

UNIVERSITY SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

Department of Information Technology

COURSE STRUCTURE

Course: Bachelor of Computer Applications

BATCH: 2026-29



**GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR,
GREATER NOIDA, UP, INDIA**

COURSE STRUCTURE**SEMESTER I**

S.No	Course Code	Course Name	Teaching Scheme			Credits	Types
			L	T	P		
1.	BCA101	Computer Fundamentals and Programming in C	3	0	0	3	CC
2.	BCA103	Artificial Intelligence	2	0	0	2	CC
3.	BCA105	Web Technology	3	0	0	3	CC
4.	BCA107	Logical Organization of Computer	3	0	0	3	CC
5.	MA151	Mathematical Foundation of Computer Science-I	3	1	0	4	GE
6.	EN101	English Proficiency	2	0	0	2	AEC/SEC
7.	BCA181	C Programming Lab	0	0	4	2	CC-L/SEC-L
8.	BCA183	Web Technology Lab-1	0	0	4	2	CC-L/SEC-L
9.	ICTV1	<i>Career Skills</i>	2	0	0	2	VAC
10.	GP	General Proficiency	Non Credit				
Total Hours and Credits			18	1	8	23	

*CC: Core Course from IT, GE: General Elective from other Department/School,

VAC: Value Added Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lab

SEMESTER II

S.No	Course Code	Course Name	Teaching Scheme			Credits	Types
			L	T	P		
1.	BCA102	Data Structures	3	0	0	3	CC
2.	BCA104	Data Science and Analytics	3	0	0	3	CC
3.	MA152	Mathematical Foundation of Computer Science-II	3	1	0	4	GE
4.	ES101	Environmental Studies	3	1	0	4	OE/VAC
5.	BCA106	Digital Marketing	2	0	0	2	AEC/SEC
6.	BCA182	Data Structures Lab	0	0	4	2	CC-L/SEC-L
7.	BCA184	Data Science and Analytics Lab	0	0	4	2	CC-L/SEC-L
8.	BCA186	Web Technology Lab 2	0	0	4	2	CC-L/SEC-L
9.	GP	General Proficiency	Non Credit				
Total Hours and Credits			14	2	12	22	

*OE: Open Electives from other Department/School

SEMESTER I

COMPUTER FUNDAMENTALS AND PROGRAMMING IN C			
Course Code:	BCA 101	Course Credits:	3
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester	1U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. Knowledge of basics of computers			
2. A general understanding of I/O Devices			
3. Understanding of operating system including memory management			
4. Understanding of computer generations and languages			
5. Understanding of coding fundamentals			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Understanding the fundamental concepts of computers.			
2. Understanding the concept of Computer Organization			
3. Understanding the Concept of Memory and data processing			
4. Understanding of Analog and Digital Computers			
5. Understanding the basic terminologies used in computer programming.			

Unit I: Basics of Computer

Computer System Characterization & Capabilities. Computer Hardware & Software, I/O Devices, Types of Software's. Types of Computer: Analog Digital & Hybrid, Computer Generations of Computers, Introduction to PC, Types of PC Systems.

Unit II: Computer Organization:

Operating System, Booting, Functions of OS, Types of OS. Storage Fundamentals, Primary and Secondary Storage, Data Storage and Retrieval Methods, Tape Storage and Retrieval Methods, Characteristics & Limitation, Direct Access Storage for Microcomputers- Hard Disks, Disk Cartridge, Direct Access Storage Devices For Large Computer Systems, Mass Storage Systems and Optical Disks CD ROM.

Unit III: Data Processing:

Data, Data Processing System, Storing Data, Processing Data. Central Processing Unit: The Microprocessor Control Unit, A L. U., Register, Buses Main Memory, Main Memory (Ram) For Microcomputers, Read-Only Memory. Computer Output: Output Fundamentals, Hardcopy Output

Devices, Impact Printers, Non-Impact Printer's Plotters, Computer Output Microfilm/Microfiche (Com) System, Softcopy Output Devices, Cathodes Ray Tube And Flat Screen Technologies

Unit IV: Computer & System Software:

System Software Versus Application Software, Type of System. Software's, Introduction Types of Operating System Programs, Booting Loader, Diagnostic Tests, Operating System Executive, BIOS, Utility Programs, File Maintenance, Language Processors, Assembler, Compiler and Interpreter. Applications Software: Microcomputer Software, Interacting With System, Trends In PC Software, Types of Application Software, Difference Between Program And Packages.

Unit V: Computer Languages:

Computer Programming Languages, Types of Programming Languages, Generations of Programming Languages Development Low Level Versus High Level Language, Machine Code (Or Machine Language) Advantages of Using Machine Code, Disadvantages of Using Machine Code, Assembly Language, Assembler, Advantages of Assemble Languages, Limitations of Assembly Languages. The Need For Assembly Languages. High Level Languages: Development of Higher Level Languages, Machine Independence and Portability, Advantages of High Level Languages, Problem Oriented Languages. Procedure Oriented Languages, Compilers And Interpreters, Examples of Some High Level Languages, Object Oriented Programming. Fourth Generation Languages, Difference Between a Higher Level & Fourth Generation Languages, Merits And Demerits of 4 Gls, Type of 4 Gls. The Future of 4-Gls, Few Popular 4-Gls, Application Program Generators (APGS).

Text Books:

1. William Stallings, "Computer Organization and Architecture", PHI

Reference Books:

1. Computer Fundamentals By P.K. Sinha
2. Fundamental of Computers - By V.Rajaraman B.P.B. Publications
3. Fundamental of Computers - By P.K. Sinha
4. Unix Concepts and Application - By Sumitabha Das
5. MS-office 2000(For Windows) - By Steve Sagman
6. Computer Today by S.K.Bansandra: Galgotia publication Pvt.Ltd. New Delhi.

ARTIFICIAL INTELLIGENCE			
Course Code:	BCA103	Course Credits:	2
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No. of Lectures + Tutorials (Hrs/Week):	02 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	30 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. To introduce students to artificial intelligence			
2. To introduce the concepts of artificial intelligence to students			
3. To familiarize students with flow of artificial intelligence projects			
4. To familiarize students with different domains and application areas of artificial intelligence			
5. To enable students in implementation of artificial intelligence projects			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Understand the artificial intelligence evolution			
2. Understand the significant concepts of artificial intelligence			
3. Understand the flow of artificial intelligence projects			
4. Aware of application areas of artificial intelligence			
5. Implement artificial intelligence projects			

UNIT I Introduction

Introduction to AI, Components of AI, Goals of AI, Types of AI, History of AI, Turing Test in AI, Advantages and Disadvantages of AI, Intelligence, Intelligent System, Role of IS, Comparison of various IS, Weak AI and Strong AI, Mind Body Problem in AI, Chinese Room Experiment in AI, Parallel and Distributed AI.

UNIT II Agents in AI

Intelligent Agents, Types of AI Agents, Simple Reflex Agent, Model-based reflex agent, Goal-based agents, Utility-based agent, Learning agent, Structure of an AI Agent, Agent Environment in AI, Examples of Agents, Knowledge Engineering, Knowledge Based System, Knowledge Engineering Techniques, Knowledge Engineering Principles, Knowledge Engineering Methodology.

UNIT III Searching Techniques and AI problems

Searching in AI, Search Algorithm Terminologies, Properties of Search Algorithms, Breadth-first search, Depth-first search, Best First Search, Tic-Tac Toe Problem, Water Jug problem, Chess Problem, Tower of Hanoi problem, Travelling Salesman problem, Monkey and Banana Problem, Magic Square.

UNIT IV Knowledge Representation

Knowledge Representation Definition, Declarative Knowledge, Procedural knowledge, Meta Knowledge, Heuristic Knowledge, Structural Knowledge, Inheritable Knowledge, Inferential Knowledge, Relational Knowledge, Explicit Knowledge, Tacit Knowledge, Uncertain

Knowledge, Knowledge Storage, Relation between Knowledge and Intelligence, AI knowledge cycle.

UNIT V AI Techniques and applications

Introduction to Machine Learning, Introduction to Deep Learning, Introduction to Expert system, Introduction to Natural Language Processing, AI in future, AI in social Media, AI in Entertainment and education, AI in drones, AI in Automated Computer support, AI in personalized shopping experience, AI in Finance, AI in smart Cars, AI in travel and navigation,

AI in smart home devices, AI in security and surveillance, Ai in education, AI in health care, AI in E commerce.

Text Books:

1. Artificial Intelligence, Elaine Reich: Tata Mcgraw Hill publishing house, 2008.
2. Artificial Intelligence, Ela Kumar, IK Publishing.
3. Artificial Intelligence, Peterson, TataMcGraw Hill, 2008.

References Books:

4. Artificial Intelligence, Russel and Norvig, Pearson Printice Hall Publication, 2006.
5. Artificial Intelligence, Winston, PHI publication, 2006.
6. Artificial Intelligence- A modern approach (3rd Edition) By Stuart Russell & Peter Norvig.
7. Artificial Intelligence: The Basics By Kevin Warwick

WEB TECHNOLOGY			
Course Code:	BCA105	Course Credits:	3
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. Become familiar with basic Overview of Internet and Web technology.			
2. Become familiar with Web Designing.			
3. Become Familiar with the Browsing tools and technologies.			
4. Understanding JavaScript and its significance for Internet and web technology.			
5. Understanding of XML and its functionalities			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Understanding basics of Internet and web technology.			
2. Understanding the role and significance of Internet and web technology			
3. Applying internet technology in web technology.			
4. Designing internet applications using different web languages			

UNIT I OVERVIEW OF INTERNET AND WEB

Introduction to Internet, history of Internet and web, Internet services and accessibility, uses of the Internet, Internet standards, Internet protocols- IP, TCP,UDP and host names, web server, proxy server, fast ready connections on the web, web browsers, Netscape communication suite, Microsoft Internet explorer, firewalls, data security.

UNIT II WEB DESIGN

Key issues in web site design, introduction to HT.ML, SGML- DID, DID elements, attributes, outline of an HTML document, head section- prologue, link, base, meta, script, style, body section- headers, paragraphs, text formatting, linking, internal linking, embedding images, lists, tables, frames, other special tags and characters, XHT.ML, XML, structuring data, XML schema documents, document object model, security and management issues for creating a website.

UNIT III BROWSING SYSTEMS

Searching and web casting technique, popular web servers, basic features, bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines, architecture of search engines, search tools, web crawlers, types of crawlers, scalable web crawler, incremental crawler, parallel crawler, focused crawler, agent based crawler,

case study of IE, counters, Internet chat, hardware and software requirements for Internet and web based applications, Internet and web technologies.

UNIT IV JAVASCRIPT

Introduction, Language elements, objects of JavaScript, other objects like data, math, string, regular expressions, arrays.

UNIT V XML

The origins of XML, The motivation for XML, XML objectives, the advantages of XML, XML describes data, Data storage and XML, E-publishing and XML, Single source documentation, Browser support, Well-formed XML documents, Requirements for well-formed XML documents, Plain text versus well-formed XML, Valid XML documents.

Text Books:

1. Raj Kamal, Internet and Web Technologies, TMH, 2005.
2. Monica D'Souza, Web publishing, TMH, 2001.
3. David Crowder and Rhonda Crowder, Web Design, IDG Books India, 2001.

Reference Books:

4. Musciano C., HT.ML and XHTML the Definitive Guide, 6th edition, O'Reilly, 2006.
5. Deitel H., Deitel P., Internet and World Wide Web: How to Program, 4 edition, PHI.

LOGICAL ORGANIZATION OF COMPUTER			
Course Code:	BCA107	Course Credits:	3
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. Understanding of digital representation of data in a computer system.			
2. Understand the general concepts in digital logic design, including logic elements.			
3. Understanding of combinational and sequential logic circuit design.			
4. Understanding of computer arithmetic formulate and solve problems.			
5. Understand the performance requirements of systems.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Understand of combinational and sequential circuits.			
2. Understand register transfer and micro operations.			
3. Learn various types of memories used in computers.			
4. Understand processor design.			
5. Learn about processor design and its architectures.			

UNIT I: Introduction:

Types of computers: Analog, Digital and Hybrid Computers, Modern Digital Computer. Digital logic circuits and Components: Logic gates, Boolean Algebra, K-Map Simplification, Half Adder, Full Adder, Decoder, Encoders, Multiplexers, Demultiplexer, Flip Flops, Registers, Binary Counters.

UNIT II: Register Transfer & Micro operation:

Register Transfer Language, Bus and Memory Transfer, Bus Architecture, Arithmetic Micro operations: Binary Adder, Binary Subtractor, Binary Adder Subtractor, Binary Increment and Binary Decrement.

UNIT III: Memory Organization:

Memory Hierarchy, Main Memory (RAM and ROM), Associative Memory, Cache Memory,

Auxiliary Memory. I/O Organization: I/O interface, Modes of transfer, Interrupt handling, Direct Memory Access, Input/ Output processor, Serial Communication.

UNIT IV: Processor Design:

General Register Organization, Stack Organization, Addressing Modes, Instruction Formats, Data Transfer & manipulation, Program Control, Reduced Instruction Set Computer and Complex Instruction Set Computer.

UNIT V: Parallel Processing:

Introduction, Linear and Nonlinear Pipeline Processors, Super Scalar and Super Pipeline Design, Vector Processing, Array Processors, Super Computer.

Text Books:

1. Mano M., "Computer System Architecture"
2. William Stallings, "Computer Organization and Architecture", PHI

Reference Books:

1. Mano M., "Digital Logic and Computer Design"
2. Kai Hwang, "Advanced Computer Architecture", McGraw Hill.

C PROGRAMMING LAB			
Course Code:	BCA181	Course Credits:	2
Course Category:	C	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No of lab (Hrs./Week)	04	Mid Semester Exam Hours:	-
Total no of lab(L+T)	10	End Term Exam Hours:	2
COURSE OBJECTIVES			
1 To develops fundamental understanding C programming environment.			
2 To create programming logics and learn C language programming concepts.			
3 To design and develop algorithms and programs with different data declarations, initialization and loop operations.			
4 To develop the ability to define and manage functions, array, structures, pointers etc. based on program objective.			
5 To understand and develop C programs to handle computer files, their usage and perform various operations on files.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1 Understand the C programming fundamentals.			
2 Understand the use of various programming concepts and techniques.			
3 Understand the C data types and operators with their applications.			
4 Understand C by using arrays, functions, structures and union.			
5 Develop the Programs in C using its advanced features.			

LIST OF EXPERIMENTS:

1. Write a program to find the sum (arithmetic operations) of the two integers.
2. Write a program to demonstrate the loops (while, do_while and for) execution.
3. Write a program to compute the simple and compound interest.
4. Write a program to calculate factorial of a number using recursion.
5. Write a program to find the reverse of a given number.
6. Write a program to check whether the year is leap or not.
7. Write a program to take marks of a student of 5 subjects as an input and print the grade.

marks<40 = FAIL

marks>=40 and <=59 =GOOD

marks>=59 and <80 =EXCELLENT

marks>=80 = OUTSTANDING

8. Perform program number 5 using switch case statement.

9. Write a program to compute the length of a string using While Loop.

10. Write a program to print the following pattern: -

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

b.

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

c.

```
      0  
    1 2  
  3 4 5  
7 8 9
```

11. Write a program to illustrate the difference between call by value and call by reference.

12. Write a program to check whether a given string is palindrome or not.

13. Create a structure called STUDENT having name, reg. no., class and age as its field.

14. Write a program to compute the length of a string using pointers.

15. Write a program to create a file, input data and display its content.

WEB TECHNOLOGY LAB-I			
Course Code:	BCA 183	Course Credits:	2
Course Category:	CC-L	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No of lab (Hrs./Week)	04	Mid Semester Exam Hours:	-
Total no of lab(L+T)	10	End Term Exam Hours:	2
COURSE OBJECTIVES			
1. HTML fundamentals.			
2. Basic understanding of graphic production with a specific stress on creating graphics for the Web.			
3. A general grounding introduction to more advanced topics such as programming and scripting.			
4. Explore the basic tools and applications used in web publishing.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Analyze a web page and identify its elements and attributes.			
2. Create web pages using XHTML and Cascading Style Sheets (CSS).			
3. Build dynamic web pages using Javascript (Client side programming).			
4. Create XML documents and Schemas.			

LIST OF EXPERIMENTS

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to create a Home page having three links
4. About Us, Our Services and Contact Us. Create separate web pages for the three links.
5. Write an HTML code to create a login form. On submitting the form, the user should
6. get navigated to a profile page.
7. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with these new credentials. Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subjects.
8. Write an HTML code to illustrate the usage of the following:
 - Ordered List
 - Unordered List
 - Definition List
9. Write an HTML code to create a frameset having header, navigation and content section.
10. Write an HTML code to demonstrate the usage of inline CSS.
11. Write an HTML code to demonstrate the usage of internal CSS.

12. Write an HTML code to demonstrate the usage of external CSS.
13. Design HTML form for keeping student records.
14. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
15. Write a program in XML and create a style sheet in CSS & display the document in internet explorer.
16. Write an XML program to display products.

Career Skills			
Course Code:	ICTV1	Course Credits:	2
Course Category:	VAC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	1U
No. of Lectures + Tutorials (Hrs/Week):	02 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	30	End Sem. Exam Hours:	3

COURSE OBJECTIVES
1 To assess a student's overall cognitive ability.
2. Evaluating their capacity to learn, reason logically.
3 Solve problems across various domains.
COURSE OUTCOMES
At the end of the course the students should be able to:
1. Improved problem-solving skills.
2. Enhanced critical thinking abilities.
3. Better analytical skills.
4. Better decision-making under pressure.

UNIT I – Number System and Work Efficiency

Number System: Divisibility Rules, Remainder Theorem, Unit Digit, Series, Number of Factors, Simplification, LCM and HCF.

Time and Work: Efficiency, Ratio of Work Done, Work Done in Given Time, Combined Work of Multiple People, Individual Work Rates, and Problems Involving Days and Hours.

UNIT II – Time and Distance

Basic Concepts, Average Speed, Relative Speed, Time and Distance Conversions, Problems Involving Uniform Motion, and Different Scenarios like Trains Crossing Each Other or a Man Walking on a Moving Train.

UNIT III – Percentage, Profit & Loss, Interest

Percentage: Basic Percentage Calculations, Percentage Increase and Decrease, Finding Given Percentage of a Number, Percentage Relationship Between Two Numbers. Profit and Loss: Cost Price, Selling Price, Marked Price, Profit Percentage, Loss Percentage, and Calculation of Profit or Loss.

Simple Interest: Calculating the Interest Earned on a Principal Amount at a Fixed Rate Over a Specific Period of Time, Understanding the Formula, Converting Time Units, Calculating Simple Interest, Finding the Principal Amount. Compound Interest: Basic Formula, Different Compounding Frequencies, Comparison with Simple Interest.

UNIT IV – Logical and Analytical Reasoning

Number Series, Alphabet Series, Analogy and Classification, Blood Relations, Direction Sense, Coding-Decoding, Ranking and Order, Syllogisms, Puzzles (Seating Arrangement and Scheduling), Statement and Conclusion, Cause and Effect, and Data Sufficiency.

Text Books:

1. Magical Book on Quicker Maths by M. Tyra
2. Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal
3. A Modern Approach to Logical Reasoning by R.S. Aggarwal

Reference Books:

4. Advance Maths by Rakesh Yadav
5. SSC Elementary and Advanced Maths BY Kiran

SEMESTER II

DATA STRUCTURES			
Course Code:	BCA102	Course Credits:	3
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	2U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. To impart the basic concepts of data structures and algorithms.			
2. To understand concepts about searching and sorting techniques.			
3. To Understand basic concepts about stacks, queues, lists, trees and graphs.			
4. To understand about writing algorithms and step by step approach in solving problems with data structures.			
5. To understand different applications of various data structures.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Ability to analyze algorithms and algorithm correctness.			
2. Ability to have knowledge of hashing and collision resolution techniques.			
3. Ability to describe stack, queue and linked list operation.			
4. Ability to have knowledge of tree and graphs concepts.			
5. Ability to summarize searching and sorting techniques.			

UNIT I INTRODUCTION

Data types in C, pointers in C, one dimensional array, Implementing one dimensional array, two dimensional array ,structure parameters, allocation of storage and scope of variables, recursive definition and processes: factorial function, recursion in C, efficiency of recursion, hashing: hash function, open hashing, closed hashing: linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT II STACK, LINKED LIST

Stack definition and examples, push and pop operation implementation, queue as ADT, C Implementation of queues, insert operation, priority queue, array implementation of priority queue, Linked List, , circular and doubly linked list.

UNIT III TREES REPRESENTATION

Binary trees: operations on binary trees, applications of binary trees, binary tree representation, node representation of binary trees, implicit array representation of binary tree, binary tree traversal in C, threaded binary tree, C representation of trees, tree traversals, evaluating an expression tree, constructing a tree.

UNIT IV SEARCHING AND SORTING

General background of sorting: efficiency considerations, notations, efficiency of sorting, bubble sort; quick sort; selection sort, biheap sort, heap as a priority queue, sorting using a heap, heap sort procedure, insertion sorts: simple insertion

UNIT V GRAPHS

Application of graph, C representation of graphs, transitive closure, Warshall's algorithm, shortest path algorithm, linked representation of graphs, traversal methods for graphs, spanning forests, undirected graph and their traversals, depth first traversal, application of depth first traversal, efficiency of depth first traversal, breadth first traversal, minimum spanning tree,

Text Books:

1. Aaron M. Tenenbaum, Yeedidiah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.

References Books:

2. E. Balagurusamy, 'Programming in Ansi C', Second Edition, TMH, 2003.
3. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.

DATA SCIENCE AND ANALYTICS			
Course Code:	BCA104	Course Credits:	3
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester	2U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. Knowledge of basics of data science.			
2. Describe the significance of data science and understand the Data Science process			
3. Explain how data is collected, managed and stored for data science			
4. Build, and prepare data for use with a variety of statistical methods and models			
5. Analyze Data using various Visualization techniques			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Summarize testable predictions for real-time data.			
2. Understand the concepts of Data collection and management			
3. Identify distribution properties of data using statistical concepts.			
4. Evaluate models for multiple environments.			
5. Understand regression techniques			

UNIT – I Introduction

Definition, Big Data and Data Science Hype, Datafication Data Science Profile, Meta-Definition, Data Scientist, Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Big Data Can Mean Big Assumptions, Modeling, Philosophy of Exploratory Data Analysis, The Data Science Process

UNIT –II Mathematical Preliminaries

Probability, Descriptive Statistics, Correlation Analysis. Data Munging: Properties of Data, Languages for Data Science, Collecting Data, Cleaning Data, Crowdsourcing.

UNIT – III Scores and Rankings

Developing Scoring Systems, Z-scores and Normalization, Advanced Ranking Techniques Statistical Analysis: Sampling from Distributions, Statistical Distributions, Statistical Significance, Permutation Tests and P-values

UNIT- IV Visualizing Data

Exploratory Data Analysis, Developing a Visualization Aesthetic, Chart Types, Great Visualizations Mathematical Models: Philosophies of Modeling, A Taxonomy of Models, Baseline Models, Evaluating Models, Evaluation Environment.

UNIT-V Supervised Learning

Linear Regression, Better Regression Models, Regression as Parameter Fitting, Simplifying Models through Regularization Classification and Logistic Regression, Issues in Logistic Classification, Naive Bayes, Decision Trees Classifiers

TEXT BOOKS:

1. Steven S. Skiena, "The Data Science Design Manual", Springer 2017.
2. Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Frontline O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.

REFERENCE BOOKS

1. Joel Grus, "Data Science from Scratch" First Edition, April 2015
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning-with Applications in R", 2013
3. Jure Leskovec, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2 edition (30 September 2014)
4. R Programming for Data Science, Roger D. Peng, LeanPub, 2015.

WEB REFERENCES:

1. "Data science for engineers" <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28/>

Environmental Studies			
Course Code:	ES101	Course Credits:	4
Course Category:	OE/VAC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	2U
No. of Lectures + Tutorials (Hrs/Week):	03 + 01	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	45 + 15	End Sem. Exam Hours:	3
COURSE OBJECTIVE			
To impart knowledge on environment and environmental issues and challenges of local, national and global significance for achieving environmental security and sustainable living			
COURSE OUTCOME			
To knowledge and awareness so generated will enhance ability of the learners for conservation of environment and natural resources for a healthy planet Earth, and happy living of the present and future generations.			

Unit 1 : Introduction to Environmental Studies (2 lectures)

- Multidisciplinary nature of environmental studies; components of the Earth's environment-atmosphere, hydrosphere, lithosphere and biosphere
- Scope and importance; Concept of sustainability and sustainable development

Unit 2 : Ecosystems (6 lectures)

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems (pond, stream, lake, river, ocean, estuary)

Unit 3 : Natural Resources : Renewable and Non-renewable Resources (8 lectures)

- Land resources and land-use changes; Land degradation, soil erosion and desertification
- Deforestation: Causes and impacts due to mining and dam building on environment, forest, biodiversity and tribal population
- Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international and inter-state)
- Heating of Earth and circulation of air; air mass formation and precipitation
- Energy resources: Renewable and non-renewable energy resources, use of alternate energy sources, growing energy needs, case studies

Unit 4 : Biodiversity and Conservation (8 lectures)

- 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, human-wildlife conflicts, biological invasion; 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 (8 lectures)

- Environmental pollution : Types, causes, effects and control; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial wastes
- Pollution-related case studies

Unit 6 : Environmental Policies and Practices (7 lectures)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention and 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 population and rights and human-wildlife conflicts in Indian context

Unit 7 : Human Communities and the Environment (6 lectures)

- Human population growth: Impacts on environment, human health and welfare, Carbon foot print
- Resettlement and rehabilitation of project-affected persons; case studies
- Disaster management : Floods, earthquakes, 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 (Equal to 5 lectures)

- 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.

Text Books:

1. Carson, R., 2002, Silent Spring, Houghton Mifflin Harcourt, Boston.
2. Gadgil, M., and Guha, R. 1993. This Fissured Land: An Ecological History of India, University California Press, California.
3. Gleeson, B. and Low, N. (Eds.) 1999. Global Ethics and Environment, Routledge, London.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, Oxford.
5. Groom, M.J., Meffe, G.K. and Carroll, C.R. 2002 Principles of Conservation Biology, Sinauer Associates, Sunderland.
6. Grumbine, R. E., and Pandit, M.K., 2013. Threats from India's Himalayan dams, Science 339: 36-37.
7. McCully, P., 1996. Rivers No More: The Environmental Effects of Dams, Zed Books, London.
8. McNeill, J. R, 2000. Something New Under the Sun: An Environmental History of the Twentieth Century, Norton, New York.
9. Odum, E.P., Odum, H.T. and Andrews, J., 1971, Fundamentals of Ecology, Saunders, Philadelphia.
10. Pepper, I.L., Gerba, C.P. and Brusseau, M.L. 2011, Environmental and Pollution Science, Academic Press, New York.
11. Rao, M.N. and Datta, A.K., 1987. Waste Water Treatment, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
12. Raven, P.H., Hassenzahl, D.M. and Berg, L.R., 2012. Environment, 8th Edition, John Wiley and Sons, New York.
13. Rosencranz, A., Divan, S., and Noble, M. L. 2001. Environmental Law and Policy in India, Oxford University Press, New Delhi.
14. Sengupta, R., 2003. Ecology and Economics: An Approach to Sustainable Development, Oxford University Press, New Delhi.

DIGITAL MARKETING			
Course Code:	BCA106	Course Credits:	2
Course Category:	AEC/SEC	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	2U
No. of Lectures + Tutorials (Hrs/Week):	02 + 00	Mid Sem. Exam Hours:	1.5
Total No. of Lectures (L + T):	30 + 00	End Sem. Exam Hours:	3
COURSE OBJECTIVES			
1. The aim of the Digital Marketing Course is to provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success.			
2. The application of the gained knowledge, skills and competences will help future managers in forming digital marketing plan in order to manage a digital marketing performance efficiently.			
3. It helps the marketer to reduce the cost, it helps the marketer to target the proper segment of consumer, it helps the marketer in the better understanding STP process			
4. Make business decisions from the metrics available in Digital Marketing.			
5. Understand mobile marketing measurement and analytics.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Understanding of Digital Marketing and Media Concepts.			
2. Identify the importance of digital marketing for marketing success			
3. Identifying digital channels, their advantages and limitations.			
4. To manage relationships across all digital channels and build better customer relationships.			
5. Implement best practices for creating, measuring, and optimizing display ad campaigns.			

UNIT I Introduction to Digital Marketing:

The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, Digital Marketing Vs Traditional Marketing, Digital Marketing importance and its components, how digital marketing is adding value to business, ROI of digital strategies.

UNIT II Social Media Marketing

Introduction to Blogging, Create a blog post project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube,

Instagram and Pinterest; their channel advertising and campaigns.

UNIT III Digital Channels:

Understanding the relationship between content and branding and its impact on sales, search engine marketing (SEM), mobile marketing, video marketing, e-mail marketing, content marketing and affiliate marketing. Online campaign management; using marketing analytic tools to segment, target and position;

UNIT IV Search Engine Optimization:

Understanding search engine, on-page search engine optimization and off-page search engine optimization; Search Engine Marketing (SEM): Google Ads platform, Tools used for SEO, display advertising techniques, My Client Centre (MCC), click through rates (CTR) & pay per click (PPC).

UNIT-V Digital Marketing Budgeting:

Resource Planning, cost estimation, cost budgeting and cost control; Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation.

Textbooks:

1. Moutsy Maiti: Internet Marketing, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital

Reference Books:

1. Experts Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional (October, 2013).
2. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page (3rd Edition, 2014).
3. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

DATA STRUCTURE LAB			
Course Code:	BCA182	Course Credits:	2
Course Category:	CC-L/SE C-L	Course (U / P)	U
Course Year (U / P):	1U	Course Semester (U / P):	2U
No of lab (Hrs./Week)	04	Mid Semester Exam Hours:	-
Total no of lab(L+T)	10	End Term Exam Hours:	2
COURSE OBJECTIVES			
a. Introduce the concept of data structures through ADT including List, Stack, Queues .			
b. To design and implement various data structure algorithms.			
c. To introduce various techniques for representation of the data in the real world.			
d. To develop application using data structure algorithms			
e. Compute the complexity of various algorithms.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
a) Select appropriate data structures as applied to specified problem definition			
b) Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.			
c) Students will be able to implement Linear and Non-Linear data structures.			
d) Implement appropriate sorting/searching techniques for given problems.			
e) Design advanced data structure using Non-Linear data structure			

LIST OF EXPERIMENTS

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
 - a. Searching (Linear Search, Binary Search)
4. Study and Implementation of Array Based Program
 - a. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
5. Study and Implementation of Array Based Program
 - a. Merging
6. Implementation of Link List

- f. Creation of Singly link list, Doubly Linked list
 - g. Concatenation of Link list
 - h. Insertion and Deletion of node in link list
 - i. Splitting the link list into two link list
-
- 7. Implementation of STACK and QUEUE with the help of
 - a. Array
 - b. Link List
-
- 6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
-
- 8. Write a program to simulate various traversing Technique
-
- 9. Representation and Implementation of Graph
 - a. Depth First Search
 - b. Breadth First Search
 - c. Prims Algorithm
 - d. Kruskal's Algorithms
-
- 10. Implementation of Hash Table.

DATA SCIENCE AND ANALYTICS LAB			
Course Code:	BCA 184	Course Credits:	2
Course Category:	CC	Course (U / P)	U
Course Year (U / P):	1P	Course Semester	2P
No of lab (Hrs./Week)	04	Mid Semester Exam Hours:	-
Total no of lab(L+T)	10	End Term Exam Hours:	2
COURSE OBJECTIVES			
1.	Understand the basics and functions of MS excel		
2.	Clear understanding and use of data validations and templates.		
3.	Purpose of sorting and filtering features.		
4.	Use of reports in business organizations.		
5.	Purpose and advantage of charts for top management in any work place.		
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1.	Learn to understand the functions in Excel.		
2.	Understand the validations.		
3.	Make reports in excel.		
4.	Learn to work with different formulas		
5.	Learn how to make charts in MS excel.		

LIST OF EXPERIMENTS

1. Introduction and installation of MS Excel in detail
2. Basic arithmetic functions like sum, multiplication, fraction, Min, Max and percentage, etc
3. Advanced function of MS Excel like Upper , Lower, Average, and Concatenation
4. Other functions of MS Excel like Left, Right, Mid, Len, and Find
2. Entering and editing data, text and values in excel
3. Modifying a worksheet by moving, copying data, copying formulas, inserting and deleting ranges, rows and columns
4. Formatting the text, row and column formatting, conditional formatting
5. Creating charts in excel like Pie chart and Bar chart.
6. Modifying existing worksheet, using shortcut keys, create and email worksheet
7. Preparing to print worksheet, page setup options, and printing worksheet

WEB TECHNOLOGY LAB-2			
Course Code:	BCA 183	Course Credits:	2
Course Category:	CC-L	Course (U / P)	U

Course Year (U / P):	1U	Course Semester (U / P):	1U
No of lab (Hrs./Week)	04	Mid Semester Exam Hours:	-
Total no of lab(L+T)	10	End Term Exam Hours:	2
COURSE OBJECTIVES			
1. To design and build a responsive personal portfolio website that adjusts layout across different screen sizes using media queries.			
2. To develop a dynamic user form (e.g., registration or login) that validates user input on the client side in real-time.			
3. To design an interactive quiz app that presents questions, validates answers, and provides scoring feedback.			
COURSE OUTCOMES			
At the end of the course the students should be able to:			
1. Student will be able to create a multi-section responsive website with personal information, links, and project showcases optimized for mobile, tablet, and desktop screens.			
2. To develop a dynamic user form (e.g., registration or login) that validates user input on the client side in real-time.			
3. To build a contact or registration form that submits data to a MySQL database using PHP as the server-side language.			
4. To create a structured product list in XML format and use XSLT to transform and display it in a styled HTML format.			

LIST OF EXPERIMENTS

1. Create a Responsive Portfolio Website using HTML, CSS & Media Queries
2. Develop a Dynamic Form with Real-time Validation using JavaScript
3. Create a Single Page Application (SPA) Layout using HTML, CSS, and JavaScript Tabs
4. Build a Product Catalog Page with Filter and Sort Functionality
5. Design a Theme Switcher Web Page (Light/Dark Mode)
6. Create an Interactive Quiz Application
7. Build a Contact Form with Backend Integration using PHP/MySQL
8. Build a Contact Form with Backend Integration using PHP/MySQL