advance Concepts

Major Google updates and their implications on SEO; Using Search Console for SEO; KPIs of SEO; Tools for SEO; Moz SEO Products; SEMrushCompetitive Research and Business Intelligence Software; Competition Analysis for SEO; Overall planning for SEO; Understanding nuances of local and international SEO; Accelerated mobile pages and SEO

Suggested Readings:

1. *Dave Chaffey & Fiona Ellis-Chadwick, Digital Marketing: Strategy, Implementation and Practice, Pearson Education*
2. *Ekaterina Walter, The Power of Visual Storytelling, McGraw-Hill Education*
3. *Ben Hunt, Convert!: Designing Websites For Traffic and Conversions, John Wiley & Sons*
4. *Lon Safko, The Social Media Bible: Tactics, Tools, & Strategies for Business Success, Brilliance Audio; Unabridged edition*
5. *Pam Didner, Global Content Marketing, McGraw-Hill Education*
6. *Joe Pulizzi, Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses, McGraw-Hill Education*

Ability Enhancement Compulsory Course (AECC)

Ability Enhancement Compulsory Course (AECC) - 01 **Credits: 02**

BCAAECC (T): Communicative English **Credits: 02**

1. **Communication Skills**
   a) Theory and Types of Communication
   b) Verbal and Non-verbal Communication
   c) Barriers and Strategies
   d) Workplace Communication
   e) Telephone Communication

2. **Speaking Skills**
   a) Inter-personal Communication
   b) Group Discussion
   c) Interview

3. **Reading Skills**
   a) Close Reading
   b) Comprehension
   c) Summary
   d) Paraphrasing
   e) Interpreting Graphs and Charts

4. **Writing Skills**
   a) Report Writing
   b) Making notes
   c) Letter writing
   d) Business Communication

Ability Enhancement Compulsory Course (AECC) - 02 — Credits: 04

BCAENVS (T): Environmental Science — **Credits: 04**

Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem

Unit 3: Natural Resources: Renewable and Non--renewable Resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Joint forest management.
- Water: Use and over---exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state).
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4: Biodiversity and Conservation

- Levels of biological diversity : genetic, species and ecosystem diversity; Bio- geographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega---biodiversity nation; Endangered and endemic species of India.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man---wildlife conflicts, biological invasions; Conservation of biodiversity: In---situ and Ex---situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.
- Noise pollution

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.
- Environmental policy and gender issues.

Unit 7: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi)

Unit 8: Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site--- Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems--- pond, river, Delhi Ridge, etc.
- Disaster management.
- Coastal ecosystem

Suggested Readings:

1. *Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt*
2. *Gadgil, M., & Guha, R. 1993. This Fissured Land:An Ecological History of India. Univ. of California Press*
3. *Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge*
4. *Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press*
5. *Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006*

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