NGF College of Engineering & Technology

Overview of the Department of Computer Science (DCS)

Welcome to the Department of Computer Science (DCS), where innovation meets education. Our department is dedicated to providing students with a comprehensive understanding of both the theoretical and practical aspects of computing and technology. DCS has programs that have a presence in every field of life and, in the last two decades, has shown immense potential and growth, benefiting individuals and industries alike. Today, we cannot imagine our lives without computers and computing technology.

The Department is headed by Prof. (Dr.) Kuldeep Tomar has been a pioneering force since the establishment of the college. Under his leadership, the department has developed in leaps and bounds, continuously adapting to the rapidly changing landscape of information technology. As we move forward into the new millennium, it is crucial to remain abreast of the latest developments in computer technology, and the department is focused on guiding students in the right direction to meet these challenges.

At DCS, students explore the fundamental principles of computer science, alongside advanced techniques that are essential for the development of practical systems. This includes studying core areas such as algorithms, data structures, programming, artificial intelligence, machine learning, software engineering, and more. As we venture deeper into the digital age, DCS continues to transform various sectors like healthcare, finance, entertainment, education, and more, proving its undeniable impact on modern life.

The department has been committed to ensuring that both its curriculum and its students are in line with the latest industry trends and demands. It has been a consistent endeavour of the department to adapt itself and its students to mirror the evolving requirements of the Information Technology environment, both in India and internationally. By focusing on cutting-edge technologies and industry best practices, we equip our students to become leaders in the field of computer science and engineering.

Our faculty consists of highly qualified and experienced professionals who bring a wealth of knowledge and research expertise into the classroom. With a focus on both foundational knowledge and cutting-edge advancements, our department ensures that students are well-equipped to tackle challenges and shape the future of technology.

We emphasize hands-on learning, providing students with numerous opportunities to engage in real-world projects, internships, and research activities. Our state-of-the-art laboratories and modern teaching methods prepare students for careers in a fast-paced and ever-evolving technological landscape.

The Department fosters a collaborative environment, encouraging students to work together, think critically, and apply their knowledge to solve complex problems. Our diverse and dynamic curriculum is designed to meet the demands of the global tech industry, as well as the growing need for expertise in research and innovation within computer science.

🎓 **Programs Offered by Department of Computer Science**

✅ **Undergraduate Programs**

1. **B.Tech in Computer Science and Engineering (CSE)**
   o This program provides a comprehensive understanding of computer science and engineering fundamentals, software development, algorithms, data structures, and modern technologies.
   o **Key Areas:** Programming languages (C, C++, Python), database management, operating systems, computer networks, artificial intelligence, Cyber Law and web development etc.

2. **B.Tech in CSE (Artificial Intelligence and Machine Learning (AI & ML))**
   o This specialized program focuses on the rapidly growing field of AI and ML, equipping students with skills in data modelling, deep learning, and intelligent systems.
   o **Key Areas:** AI & Expert Systems, IOT, Big Data Analysis, Data Structures, COA, Operating Systems, DBMS, CN, Neural networks, natural language processing, data science, predictive analytics, and automation etc.

3. **Bachelor of Computer Applications (BCA)**
   o The BCA program is designed to provide a strong foundation in computer applications and software development.
   o **Key Areas:** Programming languages (C, C++, Java, Python), database management, web development, DE, CN, LOC, Wireless communication and software engineering etc.

4. **BCA in Data Science**
   o This program focuses on data analysis, visualization, and interpretation, preparing students for the data-driven world.
   o **Key Areas:** Programming languages (C, C++, Java, Python, R programming), AI, database management, web development, DS, CN, CO, Wireless Communication, , machine learning, big data processing, and data visualization tools etc.

✅ **Postgraduate Program**

5. **M.Tech in Computer Science and Engineering (CSE)**
   o The M.Tech program offers advanced-level education in computer science, focusing on research, development, and innovation.
   o **Key Areas:** Advanced algorithms, distributed computing, Cloud computing, Cybersecurity, ML, IS, NLP, data analysis, Software Testing, Research Methodology, Advanced wireless & Mobile Networks etc.

Key Highlights of the Department

- **State-of-the-art labs** equipped with the latest hardware and software technologies.
- **Industry collaborations** with tech giants for internships, placements, and projects.
- **Research opportunities** in AI, data science, cloud computing, and cybersecurity.
- **Workshops, hackathons, and seminars** to foster practical skills and innovation.
- **Career support and guidance** through placement drives and training programs.

The **Department of Computer Science** is committed to empowering students with the knowledge and skills necessary to thrive in the ever-evolving tech industry. If you're passionate about developing software solutions, understanding the inner workings of computers, or pushing the boundaries of artificial intelligence, the Computer Science Department provides the foundation, resources, and opportunities for you to thrive.

Join us as We continue to shape the future of technology and play a pivotal role in every aspect of life.

NGF College Of Engineering And Technology
Established in 2008 Under The NEW GREEN FIELD Educational Society

BCA Data Science

Mission:

- Provide a strong foundation in Data Science, Artificial Intelligence, and Computer Science.
- Develop analytical thinking, problem-solving, and critical reasoning skills.
- Equip students with practical knowledge of data handling, machine learning, and big data technologies.
- Promote ethical data-driven decision-making and responsible AI practices.
- Encourage research, innovation, and entrepreneurial mindset in the field of Data Science.
- Bridge the gap between academia and industry through internships, projects, and collaborations.

Vision

- Establish a center of excellence in Data Science and AI.
- Foster innovation, interdisciplinary research, and technological advancements.
- Develop industry-ready professionals with a global perspective.
- Contribute to societal progress and sustainable development through data-driven solutions.
- Strengthen collaborations with academia, industry, and research institutions.

B.C.A Data Science: Program Educational Objectives

PEO	Graduates will be able to:
PEO1	To create knowledge about core areas related to the field of computer science and information technology.
PEO2	To enable students to apply mathematics, science and computer engineering principles to model, design and implement software projects to meet customers' business objectives.
PEO3	To develop the ability to evaluate the computing systems from view point of quality, security, privacy, cost effectiveness, utility and ethics.
PEO4	To inculcate lifelong learning by introducing principles of group dynamics, public policies, environmental and societal context

B.C.A Data Science Graduates will be able to

PO1	**Application knowledge**:Apply the knowledge of mathematics, science, application fundamentals, and an application specialization to the solution of complex application problems.
PO2	**Problem analysis** Identify, formulate, review research literature, and analyze complex application problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and application sciences.
PO3	**Design/development of solutions**: Design solutions for complex application problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Developer and society** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional application practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the application practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex application activities with the application community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the application and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B.C.A Data Science:Programme Specific outcome

PSO	Graduates will be able to:
PSO1	Familiarity and practical competence with a broad range of programming language and open-source platforms.
PSO2	Create and integrate knowledge base in the area of computer application and information technology, which in turn enables the betterment of society. ..
PSO3	Acquire globally competence through developing their problem solving skills and to instil ethical and social principles that in turn help them to become entrepreneurs and technocrats for society..

J. C. Bose University of Science and Technology, YMCA, Faridabad, Haryana

Department of Computer Applications
(Faculty of Informatics and Computing)

Scheme and Syllabus

BCA (Data Science)

(Semester I – II)

W.e.f. 2023

Scheme
(Semester I & II)

BCA (Data Science)- I Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23-101	Fundamentals of Computers	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCA-23-103	Programming in C	3		3	25	75	100	3
3	Discipline Specific-Minor	BCA-23-105	Digital Electronics -I	3	-	3	25	75	100	3
4	Interdisciplinary	BCA-23-107	Mathematics	3	-	3	25	75	100	3
5	Ability Enhancement courses	ENG-LL-23-01	Writing Skills and the Art of Rhetoric (WSAAR)	2	-	2	25	75	100	2
6	Value Added Course	BCA-23-109	Quantitative Reasoning	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCA-23-111	C Programming Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCA-23-113	Digital Electronics Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCA-23-115	Workshop I (Hardware)	-	6	6	15	35	50	3
Total						27	195	555	750	22

BCA (Data Science)- II Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23-102	Introduction to Operating System	3	-	3	25	75	100	3
2	Discipline Specific-Major	BCA-23-104	Computer Networks	4		4	25	75	100	4
3	Discipline Specific-Minor	BCA-23-106	Digital Electronics-II	3	-	3	25	75	100	3
4	Interdisciplinary	BBA/GN/104	Microeconomics	3	-	3	25	75	100	3
5	Ability Enhancement courses	ENG-LL-23-02	Communication, Mediation and Resolution (CMR)	2	-	2	25	75	100	2
6	Value Added Course	VAC-101-N1	Environmental Science-I	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCA-23-108	OS Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCA-23-110	LOC Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCA-23-112	Workshop II (Networking)	-	6	6	15	35	50	3
Total						**27**	**195**	**555**	**750**	**22**

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SEMESTER I

No. of Credits: 3
L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1   To understand the major components of computer system, the types and functions of memory.
2   To learn about the difference between software and hardware in a computer system along with the fundamentals of Operating systems and its types.
3   To understand the concept of programming languages and their corresponding Translators
4   To learn about the basic types of Networks, Internet and computer viruses.

Syllabus:

UNIT – I: Computer Fundamentals
Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer, Applications of computers in various fields. **Memory:** Concept of primary & secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory, Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks i.e. CD, DVD, virtual memory.

UNIT – II: Computer hardware & software
I/O devices, definition of software, relationship between hardware and software, types of software. **Overview of operating system:** Definition, functions of operating system, concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user & multi-user operating system.

UNIT – III: Computer Languages
Analogy with natural language, machine language, assembly language, high-level languages, fourth generation languages, compiler, interpreter, assembler, Linker, Loader, History and Characteristics of a good programming language, Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in

programming, Documentation, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Advantages and disadvantages of Structured programming.

UNIT IV: Overview of Networking
An introduction to computer networking, Network types (LAN, WAN, MAN), Network topologies, Modes of data transmission, Forms of data transmission, Transmission channels(media),OSI model, Introduction to internet and its uses, Applications of internet, Hardware and Software requirements for internet, Intranet, Applications of intranet. **Computer Virus:** Definition, types of viruses, Characteristics of viruses, anti-virus software.

Course Outcomes:
At the end of program the student will be able to:
1. Understand about the major components of computer system, the types and functions of memory.
2. Differentiate between software and hardware in a computer system along with the fundamentals of Operating systems and its types.
3. Learn the concept of programming languages and their corresponding software tools.
4. Analyse about the basic types of Networks, Internet and computer viruses.

Text/ Reference Books:

1 Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
2 Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.
3 Norton, Peter, Introduction to Computer, McGraw-Hill
4 Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
5 Rajaraman, V., Fundamentals of Computers, PHI

Programming in C
BCA(Data Science)-I Semester

No. of Credits: 3
L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100
         Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To understand the fundamentals of C language.
2. To learn different statements like sequential, decision making, iterative such as if-else, loops.
3. To understand functions and its types in c along with the concept of recursion and storage classes.
4. To learn about the concept of Arrays, Strings and Pointers.

UNIT I: Overview of C
Characteristics of C programming language, C identifiers, keywords, Constants and Variables, Data types, Assignment statement, Symbolic constant, Structure of a C Program, inbuilt functions.
Operators & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, shorthand assignment operators, conditional operators and increment and decrement operators, Arithmetic expressions: concept of l-value and r-value, evaluation of arithmetic expression, type casting (implicit and explicit) and type conversion, operator hierarchy & associativity.

UNIT II: Decision making & branching
Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, Switch statement, goto statement.
Decision making & looping: For, while, and do-while loop, jumps in loops, break, continue statement, Nested loops.

UNIT III: Functions and Pointers: Definition of functions,Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions viz. getch(), getche(), getchar(), gets(), output functions viz., putch(), putchar(), puts(), random(), system().
User defined functions: Function prototype, Local and global variables, Storage classes: auto, extern, register and static their scope, storage& lifetime, passing parameters and returning value, recursion.

Pointers: Understanding Pointers, Accessing the address of a variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a variable through its pointer, Pointer Arithmetic.

UNIT IV: Arrays and User defined Structures
Arrays: Definition, types, initialization, storage and addressing, searching and sorting in arrays, passing arrays to functions, Declaration and initialization of string, Input/output of string data, inbuilt string manipulation functions, Array of Strings.
Structures: Structures, Union and Enumerations, File Handling.

Course Outcomes:
At the end of program the student will be able to:
1. Acquire knowledge about building blocks of C language like variables, data types, managing I/O etc.
2. Solve basic problems using different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays and structures.
3. Apply the concept of functions and pointers to solve problems and also understand about various storage classes
4. Create programs using the concept of arrays, strings, structures and file handling.

Text/ Reference Books:

1.The C programming language, Dennis M. Ritchie,Pearsons Educations.

2. Gottfried, Byron S., Programming with C, Tata McGraw Hill

3.Let us C, YashwantKanetker, BPB Publications.

4. Pointers in C,YashwantKanetker, BPB Publications.

5. Balagurusamy, E., Programming in ANSI C, 4E, Tata McGraw-Hill

6. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

7. Jeri R. Hanly& Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.

BCA-23-105
Digital Electronics-I
BCA(Data Science)-I Semester

No. of Credits:	3				
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To introduce the fundamentals of digital electronics.
2. To familiar the students about the design and analyze various combinational
3. circuits.
4. To give exposure to the students about design and analyze various sequential circuits.
   To introduce various converters.

Syllabus:
UNIT- I: Fundamentals of Digital Systems

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal, hexadecimal number, binary arithmetic, one's and two's complements arithmetic,

UNIT-II: Combinational Digital Circuits

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders.

UNIT-III: Sequential Circuits and Systems

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K, T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter.

UNIT-IV: Digital to Analog Converters

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit,.

Course Outcomes:
At the end of this course, students will be able to:
1. Design and analyse combinational logic circuits.
2. Acquire basic knowledge of digital logic families & semiconductor memories.
3. Design & analyse synchronous sequential logic circuits.
4. Design various converters

Text/ Reference Books:

1. Millman and Halkias, Integrated Electronics, Pearsons Education
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
3. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

Mathematics
BCA(Data Science)-I Semester

No. of Credits: 3

L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To understand Sets, Relations and functions along with their properties,types and operations on them.

2. To understand Propositions, its basic operations, types and applications.

3. To learn about the concept of recurrence and recurrence relations

4. To make the students understand Regular expressions, Regular Language and their conversions, conversion of automata machines

UNIT- I: Sets Theory
Definition of Set, Representation of Sets, Operations on sets, Laws of Sets, Cartesian Products, Partially Ordered Set, Relation between Boolean algebra and set theory.
Relations and Functions: Relations and its types, Binary Relation, Properties of Binary relation, Matrix representation of relations, Equivalence Relation, Partial Ordering Relation, Hasse diagram, well ordered set, Lattices, Properties of lattices, Bounded lattices, Complemented and Distributive lattices
Functions and its Types, Composition of function, Inverse and Composite Function, Recursively defined function.

UNIT–II: Propositional Logic
Boolean algebra, Propositions, logical operations, Tautologies, Contradictions, Logical implication, Logical equivalence, Normal forms: CNF, DNF, PCNF, PDNF, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers, Mathematical Induction.

UNIT-III: Recursion and Recurrence Relation
Linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

UNIT–IV: Theory of Automata

Definition of grammar and language, Chomsky Hierarchy of Grammars, NFA, DFA,Conversion of NFA to DFA, Regular expressions, conversion of regular expression to Finite Automata, FA with output: Moore machine, Mealy machine, Conversions, introduction to Turing machine.

Course Outcomes:
At the end of this course, students will be able to:
1. Apply set theory, functions, relations and lattices to solve computational problem.
2. Design propositions and apply operations on them.
3. Design solutions to the problems using recursive functions.
4. Understand different models of computation.

Text/ Reference Books:
1. C.L.Liu: Elements of Discrete Mathematics McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series.
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P. & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen : Discrete Mathematics and its applications, TMH.
6. Theory of Computer Science; K.L.P. Mishra. N. Chandrasekaran

Writing Skills and the Art of Rhetoric (WSAAR)
BCA(Data Science)-I Semester

No. of Credits:	3				

L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

Unit-I: Narration and Writing
Define, Describe, Narrate and Argue; Articulating Questions and Innovative Thoughts; Narration: chronological order and a chronological order; first-person, second-person and third person point of view in narration; key elements: plot, character, pov, setting and conflict; Storytelling, event news stories and Corporate Storytelling; problem-solution structures.
Exercise: *Ekphrasis*, Pictures: Describing scenes; Creating Stories out of words and pictures.

Unit-II: Reasoning and Rhetoric: Rhetoric, the art of persuasion; *ethos, logos* and *pathos*, Aristotle's triangle; Freytag's pyramid; reasoning; organizing; articulating; Synthesis; *Antanagoge; Hypophora.*
Recognize and evaluate the strength of an argument and its impact.

Exercise: Rhetorical and Oratorical Skills: Techniques for effective public speaking, both prepared and extemporaneous; Brainstorm ideas for your own short speech.

Unit-III: Writing Features and Articles: Writing Features and Articles, , Op-Eds (Opinions and Editorials), Features; Articles; Topical Issues, Memes; Backgrounders; Memes; Idioms, Proverbs; Using Literary Devices and Figurative Language.
Exercises: Building Memes and Feature Writing
Unit: IV: Performance and Drills
Reading Drills; Speaking Drills; Team-Performance Drills; Solo Performance Drills; Apply the elements of rhetoric you have learned so far in the final draft of your op-ed and discussion.

Course Outcomes:

After completion of the course student will be able to :

1. Understand the concept of soft skills including communication skills, listening skills, positive thinking and also will be able to enhance own personality.
2. Able to write business letters.
3. Able to write reports.
4. Able to make effective resume and will also be able to present himself/herself in interview, speeches, presentations, talks etc.

Text/ Reference Books:

1. Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
2. Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
3. Goleman, Daniel. Working with Emotional Intelligence. London: Banton Books. 1998.
4. Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley. rpt. 2011.
5. Holtz, Shel. Corporate Conversations. New Delhi: PHI. 2007.
6. Kumar, Sanajy and PushpLata. Communication Skills. New Delhi: OUP. 2011.
7. Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Book Co. International Edition, 11th edition**.**

BCA-23-109
Quantitative Reasoning

BCA(Data Science)-I Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To Understand the basic concepts of quantitative ability
2. To learn the basic concepts of logical reasoning Skills
3. To acquire satisfactory competency in use of reasoning
4. To understand the problems for campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

Syllabus:

UNIT I Quantitative Aptitude:

Periods Numerical computation: Applications based on Numbers, Chain Rule, Ratio Proportion, Time and work, Time and Distance, Percentages, Profit Loss and Discount, Simple interest and Compound Interest Partnerships, Shares and dividends, Data interpretation Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams

Unit II Verbal Ability:

Reading Comprehension Structure of a Reading Passage – Idea Organization Styles – Style and Tone – Skimming and Scanning – Techniques for Fast and Active Reading – Different Types of Questions and Techniques for Answering Them – Reading between the Lines and Reading beyond the Lines – Theme Detection – Identifying Central Idea of the Passage – Using Context to Answer Vocabulary Based Questions

Unit III Critical Reasoning:

Understanding Critical Reasoning – Basic Terminology in CR (Premise, Assumption, Inference and Conclusion) – Sequencing of Sentences (Rearranging Jumbled Paragraphs) – Cloze Passages.

Unit IV Numerical Reasoning:

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

Combinatory: Counting techniques, Permutations, Combinations and Probability Syllogisms and data sufficiency

Course Outcome:

On successful completion of the course the students will be able to:
1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

Text books &References:

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test by Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by AbhijitGuha 4 th edition
6. https://prepinsta.com/
7. https://www.indiabix.com/
8. https://www.javatpoint.com/

BCA-23-111

C Programming Lab
BCA(Data Science) -I Semester

Discipline Specific Course

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1.Write programs to give introduction to basic C I/O instructions, variables and constants :
    a)To print Hello World.
    b) To perform arithmetic operations on varaibles:+,-,/,* etc.
    c) To calculate area and perimeter of a circle.
    d) To find average of five numbers.

2. Write programs to implement if-then-else, nesting if else:
    a) To find the larger between two numbers.
    b) To calculate gross salary giving basic salary, da,hra.
    c) To find the largest between three numbers.
    d) To find whether a number entered by user is leap year or not.

3. Write programs to implement loops:
    a) To print even numbers from1 to 50
    b) To print odd numbers from 1 to 100
    .c) To generate table of number
    d) To find reverse of a number
    e) to print different patterns .
    f) To calculate sum of n numbers using do-while loop. (for statement)
    g) To find the average mail height & average female heights in the class (input is in the form of gender code, height).

4. Write a program to find roots of a quadratic equation using functions and switch statements.

5. Write programs to implement arrays:
    a) To calculate Sum of all the elements of an array
    b)To implement Linear search
    c) To implement Binary Search
    d) To implement basic Sorting algorithms(Selection/Bubble)
    e) To find the largest and second largest number out of given 50 numbers.

6. Write programs to implement the concept of 2-D arrays(Matrices)
    a) to add two matrices
    b) Write a program to multiply two matrices.
    c)Write a program to transpose a given matrix.

7. Write programs for string operations
    a) various string inbuilt functions
    b) to read a string and write it in reverse order.
    c) Write a program to concatenate two strings of different lengths.
    d)Write a program to calculate length of a string without using string inbuilt function.

8. Write program for basic pointer arithmetic.

9. Write a program to swap two numbers using pointers.
10. Write programs to implement functions:

a) to find factorial of a number using function.
b) Write a program to calculate a^b using function.
c) Write a program to print Fibonacci series using recursion

11. Write programs for implementing Structures.
12. Write Programs for File Handling

Digital Electronics Lab
BCA(Data Science)-I Semester

Discipline Specific Course

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Fabrication of all the gates using Diode & transistors and verification of truth table.
2.To design & realize combinational circuit using K-map & logic simplification
3.To verify the operation of Multiplexer & to implement any given function with a MUX
4.To verify the operation of DEMUX & decoder.
5. To design a Bi-stable latch using basic transistors
6.To verify the truth table of SR, JK, D & T Flip-Flop & conversion of one Flip-Flop to another FF.
7. To verify the function of 4- bit shift register.
8. To design serial to parallel and parallel to serial converters
9.To design 4 bit DAC

BCA-23-115
Workshop 1
BCA(Data Science)-I Semester

Discipline Specific Course

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1. Set date and time of the windows and change screensaver and appearance.
2. Manage files and folders.
3. To study various components of PC such as keyboard, mouse, CPU, RAM, motherboard and SMPS.
4. To assemble a PC.
5. To study, remove and replace floppy disk drive, hard disk and CD ROM drive .
6. Printer Installation and Servicing and troubleshooting.
7. Study various operations on Hard Disk such as formatting, logical partitioning, error checking, defragmentation etc..
8. Installation of various Operating Systems
9. Handling registry file, automatic update, security settings.

SEMESTER II

BCA-23-102
Introduction to Operating systems
BCA(Data Science)-II Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To understand evolution and types of OS and to understand the structure, components and functions of OS.
2. To learn about Processes, threads and various Scheduling policies.
3. To understand the principle of Deadlocks and various memory management
4. schemes
   To understand virtual memory management, Disk management, I/O management and File system

Syllabus:

UNIT – I : Fundamentals of Operating System
Introduction to Operating System, its need and operating System services, Early systems, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems.
Process Management: Process concept and context, Process Control Block, Operation on processes, Threads, and Inter-process Communication.

UNIT-II: CPU Scheduling Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Premptive and non-premptive, Round Robin,& Queue Algorithms.
Deadlocks: Deadlock characterization, Prevention and Avoidance, Deadlock Detection and Recovery Methods for handling deadlocks, Banker'sAlgorithm.

UNIT-III: Memory Management
Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation.
Virtual Memory: Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

UNIT-IV: Disk Scheduling and File Management
Disk structure, Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

Type of File systems, File Structure, File allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.

Course Outcomes:

After completion of the course student will be able to :

1. Learn various types of OS and will also understand the various functions of OS.
2. Understand CPU scheduling along with its various algorithms. Also, the students will be familiar with different deadlock handling algorithms.
3. Apply various memory management schemes like demand paging and segmentation and also able to understand virtual memory and page replacement algorithms.
4. Understand disk scheduling and different file handling schemes in OS.

TextBooks/Reference Books:

1. Abraham Silberschatz,PeterB.Galvin,"OperatingSystemConcepts",AddisonWesleypublishing. Co.,7th. Ed., 2004.
2. Nutt Gary, "Operating Systems", Addison WesleyPublication,2000.
3. Andrew S.Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.
4. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition, PH, 2001.

Computer Network
BCA(Data Science)-II Semester

No. of Credits: 3
L   T   P   Total   Sessional: 25 Marks
3   0   0   3   Theory: 75 Marks
                                                         Total: 100 Marks
                                        Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1   To understand basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
2.   To know basic protocols of data link layer, how they can be used to assist in network design and implementation
3.   To analyse the features , protocols and operations of network layer
4.   To understand transport and application layer protocols, along with basics of cryptography.

UNIT-I: Data Communication Components
Representation of data, analog and digital signals, asynchronous and synchronous transmission.Various Connection Topology, Protocols and Standards, OSI model, TCP/ IP reference model, Transmission Media, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT-II: Data Link Layer and Medium Access Sub Layer
Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Medium access controls, Pure ALOHA, Slotted ALOHA, Introduction to CSMA/CD, CDMA/CA.

UNIT-III: Network Layer
Switching, IP packet format, Logical addressing – IPV4, IPV6, Physical to IP address mapping protocols – ARP, RARP, BOOTP and DHCP–Delivery, Introduction to forwarding and unicast Routing protocols.

UNIT-IV: Transport Layer and Application Layer
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service,Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

1. Acquire knowledge about basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
2. Understand the basic protocols of data link layer, how they can be used to assist in network design and implementation
3. Apply protocols of data link layer in network design and implementation.
4. Analyse the features and operations of various transport and application layer protocols, along with basics of cryptography.

TextBooks/References:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. Network and Internet, Douglas Comer, Prentice Hall of India.
6. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America
7. Computer Networks, UYLess Black, Pearsons Education.

No. of Credits: 3

L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1. To introduce the fundamentals of digital electronics.
2. To familiar the students about the design and analyze various combinational
3. circuits.
4. To give exposure to the students about design and analyze various sequential circuits.
   To introduce various converters.

Syllabus:
Unit-I: Digital codes and Logic Families
Codes, error detecting and correcting codes, FET, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

Unit II: Combinational Digital Circuits
Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Unit III: Sequential Circuits and Systems:
Ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit IV: Analog to Digital Converters:
Quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs
Course Outcomes:

At the end of this course, students will be able to:
1. Design and analyse combinational logic circuits.
2. Acquire basic knowledge of digital logic families & semiconductor memories.
3. Design & analyse synchronous sequential logic circuits.
4. Design various converters

Text/ Reference Books:

1. Millman and Halkias, Integrated Electronics, Pearsons Education
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
3. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

BBA/GN/104
Microeconomics
BCA(Data Science)-II Semester

No. of   3
Credits:

L   T   P   Total   Sessional: 25 Marks
3   0   0   3   Theory: 75 Marks
                                               Total: 100 Marks
                                   Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Syllabus:
UNIT-I:
Introduction to Economics, definition and scope of Economics, nature and scope of microeconomics, Demand: law of demand and its determinants, price, cross and income elasticity of demand, law of supply and its determinants, elasticity of supply, Law of diminishing Marginal Utility Analysis, competitive equilibrium; consumer's equilibrium, utility and indifference curve approaches.

UNIT-II:
Basic Cost Concepts, Total Cost, Fixed Cost, Variable Cost Average Cost & Marginal Cost, Explicit Cost and Implicit Cost, Short run and long run production functions, laws of returns; optimal input combination; classification of costs; short run and long run lost curves and their interrelationship; internal and external economies of scale

UNIT-III:
Characteristics of various factors of production. Determination of rent; quasi rent, optimum size of the firm; factors affecting the optimum size, location of firms.

UNIT-IV:
Equilibrium of the firm and industry, perfect competition, monopoly, monopolistic competition, discriminating monopoly, aspects of non-price competition and oligopolistic behaviour.determination.Indian Economy, nature and characteristics.Basic concepts; fiscal and monetary policy, LPG, Inflation, Sensex, GATT, WTO and IMF.Difference between Central bank and Commercial banks.

Course Outcomes:
After completion of this course, student will be able to:
1. Understand the basic concept and theories of microeconomics.

2. Develop a critical understanding of the implications of the production and cost.

3. Understand various market structures and factor pricing.

4. Acquire necessary skills to analyze certain economic aspects to understand basic business activities.

TextBooks/References:
1. D. Salvatore. Microeconomic Theory. Tata McGraw Hill, New Delhi.
2. N. Dwivedi. Managerial Economics. Vikas Publishing House.
3. Mark Hirschey. Managerial Economics. Thomson, South Western, New Delhi.
4. R H Dholkia and A.N. Oza. Microeconomics for Management Students. Oxford University Press, New Delhi.
5. N. Gregory Mankiw. Economics: Principles and Applications. India edition by South Western, a part of Cengage Learning. Cengage Learning India Private Limited.
6. P.L. Mehta. Managerial Economics. Sultan Chand, New Delhi.

Communication, Mediation and Resolution (CMR)
BCA(Data Science)-II Semester

No. of Credits: 3
L   T   P   Total   Sessional: 25 Marks
3   0   0   3   Theory: 75 Marks
                                                               Total: 100 Marks
                                              Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
   1. .

Unit-I: Communication and Barriers to Communication: 7C's of Communication, Win-Win Communication, Strategies for Effective Communication, Zero-Sum; Reasons for Conflict; Communication Barriers.
Unit-II: Critical Thinking and Cognitive Skills: reason; analysis, synthesis, divide and rule; root-cause analysis; logic and logical fallacies.
Reasoning; Logic; Inductive and Deductive Reasoning; Logical fallacies: *Ad hominem,* straw man fallacy; bandwagon fallacy; hasty generalization; false dilemma; false dichotomy; *Tu Quoque* ; circular reasoning and hasty generalization; Recognizing fallacies.
Unit-III: Mediation and Conflict-Resolution: Cognitive Skills and Critical thinking; Listening for key words, phrases and hints, Creative Communicating, Managing and celebrating Diversity, Adaptability and Negotiation; Dispute-resolution; arbitration; mediator's role; caucuses, third party, objectivity, impartiality, neutrality, offers, counter offers, questions, demands, and proposals, impasse, settlement. Brainstorming, Problem solving strategies, Stress management, Significance of Collaboration, Confronting challenges.
Unit-IV: Mediation in Practice: Exercises in role-playing and mediation and one case study assignment as directed by the teacher
Course Outcomes:
After the completion of the course, the students will be able to:
   1
   .

TextBooks/References:
1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004

2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)

6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.

7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN

VAC-101-N1

No. of Credits: 3
L   T   P   Total   Sessional: 25 Marks
3   0   0   3   Theory: 75 Marks
                                                                                      Total: 100 Marks
                                                          Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
At the completion of this course, the learner will be able to:
1. Understand human interaction with the environment and efforts taken for emergence of environmentalism at international level.
2. Understand concept of natural resources, their distribution, conservation, management and sustainable utilization.
3. Develop critical thinking towards local, regional and global environmental issue.
4. Describe the concept of ecosystem, biodiversity and their conservation at national and international levels.

UNIT-I: Humans and the Environment
The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

UNIT-II: Natural Resources and Sustainable Development
Overview of natural resources: Definition of resource; Classification of natural resources-biotic and abiotic, renewable and non-renewable.
Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (fresh water and marine); Microbes as a resource; Status and challenges.
Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress; Conflicts over water.
Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation.

Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Conventional energy sources- coal, oil, natural gas, nuclear energy; non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells; Implications of energy use on the environment. *Introduction to sustainable development: Sustainable Development Goals (SDGs)-* targets and indicators, challenges and strategies for SDGs.

UNIT-III: Environmental Issues: Local, Regional and Global
Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products.
Pollution: Impact of sectoral processes on Environment; Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog.
Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact.
Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic)

Unit IV: Conservation of Biodiversity and Ecosystems
Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types; Biodiversity in India and the world; Biodiversity hotspots.
Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristicsforests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and significance.
Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change.
Major conservation policies: in-situ and ex-situ conservation; Major protected areas; Biosphere reserves; Ecologically Sensitive Areas; Coastal Regulation Zone; the role of traditional knowledge for biodiversity conservation, community-based conservation; Gender and conservation.
Overview of the following conventions and protocols- Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; Ramsar sites; United Nations Convention to Combat Desertification (UNCCD).

Unit V: Case studies/ Field Work
The students are expected to be engaged in some of the following or similar identified activities:
a) Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
b) Discussion on one national and one international case study related to the environment and sustainable development.
c) Participation in plantation drive and nature camps.
d) Documentation of campus flora and fauna

TextBooks/References:
1. Baskar, R & Baskar, S. (2010). Natural Disasters: Earth's Processes & Geological

2. Bhagwat, Shonil (Editor) (2018) Conservation and Development in India: Reimagining Wilderness, Earthscan Conservation and Development, Routledge.
3. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
4. De Anil, K. (2003). Environmental chemistry. New Age International.
5. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
6. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)
7. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge.
8. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
9. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
10. Hughes, J. Donald (2009) An Environmental History of the World- Humankind's Changing Role in the Community of Life, 2nd Edition. Routledge.
11. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS)
12. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
13. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK
14. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
15. Perman, R., Ma, Y., McGilvray, J., and Common, M. (2003) Natural Resource and Environmental Economics. Pearson Education.
16. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.
17. Sharma, P. D., & Sharma, P. D. (2012). Ecology and environment. Rastogi Publications.
18. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. Edinburgh University Press
19. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications https://sdgs.un.org/goals
20. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.
21. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022) Conservation through Sustainable Use: Lessons from India. Routledge.
22. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)

BCA-23-108

Discipline Specific Course

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1. Write C programs to demonstrate various process related concepts.
2. Write C programs to demonstrate various thread related concepts.
3. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.
4. Write C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory.
5. Write C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer – Consumer, Readers – Writers.
6. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
7. Write C programs to simulate Page Replacement Algorithms: FIFO, LRU.
8.Write C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.
9. Write a C programs to implement UNIX system calls and file management
10. Simulate Banker's algorithm for deadlock avoidance.

BCA-23-110

Digital Electronics-II Lab
BCA (Data Science)-II Semester

Discipline Specific Course

No. of Credits: 2

L	T	P	Total		
0	0	2	2		

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Study of TTL gates
2. To study CMOS NAND NOR
3.To design 4 bit parallel adder/ subtract or/ for unsigned/ signed numbers
4. To verify the operation of gray to binary code convertor.
5.To verify the operation of gray to binary code convertor
6. To verify the function of 4- bit ALU.
7.To design and implement 1 bit comparator.
8.Verify the operation of ring counter and Johnson Counter
9. To design and verify operation of synchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
10. To design and verify operation of asynchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
11. To design and verify operation of synchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
12. To study the operation of 8-bit A/D converter.

BCA-23-112

Discipline Specific Course

No. of Credits: 2

L	T	P	Total		
0	0	2	2		

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Study of different types of Network cables and connectors and making the cross-wired cable and straight through cable using clamping tool.
2 Study of Network Devices such as Switch, Router, Gateway, Servers etc.
3 To study and design network/subnet using subnet masking and IP addressing.
4 To study of basic network command and network configuration commands.
5 Performing an Initial Switch Configuration
6 Performing an Initial Router Configuration
7 Configuring and Troubleshooting a Switched Network
8 Connecting and configuring Switch
9 Configuring Ethernet and Serial Interfaces
10 To design Local Area Network for a laboratory
11 Configuring WEP on a Wireless Router
12 Using the Cisco IOS Show Commands
13 Examining WAN Connections Output using commands such as ping, Traceroute, ipconfig
14 Implementing various LAN configurations using LAN kit (Benchmark).
15 Study and configure Firewall such as Cyberoam

J. C. Bose University of Science and Technology, YMCA, Faridabad, Haryana

Department of Computer Applications

Scheme and Syllabus

Bachelor of Computer Applications specialization in Data Science
(Semester III)
w.e.f(2024-25)

SEMESTER
III

BCA(Data Science) Scheme of Studies
Semester– III

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Terms		
1	Discipline Specific-Major	BCA-23-201	Data Structures	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCA-23-203	Object oriented Programming Using C++	4		4	25	75	100	4
3	Discipline Specific-Minor	BCA-23-205	Internet & Web Technology	4	-	4	25	75	100	4
4	Multidisciplinary	BCA-23-207	Algebra & Calculus	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-103-N3	Effective Corporate Communication	3	-	3	25	75	100	3
6	Value Aided Course	VAC-102-N1	Environment Science -II	3	-	3	25	75	100	4
8	Skill Enhancement Courses	BCA-23- 209	Data Structures Lab	-	4	4	15	35	50	2
9	Skill Enhancement Courses	BCA-23- 211	Object oriented Programming Using C++ Lab	-	4	4	15	35	50	2
10	Skill Enhancement Courses	BCA-23- 213	Internet & Web Technology Lab	-	2	2	15	35	50	1
			Total			**32**	**195**	**555**	**750**	**27**

No. of Credits: 4

L	T	P	Total		
4	0	0	4		

Sessional: 25 Marks

Theory: 75 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To understand the basic concepts of data structures and algorithms along with an introduction to strings and some basic search algorithms (Linear Search and Binary Search).
2. To understand and relate Arrays and linked lists in detail.
3. To become familier with the concept of stacks and queues along with their representations in memory.
4. To understand the representation and traversal of trees and graphs along with some algorithms in detail.

Syllabus:

Unit I: Introduction to Data Structure and Strings
Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-O notataion.
Strings: Introduction, Storing strings, String operations, Pattern matching algorithms, Linear search, binary search.

Unit II: Arrays and Linked List
Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, Sparse arrays. Searching and Sorting algorithms.
Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searchingin a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Garbage collection, Applications of linked lists.

Unit III: Stack and Queues

Introduction to stack, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Reverse Polish notation, Recursion, Evaluation of arithmetic operations.
Introduction to queue, Array and linked representation of queues, Operations on queues, Dequeues, Priority Queues, Applications of Queues.

Unit IV: Tree and Graph
Introduction to Tree, Representing Binary tree in memory, traversing binary trees using recursion and using stacks.
Introduction to graph, Matrix, List and linked representation of graphs, Traversal of the graph, Warshall's algorithm for the shortest path, Dijkstra algorithm for the shortest path, Minimum spanning tree: Prim's and Kruskal's algorithm.

Course Outcomes:

A student will be able to:

CO1 :	Understand the various types of data structures along with their advantages and disadvantages.
CO2 :	Analyze them to determine the time and computation complexity.
CO3 :	Implement search problem (Linear search and Binary search).
CO4 :	Access the performance of Arrays, Stacks, Queues, linked lists and trees, and also their time and computation complexity.
CO5 :	Implement tree and graph search, and traversal algorithms and determine their time and computation complexity

Text/ Reference Books:

1   Seymour Lipschutz, "Data Structure", Tata-McGraw-Hill
2   Aaron M. Tanenbaum, Data Structures using C/C++, PHI
     Horowitz, Sahni & Anderson-Freed, "Fundamentals of Data Structures in C", Orient Longman.
3   Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.
4   Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison-Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

Object Oriented Programming Using C++
BCA(DS)-III Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1   To understand the difference between object-oriented programming and procedural programming.
2   To learn basic concepts and syntax of C++.
3   To implement C++ classes using encapsulation and design principles.
4   To critically understand the syntax of a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, excption handling, templates etc.

Syllabus:

Unit I: Object Oriented Programming Concepts
Procedural Language and Object-Oriented approach, Characteristics of OOP, user-defined types, polymorphism, and encapsulation. Getting started with C++: syntax, data types, variables, string, function, namespace and exception, operators, flow control, recursion, array and pointer, and structure.

Unit II: Abstracting Mechanism and Memory Management
Classes, private and public, Constructor and Destructor, member function, static members, references;
Memory Management: new, delete, object copying, copy constructor, assignment operator, this input/output.

Unit III: Inheritance and Polymorphism

Derived Class and Base Class, Different types of Inheritance, Overriding member function, Abstract Class, Public and Private Inheritance, Ambiguity in Multiple inheritances, Virtual function,Friend function, Static function, Operator Overloading.
Template and Standard Template Library: Template classes, declaration, template functions, namespace, string, iterators, hashes, streams, and other types.

Unit IV Exception and File Handling

Exception and derived class, function exception declaration, unexpected exception, and exception when handling an exception, resource capture, and release.
Streams and File handling: I/O streams, fos.open, fos.close, I/O stream libraries.

Course Outcomes:

A student will be able to:
CO1:   Explore the difference between object-oriented programming and procedural programming.
CO2:   Learn basic concepts and syntax of C++.
CO3:   Implement C++ classes using encapsulation and design principles.
CO4:   Implement a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates, etc.

Text/ Reference Books:

1   Bjarne Stroustrup, The C++ programming language, Pearsons education
2   Robert Lafore, Object oriented programming using C++,PHI
3   Paul Deitel & Harvey Deitel, C++ How to program , Pearsons education
4.   Yashawant Kanetkar, Let Us C++, BFB

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No. of Credits: 4
    L   T   P   Total   Sessional: 25 Marks
    4   0   0   4   Theory: 75 Marks
                                                               Total: 100 Marks
                                        Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To learn the basic concepts of the internet, its history and various fundamental

    features of the world wide web like HTTP, TCPIP protocols etc.

2. To understand the utility of search engines, its components and working.

3. To understand the concepts of Web site design and acquaint them with advanced

    graphics features for designing effective web sites.

4. To analyze and implement the student the concepts of cascading style sheets and

    the basics of client-side scripting using JavaScript

Syllabus:

Unit I: Introduction to Internet and World Wide Web

Evolution and History of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol, Overview of TCP/IP and its services; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools.

Unit II: HTML

Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Textstyles; Text Structuring; Text colors and Background; Formatting text; Page layouts,

Unit III: Dynamic HTML

Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes, Text Boxes, Dynamic HTML, Features of DHTML,CSS, CSSP (cascading style sheet

positioning) and JSSS (JavaScript assisted style sheet), Architecture of Web Browser, The ID attributes, DHTML events.

Unit IV: Web Publishing
Hosting your Site; Internet Service Provider; Web terminologies, Phases of Planning and designing your Web Site; Steps for developing your Site; Choosing the contents; Home Page; Domain Names, Front page views, Hosting website on server and on cloud, Security issues related to website.

Course Outcomes:

A student will be able to:
CO1: Understand the basics of the internet, its applications and ways to connect to it and learned the basics and types of search engines.
CO2: Implement programs based open HTML and learned the need and basics of CSS and the concepts of client-side JavaScript
CO3: Evaluate the difference between client-side and server-side scripting
CO4: Implement how to import multimedia pages over the web

Text/ Reference Books:

1   Douglas E. Comer : Computer Networks and Internets.
2   Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.
3   Thomas A. Powell, "Web Design: The Complete Reference" , 4/e, Tata McGraw-Hill.
4   Wendy Willard, "HTML Beginners Guide", Tata McGraw-Hill.
5   Deitel and Goldberg, "Internet and World Wide Web, How to Program", PHI.

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1   To understand relations, equivalence relations and partitions with linear algebra.
2   To learn the ideas of the importance of multivariable calculus differentiation
3   To formulate the mathematical modelof multivariable calculus-Integration and sequences and series.
4   To Access the performance of the Series representation of functions

Syllabus:

Unit I: Matrices
Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, solving system of linear equation Cramer's Rule. Symmetric, Skew-Symmetric, Orthogonal and Unitary matrices, Rank of a Matrix, Consistency, Characteristic equation – Eigen values and Eigen vectors.

Unit II: Differential Calculus

Derivative of a function, Derivatives of Sum, Differences, Product & Quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain Rule and differentiation by substitution.

Unit III: Integral Calculus

Indefinite Integrals, Methods of Integration by Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcendental Functions, Reduction Formulae for simple and Trigonometric Functions, Definite Integral as Limit of Sum, Fundamental Theorem of Integral Calculus, Evaluation of definite integrals by substitution, using properties of definite integral.

Unit IV: Sequences and Series

Convergence of sequences and series, the convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.

Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence);

Course Outcomes:

A student will be able to:

CO1: Understand the systems of linear equations, diagonalize matrices and characterize quadratic forms

CO2: Compute the partial and total derivatives and maxima and minima of multivariable functions.

CO3: Utilize the multiple integrals and apply them to find areas and volumes of geometrical shapes,mass and centre of gravity of plane laminas.

CO4: Implement various tests to determine whether a given series is convergent, convergent or conditionally convergent

Text/ Reference Books:

1   H. Anton, I. Biven,S.Davis, "Calculus", Wiley, 10th edition, 2015.
2   Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.
3   J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017
4   G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.
5   Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012
6   Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
7   B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010.

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Effective Corporate Communication (ECC)
AEC-103-N3
BCA(DS)-III semester

No. of Credits: 3
L   T   P   Total   Sessional: 25 Marks
3   0   0   3   Theory: 75 Marks
                                                           Total: 100 Marks
                                              Duration of Exam: 3 Hours

Course Objectives:
CO I: To understand the appropriate grammatical structures in written forms.
CO II: To understand the significance of technical writing and formal communication
CO III: To develop and demonstrate effective writing skills in varied forms.
CO IV: To understand how to deliver persuasive presentations.

Unit-I: Writing Skills and Basics of Grammar
Subject-verb agreement; sentence correction; tense-verb usage; Composition of a Paragraph; Characteristics of a Good Paragraph; Use of Idioms and Proverbs, Literary Tropes and Use of Figures of Speech.

Unit-II: Technical Writing and Reports
SPSE structure; IMRD structure; Report Writing: Types of Reports and Structure of a Long Report.Hedging, Nominalization; Memos; Agenda and MoM; Case Study Method; Presentations; Business Letters-quotation and placing order.

Unit-III: Drafting proposals
From essays to proposals; Types of Essay Writing:Structure of an essay; Argumentative essays; Expository essays; Narrative essays; and Descriptive essays;Structure of an EssayReading, Writing and Comprehension. Drafting proposals;Synopsis Writing;Definitions; Comparisons and Contrasts; Hedging; Nominalization, proposal presentations

Unit-IV: Exercises in Proposal Presentations
Drafting and Presenting Proposals.

Course Outcomes:
CO I: Use appropriate grammatical structures in written forms.
CO II: Understand the significance of technical writing and formal communication.
CO III: Develop and demonstrate effective writing skills in varied forms.
CO IV: Deliver persuasive presentations

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No. of Credits: 3
  L   T   P   Total   Sessional: 25 Marks
  3   0   0   3   Theory: 75 Marks
                                                             Total: 100 Marks
                                             Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

COURSE OUTCOMES:
At the completion of this course, the learner will be able to:
CO1: Understand about different types of pollution, their sources and their adverse impacts.
CO2: Develop understanding on the climate change concept, climate change adaptation and mitigation.
CO3: Understand broad aspects of environmental management systems and various methods followed for assessment of environmental quality and associated risks.
CO4: Learn about the major environmental conventions/protocols adopted at national and international level to protect and conserve environment.

Unit I: Environment Pollution and Health (6 hrs)
Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution.
A) Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter, and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards.
B) Water pollution: Sources of water pollution; River, lake, and marine pollution, groundwater pollution; water quality. Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.
C) Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.
D) Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health.
E) Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.

Unit II: Climate Change: Impacts, Adaptation and Mitigation (6 hrs)
Understanding climate change: Natural variations in climate; Structure of atmosphere; Anthropogenic climate change from greenhouse gas emissions– past, present and future; Projections of global climate change with special reference to temperature, rainfall, climate variability and

extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent.

Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept

of carbon intensity, energy intensity, and carbon neutrality; Energy efficiency measures; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice. **Unit III: Environmental Management (6 hrs)**

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights.

Environmental legislations in India: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules.

Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Environmental risk assessment, Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Eco mark scheme.

Unit IV: Environmental Treaties and Legislation (6 hrs)

An overview of the following national and international cooperation, agreements, conventions, protocols - adoption, signature, ratification and entry into force; binding and nonbinding measures; Conference of the Parties (COP):

A) Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Status phase-out of production and consumption of Ozone Depleting Substances by India.

B) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants; Minamata Convention on Mercury.

C) United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions.

D) National Green Tribunal; Some landmark Supreme Court judgements.

E) Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Unit V: Case studies/ Field Work (6 hrs)

The students are expected to be engaged in some of the following or similar identified activities:

a) Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.

b) Discussion on one national and one international case study related to the environment and sustainable development.

c) Campus environmental management activities such as solid waste disposal, water management and sanitation and sewage treatment plant

Suggested Readings:

1. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.

2. Ahluwalia, V. K. (2015). *Environmental Pollution, and Health*. The Energy and Resources Institute (TERI).

3. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.

4. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.

5. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change—Human and Policy Dimensions 21: 25-33.

6. Bohra, Saroj, Judicial Intervention and Evolution of Environmental Principles and Doctrines (January 7, 2019). Available at SSRN: https://ssrn.com/abstract=3311406 or http://dx.doi.org/10.2139/ssrn.3311406

7. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards/

8. India Code – Digital repository of all Central and State Acts: https://www.indiacode.nic.in/

9. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.

10. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.

11. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.

12. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.

13. Masters, G. M., & Ela, W. P. (2008). *Introduction to environmental engineering and science* (No. 60457). Englewood Cliffs, NJ: Prentice Hall.

14. Miller, G. T., & Spoolman, S. (2015) Environmental Science. Cengage Learning.

15. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf

16. Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition.Routledge.

17. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

18. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.

19. Tiefenbacher, J (ed.) (2022), Environmental Management - Pollution, Habitat, Ecology, and Sustainability, Intech Open, London. 10.5772/

20. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5

21. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle

				BCA-23-209	
				Data Structures Lab	
				BCA-III Semester	

Discipline Specific Course					
No. of Credits:		2			
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a program to find an element in list using linear search					
2.Write a program to find an element in list using binary search.					
3.Write a program to concatenate two strings of different lengths					
4. Write a program to transpose a given matrix					
5. Write a program to implement various Sorting Algorithms.					
6. Write a program for Implementation of stacks using array.					
7. Write a program to perform all operations of queues.					
8. Write a program to perform infix to postfix using stack					
9. Write a program to implement Link List.					
10. Write a program to implement (preorder, in order,postorder) traversal in a tree..					

BCA-23-211	
Object-oriented Programming Using C++ Lab	
BCA-III Semester	

Discipline Specific Course						
No. of Credits:		2				
L	T	P	Total		Sessional:	15 Marks
0	0	4	4		Theory:	35 Marks
					Total:	50 Marks
					Duration of Exam:	3 Hours

List of Experiments
1. WAP to check a Number is prime or not
2.Write a program to find an element in list using binary search.
3. WAP to implement Student grade using Classes
4. . WAP to compute total salary of employees using containership
5. write a program to calculate grade of students using array of objects write a program to calculate area of different shapes using function overloading a) circle b) square c) cylinder d) triangle e) cone
6. Write a program to find compound interest using default argument
7. write a program to do swapping of two numbers using a) call by value b) call by reference c) call by address
8. Write a program to have 2 times addition using argument passing
9. write a program to addition of two Matrix using argument passing
10. Write a program to add two complex number using constructor function
11.WAP to implement friend function to add two complex numbers
12. write a program to add two complex number by using overloading binary + operator.
13. write a program to implement overloading unary - operator using point class
14. write a program to compare two length object by using == operator
15. Write a program to implement incremental operator on time class object using overloading function
12write a program to exchange the values of two variables using function templates
12write a program to implement an inheritance hierarchy of class quadrilateral, parallelogram, triangle and square use quadrilateral as super class for the hierarchy specify the instance variable and member function for each class,the private instance variable of quadrilateral should be xy coordinate pair for each of four numeric Write a program that creates a object of class and output of each as area (except quadrilateral) Write a program to implement stack using class template that offers the following services for generic data type:- a) push an element on a stack b) pop an element from a stack

BCA-23-211						
Internet & Web Technology Lab						
BCA-III Semester						
Discipline Specific Course						
No. of Credits:		1				
L	T	P	Total		Sessional:	15 Marks
0	0	2	2		Theory:	35 Marks
					Total:	50 Marks
					Duration of Exam:	3 Hours
List of Experiments						
1. Write a program using basic tags:- a)Bold b) Italic c) underline d) paragraph						
2. create a table for railway time table						
3. create a student table with attributes (name,age,roll no,class, semester)using cell spacing(4) and cell padding (3,4,5)						
4.Write a program to insert an image in the web page,use atleast 2 attributes of image ising H1 H2 tags.also write description of image						
5. Wap to use frames in a web page implementing different elements						
6. WAP to create a University Website						
7. WAP to add two numbers using JavaScript						
8. Wap to find a factorial of number using recursion in JS.						
9.Wap to add two numbers make use of the functions called sum and pass tha parameter						
10. WAP to create a University Website						

BCA(DS)
SEMESTER
IV

BCA(DS) Scheme of Studies
Semester– IV

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23-202	Database Management System	3	-	3	25	75	100	3
2	Discipline Specific-Major	BCA-DS-23- 204	Probability and Statistics	3		3	25	75	100	3
3	Discipline Specific-Major	BCA-DS-23- 206	Data Science Using R	3	-	3	25	75	100	3
4.	Discipline Specific-Major	BCA-23-208	Logical Organization of Computer	4		4	25	75	100	4
5	Discipline Specific-Minor	BCA-23-210	Wireless Communications	4	-	4	25	75	100	4
6	Ability Enhancement Courses	AEC-108-N1	Critical Thinking and Rhetorical Communication	2	-	2	25	75	100	2
7	Value Added Course	VAC-108-N1	Indian Knowledge System	2	-	2	25	75	100	2
8	Discipline Specific Lab	BCA-23-212	Database Management System Lab	-	4	4	15	35	50	2
9	Discipline Specific Lab	BCA-DS-23- 208	Data Science using R Lab	-	4	4	15	35	50	2
10	Discipline Specific Lab	BCA-DS-23- 210	Probability & Statistics Lab	-	4	4	15	35	50	2
			Total			**33**	**220**	**630**	**850**	**27**

No. of Credits: 3
  L   T   P   Total   Sessional: 25 Marks
  3   0   0   3   Theory: 75 Marks
                                                    Total: 100 Marks
                                        Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1   To understand basic terminology used in database systems, basic concepts, the applications of database systems and understand role of Database administrator in DBMS.
2   The critically evaluate the various data model like Hierarchical model, Network Model, Relational model, E-R model and will be able to make E-R diagram from data given by user and table from E-R diagram.
3   The students will become familiar with relational database theory and be able to write relational algebra expressions for query and will be able to understand the logical design guidelines for databases, normalization approach, primary key, super key, foreign key concepts.
4   To design the basic issues of transaction processing, query optimization and Concurrency, security, and control.

Syllabus:

Unit I: Basic Concepts of DBMS and Database System Architecture

Introduction to Database, Purpose of Database Systems,Characteristics of Database Approach, advantages, and disadvantages of database system. Data, Information, Records, and files. Database Administrator, Database Designers, DBMS users, DBMS Functions and Components, Databases versus information retrieval. Data models, scheme, instances, Categories of Data Models, Three-Schema Architecture, Data Independence, Component modules of a DBMS and their interactions. Centralized DBMSs Architecture, Two-Tier Client/Server Architectures for DBMS, Three-Tier and n-Tier Architectures for Web Applications, DBMS Languages, Classification of DBMS.

Unit II:**Entity-Relationship Model**

Relational Data Model - Brief History, Relational Model Terminology, Relational Data Structure, Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints

over Relations Relational Model Constraints, Relational Database Schemes, Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams, abstraction and integration.

Basic Concepts of Hierarchical and Network Data Model

Unit III: Relational Algebra and Relational Calculus

Unary Relational Operations: Select and Project, Sequence of Operations, rename Operation, Relational algebra from set theory, Cartesian product, Binary relational operations, additional relational operations such as Generalized Projection, Aggregate Functions and Grouping etc. Tuple relation calculus, Domain relation calculus.

Unit Iv: Relational Database Design:

Functional dependencies, Modification anomalies, Ist to 3rd NFs, BCNF, 4th and 5th NFs, computing closures of set FDs, SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, query processor, concept of security, concurrency and recovery, introduction to distributed DBMS.

Course Outcomes:

A student will be able to:

CO1:   Understand basic terminology used in database systems, basic concepts, and the applications of database systems and understand the role of Database administrator in DBMS. The students will also be able to understand various data models like the Hierarchical model, Network Model, Relational model, E- R model and will be able to make E-R diagrams from data given by the user and table from the E-R diagram

CO2:   Work with relational database theory and be able to write relational algebra expressions for queries.

CO3:   Demonstrate the logical design guidelines for databases, normalization approach, primary key, super key, and foreign key concepts.

CO4:   Understand the issues of transaction processing, query optimization and Concurrency, security and control.

Text/ Reference Books:

1   Elmasri&Navathe, "Fundamentals of Database Systems", 5th edition, Pearson Education.
2   Thomas Connolly Carolyn Begg, "Database Systems", 3/e, Pearson Education
3   C. J. Date, "An Introduction to Database Systems", 8th edition, Addison Wesley N. Delhi.

No. of Credits:	3					
L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1   To Apply probability theory to set up tree diagrams
2   To Describe the properties of discrete and continuous distribution functions and use method of moments and moment generating functions
3   To Assess the consistency, efficiency and unbiasedness of estimators and apply method of maximum likelihood estimation
4   To Apply the Central Limit Theorem and use statistical tests in testing hypotheses on data

Syllabus:

Unit I: Random Variables and Distribution Functions
Introduction to Probability,Probability Rules: sum and product of probability, joint probabilityDiscrete and continuous random variables - distribution function and its properties - probability mass function and probability density function - discrete and continuous probability distributions - Binomial, Geometric, Poisson, Uniform, Exponential and Normal distributions.

Unit II: Moments and Moment Generating Functions and Variables
Expectation of a random variable – probability generating function – properties - moment generating function.Two dimensional random variables: Joint marginal and conditional distribution functions - independence of random variables.

Unit III: Descriptive Statistics

Types of data - primary and secondary data, classification and representation of data, formation of frequency distribution, various measures of central tendency such as mean, mode, median, standard deviation, covariance, concept of skewness and kurtosis.

Unit IV: Correlation and Curve Fitting

Correlation and regression analysis - rank correlation - curve fitting by least square methods, fitting a straight line, parabola, power curve and exponential curves (no derivation, numerical problems only).

Course Outcomes:

A student will be able to:
CO1:   Appreciate the importance of probability and statistics in computing and research.
CO2:   Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries.
CO3:   Use appropriate statistical methods in the analysis of simple datasets.
CO4:   Interpret and clearly present output from statistical analyses in a clear concise and
        understandable manner.

Text/ Reference Books:

1   Richard Arnold Johnson, Irwin Miller, John E. Freund , Miller & Freund's Probability and Statistics for Engineers, Prentice Hall, 2011.
2   Dr. P. Kandaswamy, Dr. K. Thilagavathy and Dr. K. Gunavathy, Probability and Queuing Theory, Revised edition, S. Chand Publishing, 2013.
3   T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill, 2nd edition.
4   Goon, A.M., M. K. Gupta and B. Das Gupta Fundamentals of Statistics- Vol. I, World Press Ltd, Kolkata, 2002.
5   Gupta, S.C. and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 2002.
6   Hogg, R.V. and A. Craig, Introduction to Mathematical Statistics, McMillan Publishing co., Inc. 1978.
7   Mood A.M., F.A. Graybill and D.C. Boes, Introduction to Theory of Statistics McGraw Hill Book Co., 1974.

BCA-DS-23-206
Data Science Using R
BCA-IV Semester

No. of Credits:	3					
L	T	P	Total		Sessional:	25 Marks
3	0	0	3		Theory:	75 Marks
					Total:	100 Marks
					Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. Tounderstandhowthenatureofthedatacollection,thedataitself,andtheanalysisprocesses relatetothekindsofinferencesthatcanbedrawn.
2. To design Framework for applying R to their own domain-specific problems and understand the concepts of objects and assignment Understand the concepts of vector and data type.
3. To Introduce the resources for continuing to develop their R skill set.
4. To Analyze the ability to perform basic data transformation, analysis, and visualization with R.

Syllabus:

Unit I: Introduction to Data Science
Data science: definition of data, data types, meaning of variables, wholeness of data analytics, data processing chain, data distributions, Paths to data science, data mining, data warehousing, difference between database and data warehouse, advices for new data scientists, introduction to cloud, artificial intelligence, Machine learning, applications in real world, learning approaches: supervised, unsupervised.

Unit II: Introduction to R
What is R, History of R, Installing R, Package installation, choosing IDE, first program, help in R, Some information about R commands, special values, Objects, Functions, Simple Manipulations: Vectors and numbers, Matrices and arrays, Factors, List, data Frames

Unit III: Programming using R

Function Creation, scripts, Logical operators, Conditional Statements, Loops in R, switch Statement. List and Data Frames: Creating a list, Common List operations, Recursive list, creating a datagram, common data frame operations, using lapply () and sapply () functions. Object oriented programming with R, S3 Classes, S4 Classes, Reference Classes

Unit IV: Data handling Mathematical and statistical Concept using R

Saving and loading R data, import and export to CSV files, import and export via ODBC, Debugging Techniques in R, Statistical Graphics: Base Graphics, ggplot2, Maximum, Minimum, Frequency distribution, Measures of central tendency, Hypothesis testing, Correlation, Different statistical distribution.

Course Outcomes:

A student will be able to:
CO1:   Learn how to explore new data sets.
CO2:   Understand basic concepts such as data type and index and use them in their work.
CO3:   Demonstrate use of basic functions, Conceptualize, and create loops to solve different types of problems.
CO4:   Create their own customized functions, Construct tables and figures for descriptive statistics.

Text/ Reference Books:

1   SandeepRakshit, R for Beginners, McGraw-Hill Education
2   Hadley Wickham,GarrettGrolemund , Hands-On Programming with R: Write Your Own Functions and Simulations.
3   Tilman M. Davies, The Book of R:A first course in Programming and Statistics.
4   Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson
5   Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R , Springer, 2016
6   By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, A Beginner's Guide to R (Use R) Springer 2009

BCA-23-208
Logical Organisation of Computer
BCA-IV Semester

No. of   4
Credits:

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
1   To develop an understanding of components of computer,how Computer Systems work and the basic principles
2. To make students understand the concept of microprocessor architecture and peripherals and I/O interfacing.
3. To learn the concepts of parallel processors and pipelining techniques.
4. To Study the concept of memory organization and its techniques.

UNIT-I Functional blocks of a computer:

CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT-II Introduction to x86 architecture:
CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.
Memory system design: semiconductor memory technologies, memory organization.
Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT-III Pipelining:
 Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT-IV Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size Vs block size, mapping functions, replacement algorithms, write policies.

Course Outcomes:
After completion of this course, the students will be able to perform the following:
1. Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Write assembly language program for specified microprocessors using different data representations and design the ALU, Control Unit and CPU of a computer system.
3. Analyse concepts of parallel processors and pipelining techniques
4. Given a CPU organization, apply design techniques for memory interfacing and interleaving.

TextBooks/References:
1. **"**Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
3. "Computer Architecture and Organization", 3rd Edition by John P. Hayes WCB/McGraw-Hill
4. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
5. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

No. of Credits: 4
  L   T   P   Total   Sessional: 25 Marks
  4   0   0   4   Theory: 75 Marks
                                                              Total: 100 Marks
                                              Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1   To provide an overview of the Wireless Communication Networks area and its applications and examples of wireless communication devices.
2   To understand the various terminology, principles, devices, schemes, concepts, algorithms, and different methodologies used in Wireless Communication Networks.
3   To Introduce various wireless systems and standards such as GSM and their basic operation cases. It also deals with second-generation and third-generation wireless networks.
4   To understand the characteristics of different multiple access techniques and it provides an overview of the need for Cell splitting and Cell sectoring in cellular networks.

Syllabus:

Unit I: Introduction to Wireless Communication System
Evolution of wirelesscommunications, examples of wireless communication systems, comparison of various wireless systems.
Modern Wireless Communication System: Second generation cellular networks: GSM, third generation wireless networks: CDMA, Introduction to 4G wireless networks, wireless in local loop, wireless local area networks, Bluetooth and Personal Area Networks.

Unit II: Introduction to Cellular Mobile Systems and Design Fundamental
Spectrum Allocation, Basic cellular Systems, performance criteria, Operation of Cellular systems, Analog cellular systems, Digital cellular Systems.

Cellular System Design Fundamentals**:** Frequency Reuse, channel assignmentstrategies, hand off strategies (MAHO, MCHO, NCHO), Interference and system capacity, tracking and grade off service, improving coverage and capacity: Cell splitting, Cell sectoring, Zone concepts.
.

Unit III: Multiple Access Techniques for Wireless Communication

Introduction to Multiple Access, FDMA, TDMA, spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit IV: Wireless Networking

Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in the wireless network, wireless data services, common channel signaling, ISDN (Integrated Service Digital Networks), Advanced Intelligent Networks.

Course Outcomes:

A student will be able to:
CO1: Aware of the overall GSM cellular concept along with Cellular systems from 1G to 3G, Wireless 4G systems.
CO2: The students will be aware of the Fundamentals of cellular communications such as hexagonal cell geometry, Co-channel interference, Cellular system design, and Sectoring using directional antennas
CO3: Have Knowledge of different spread spectrum techniques and an understanding of design considerations for how to effectively share spectrum through multiple access
CO4: Understand the basic principles channel allocation and handoffs and awareness of the technologies used in Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA)

Text/ Reference Books:

1   J. Goldsmith, Wireless Communications, Cambridge University Press, 2005.
2   D. Tse and P. Viswanath, Fundamentals of Wireless Communications, Cambridge University Press, 2005.
3   A. Molisch, Wireless Communications, John Wiley & Sons, 2005.
4   S. Haykin and M. Moher, Modern Wireless Communications, Pearson Education, 2005.
5   T. S. Rappaport, Wireless Communications, Prentice Hall, 1996.
6   G. L. Stuber, Principles of Mobile Communications, Kluwer, 1996.
7   T. Cover and J. Thomas, Elements of Information Theory, John Wiley & Sons, 1991.

AEC-108-N1
Critical Thinking and Rhetorical Communication
BCA-IV Semester

No. of Credits: No. of Credits: No. of Credits:
   L   L   L   L   L   L
   2   2   2   2   2   2

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Syllabus:

Unit 1: Introduction to Critical Thinking and Rhetoric
Definition and types: Analysis, Communication, inference, Observation; Problem-Solving; Inductive and Deductive Reasoning; Edward de Bono's Thinking Hats; The Rhetorical Situation: Purpose; Audience; Topic and Context; Rhetorical strategies: compare; contrast; classify; describe; Rhetorical devices: alliteration and amplification.

Unit II: Content Analysis and Articulation
Comprehension of core ideas of an article; Identify credible sources; Evaluate and respond to arguments; Assess alternative viewpoints; Test hypotheses against relevantcriteria; analyze information and form judgments; **CRAAP test**, these queslions focus on thc currency, relevance, authority, accuracy and purpose of a source of information; bias and eliminating bias, evidence-based arguments, considering alternatives views, popular media and information literacy.

Unit III: interview Skills
STAR method: Situation, Task, Action and Result; mock-interview exercises.

Unit IV: Conflict Resolution and Group Discussion
conflict; 3 P's of conflict resolution: Problem, People and Process; strategies to resolve conflict: avoid; compromise; accommodate; compete, collaborate; GD exercises with topical issues and chronic problems of regional, national and international importance; including leadership and team-building skills.

Course Outcome:
1. Students will be familiarized with the concept and significance of critical thinking.
2. Students demonstrate critical thinking skills including comprehension analysis and interpretation of information in communication process.

3. Students are able to articulate content for clear and persuasive communication
4. Students can apply conflict-resolution and problem-solving approaches towards building and managing teams for better organizational communication.

VAC-108-N1
Subject Name: Introduction to Indian Knowledge System
BCA-IV Semester

NO. OF CREDITS: 2

L	**T**	**P**	**Total**		**Sessional**
: 25 Marks					

Final Exam   : 75 Marks

2	0	0	2		**Total : 100**
Marks					

Duration of Exam : 3

hours

NOTE:Questionpaperwillhavetwoparts.Part-
1willbecompulsoryandhave10questionsofequalmarkscoveringtheentiresyllabus.
AnyfourquestionshavetobeattemptedoutofsixfromPart-2.

Course Objectives:
1. ToprovideanoverviewofdifferentknowledgesystemsoriginatedinIndia.
2. TointroduceinthestudentsacomprehensiveunderstandingofIndianethicsandval
   ues.

UNIT-I: Introduction and foundational concepts of IKS (4 Hrs)

OverviewofvariousstreamsofknowledgeinIndiaandclassificationofancientIndiantex
ts;VariousphilosophicalsystemsofIndiaandfundamentalprinciplesinlaidinthem

**UNIT-II: Psychology from Indian perspective, Yoga and Indian Linguistics
(4 Hrs)**
Introduction to Ashtanga Yoga; Rasa Siddhanta of Natyasastra(theory of
emotions), Panini's contribution to linguistics; Contributions of the Vakyasastra
and Pramanasastra to linguistics

UNIT-III: Indian Mathematics and Astronomy (8 Hrs)
An overview of Indian mathematics, Development of arithmetic geometry and
Trigonometry; Introduction to spherical geometry and calculus in India.
Vedic system of arithmetic computation, Vedic sutra for arithmetic computation.
An introduction to Indian Astronomy, Pre and Post Siddhantic period

UNIT-IV: Medicinal traditions in India (3 Hrs)
An Introduction to Ayurveda; Distinct features of Ayurveda, as compared to
Alopathy; Excerpts from Sutrasthana

UNIT-V: Indian Architecture and Planning (3 Hrs)
Traditional measurement system used in Vastusastra, Prescriptions for residential Vastu, City planning as per Vastusastra

UNIT-VI: Economics, Management and Governance (4 Hrs)
An overview of Indian economic thought- Arthasastra and Nitisastra, Leadership and Motivation,
Planning and Organizing, Financial Management etc.

SUGGESTED BOOKS:
1. Introduction to Indian Knowledge System, B. Mahadevan, V. R. Bhat, NagendraPavana R. N., PHI. 2022
2. Yoga System of Patanjali, J. H. Woods, Bharatiya Kala Prakashan 2009
3. Indian Philosophy Vol I and II, S. Radhakrishnan, Oxford University Press. 2009
4. Mayamatam Indian Treatise on Housing, Architecture and Iconography (2 volumes), Bruno Daegens, Indira Gandhi National centre for Arts. 2007
5. Vedanta and Management: Relevance of Vedantic Concepts in Modern Management Practices, N. V. Dave, Deep & Deep. 2002
6. Tantrasagraha with detailed Mathematical Explanatory Notes, K. Ramasubramanian, M. S. Sriram, Hindustan Book Agency. 2011
7. Karanapadhati of PutumanaSomayaji, VenkateswaraPai, Ramasubramanian, M. S. Sriram and M.D. Srinivas, Hindustan Book Agency 2018
8. New Delhi 2002
9. The NighaMotilalBanarsidass Publishers 2015
10. ga Literature, Archak K.B. Kaveri Books, New Delhi, 2012
11. Textbook of Ayurveda: Volume 1 - Fundamental Principles of Ayurveda, Vasant Lad, Ayurvedic Press; UK ed. Edition 2002
12. Sanskrit Academy, Hyderabad. 2010
13. Vedic Mathematics, Jagadguru Swami Sri BharatiKrsnaTirathjiMaharaj, MotilalBanarsidass Publishers, Delhi 1965
14. LilavatiBhaskaracarya: A Treatise of Mathematics of Vedic Tradition, K S Patwardhan, S A Naimpally and ShyamLal Singh, MotilalBanarsidass Publishers Pvt Ltd, Delhi 2006

BCA-23-212				
Data Base Management System Lab				
BCA-IV Semester				

Discipline Specific Course

No. of Credits:		2			
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours

List of Experiments

1.Create a table and display data from table to understand the concept of create, insert and select command. Use of update, Delete, Truncate command to understand the concept of DML.Apply Alter command and Drop command to understand the concept of DDL.

2. Apply constraints to understand the concept of Primary Key, Foreign key, Unique key, integrity constraints

3. Apply Operators, Range Searching, and Pattern Matching on data to understand the concept of And, Or, Not, Arithmetic Operator, Like operator, In, Not in operator

4. Write a program to execute DDL(Create, Alter, Drop and Truncate) commands with examples.

5. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause

6. Write a program to execute DML(Insert, Update, Delete and Select) commands with examples.

7. Write a program to perform join operations on two tables.

8. Write a program to execute Transaction control language(Commit, Rollback and Save) commands with examples.

9. Develop GUI using front end tool

10. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.

BCA-DS-23-208	
Data Science using R Lab	
BCA-IV Semester	

Discipline Specific Course

No. of Credits:		2			
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours

List of Experiments

1. WriteaprograminRtotakeinputfromtheuser(nameandage)anddisplaythevalues.Also printtheversionofRinstallation.

2. WriteaprograminRto create a sequence of numbers from 20 to 50 and find the mean numbers from 20 to 60 and find sum of numbers from 51 to 91.

3. WriteanRprogramtocreateavectorwhichcontains10randomintegervaluesbetween-50 and +50.

4. Write a program in R to find the factors of a given number.

5. Write a program in R to find the maximum and the minimum value of a given vector.

6. Write a program in R to convert a given matrix to a 1 dimensional array.

7. Writeaprogram inRtocreateanarrayoftwo3x3matriceseach with3rows and3columns from two giventwo vectors.

8. Write a program in R to create an 3 dimensional array of 24 elements using the dim() function.

9. Write a program in R to get the statistical summary and nature of the data of a given data frame.

10. Write a program in R to extract first two rows from a given data frame.

11. Write a program in R to create a matrix taking a given vector of numbers as input. Display the matrix.

12. Write a program in R to access the element at 3rd column and 2nd row, only the 3rd row andonly the 4th column of a given matrix.

BCA-DS-23- 210		
Probability & Statistics Lab		
BCA-III Semester		
Discipline Specific Course		

No. of Credits:		2				
L	T	P	Total		Sessional:	15 Marks
0	0	2	2		Theory:	35 Marks
					Total:	50 Marks
					Duration of Exam:	3 Hours

List of Experiments

1. Write a program using excel for basic functions:-
a)Opening & Saving
b) Entering data
c) Arithmetic operations
d) Using Formulas

2. Write a program for generating random numbers in excel.

3. Write a program to create Frequency tables and histograms.

4.Write a program to calculate measures of central tendency (Mean, Mode, Median)

5. Write a program to calculate measures of variations : Standard Deviation,variance, Covariance

6. Write a program to calculate to measure skewness in data.

7. Write a program to implement linear regression.

8. Write a program to implement correlation coefficients.

9.Case study 1 on employee dataset.

10.Case study 2 on medical dataset.

SCHEME AND SYLLABUS
For
BCA (Industry Integrated) Course
(Specialization: Data Science)
(w.e.f Session 2019)
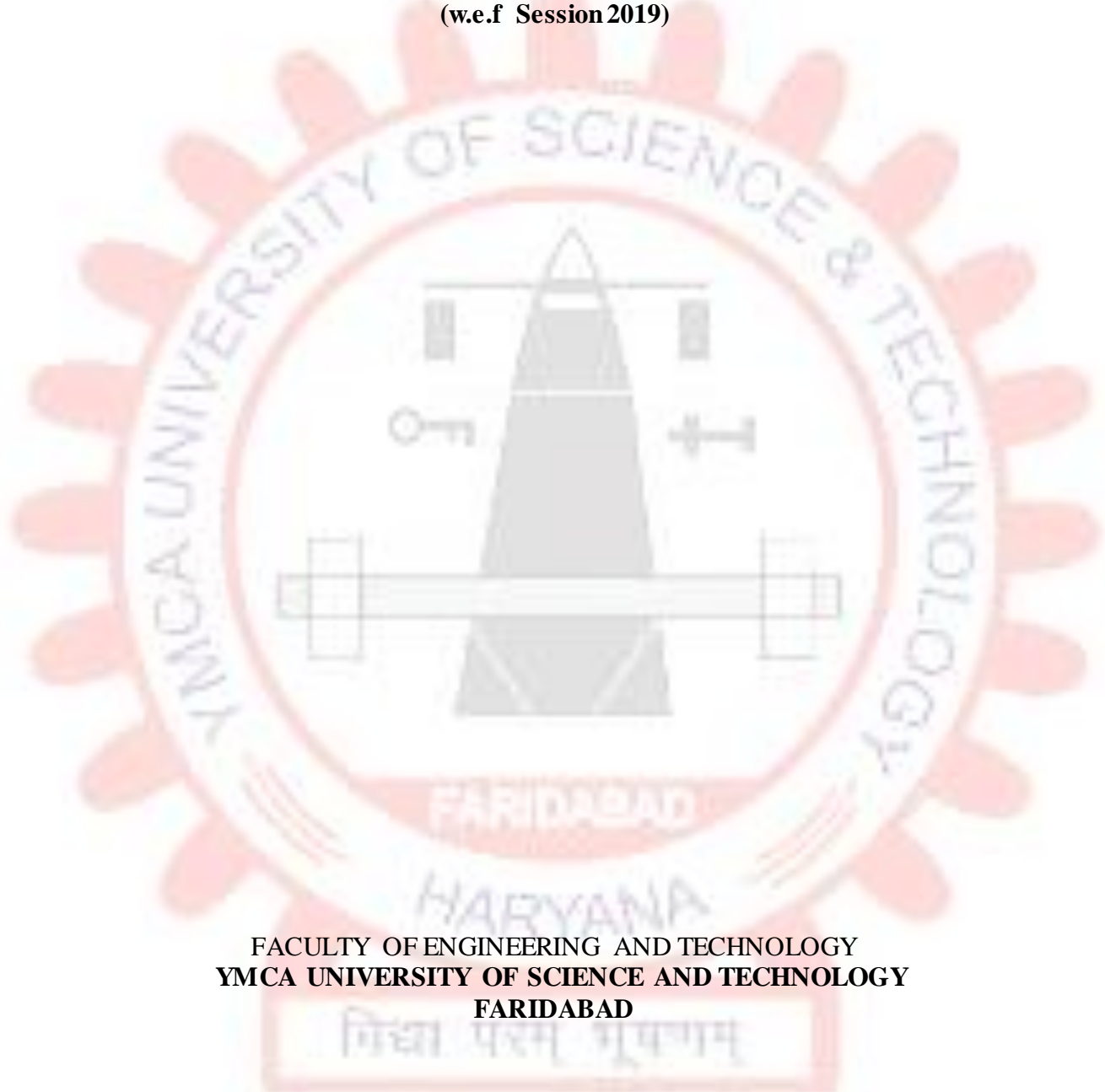
FACULTY OF ENGINEERING AND TECHNOLOGY
YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY
FARIDABAD

SYNOPSIS OF

SCHEME OF STUDIES &
EXAMINATIONS 3 YEARS
BCA (Industry Integrated: Data Science)

SEMESTER I-VI

Total Credits: 142

Total Theory Subjects (including Environment Science):27
Total MOOC Subject: 01
Total Audit Subject: 01
Total General Elective: 04
Total Labs (including Presentations and Group Discussions): 26
Industrial Training (I & II): 02

Total Marks:

Sessional/Internals	End Term	Total
1500	3050	4550

Itemized Break-up:

	No.	Hours/week/subject	Marks	Credits
Theory Subjects	26	3(26*3)	2600	78
MOOC Subject	1	4	QUALIFYING	4
Environmental Studies	1	3	QUALIFYING	NO CREDIT
Audit Course	1	2	QUALIFYING	NO CREDIT
Labs	14	4(14*4)	1050	28
General Elective	4	3(4*3)	400	12
Presentation	6	2(6*2)	150	6
Group Discussion	6	2(6*2)	150	6
Industrial Training-I	1		100	4
Industrial Training-II	1		100	4
Total	61	179	4550	142

CHOICE BASED CREDIT SYSTEM SCHEME

Discipline Core Courses (DCC)

S. No.	Name of the subject	No. of Lectures + Tutorials	No. of Credits
1	Programming in C	3	3
2	Internet and Web Fundamentals	3	3
3	Computer Fundamentals and Organization	3	3
4	Algebra and Calculus	3	3
5	Self-Guided Improvement	3	3
6	Introduction to Database Management Systems	3	3
7	Introduction to Data Structures	3	3
8	Introduction to Data Science	3	3
9	Professional English	3	3
10	Fundamentals of Management	3	3
11	Python Programming	3	3
12	Probability and Statistics	3	3
13	Principles of Operating Systems	3	3
14	Data Warehouse and Data Mining	3	3
15	Artificial Intelligence	3	3
16	Programming in Java	3	3
17	Scientific R Programming	3	3
18	Computer Networks	3	3
19	Organizational Behavior	3	3
20	Big Data - I	3	3
21	Machine Learning - I	3	3
22	Intellectual Property and Rights	3	3
23	Big Data - II	3	3
24	Machine Learning - II	3	3
25	Employability Skills	3	3
26	Bio Informatics	3	3

List of General Elective Courses

Semester III
(General Elective I)

Sr. No.	Code	Name of the Subject	Internal	External	No. of Credits
1	GEC-DS-1	Discrete Structures	25	75	3
2	GEC-DS-2	Principles of Software Engineering	25	75	3
3	GEC-DS-3	Computer Organization-I	25	75	3

Semester IV
(General Elective –II)

Sr. No.	Code	Name of the Subject	Internal	External	No. of Credits
1	GEC-DS-4	Operation Research	25	75	3
2	GEC-DS-5	Software Testing	25	75	3
3	GEC-DS-6	Computer Organization-II	25	75	3

Semester V
(General Elective –III)

Sr. No.	Code	Name of the Subject	Internal	External	No. of Credits
1	GEC-DS-7	Multimedia Technologies	25	75	3
2	GEC-DS-8	Principles of Accounting	25	75	3
3	GEC-DS-9	Management Information System	25	75	3

Semester VI
(General Elective –IV)

Sr. No.	Code	Name of the Subject	Internal	External	No. of Credits
1	GEC-DS-10	MATLAB	25	75	3
2	GEC-DS-11	Business Economics	25	75	3
3	GEC-DS-12	E-Business	25	75	3

Mandatory Audit Course (MAC) (Mandatory to Qualify)

S. No.	Code	Name of Subject	No. of Contact Hours
1	AUD-1	German 1	2
2	AUD-2	German 2(with German 1 as pre requisite)	2
3	AUD-3	French 1	2
4	AUD-4	French 2(with French 1 as pre requisite)	2
5	AUD-5	Sanskrit 1	2
6	AUD-6	Sanskrit 2(with Sanskrit 1 as pre requisite)	2
7	AUD-7	Personality Development	2
8	AUD-8	Interview and Group Discussion Skills	2
9	AUD-9	Yoga and Meditation	2
10	AUD-10	Art of Living / Living Skills	2
11	AUD-11	Contribution of NSS towards Nation / Role of NSS	2
12	AUD-12	Physical Education	2

MOOC Subject (List is provided by the Svayam Portal of UGC)

Paper Code	Course	Course Requirement (Hrs)	Credits	University Exams	Internal Assessment	Total	Course Type
	MOOC*	4	4				

Note: Any one subject from the list of MOOC subject is to be *qualified during the Semester-1 to Semester-V* through Svayam Portal of UGC. For this subject, the Institute or the Department concerned will appoint a coordinator to track the activities of the student and will ensure that all students of the programme have qualified the MOOC subject in the specified time period.

	LABS AND PROJECTS		
Sr. No.	Name of the Lab	No. of Contact Hours	Credits
1	C Programming Lab	4	2
2	Internet Fundamentals lab	4	2
3	PC Software Lab	4	2
4	Data Structures Lab	4	2
5	Database Management Systems Lab	4	2
6	Language Lab	4	2

7	Python Lab	4	2
8	Operating Systems Lab	4	2
9	Java Programming Lab	4	2
10	R Programming Lab	4	2
11	Big Data I Lab	4	2
12	Machine Learning I Lab	4	2
13	Big Data II Lab	4	2
14	Machine Learning II Lab	4	2

Industrial Training:
Note: Student has to undergo Industrial Training of 20 working days after 2nd Semester and 30 working days after 4th Semester. He / She has to present the Project completed in the said duration, for which Marks and Credits will be given.

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – I

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		L	T	P	Total		Theory	Practical		
BCA-DS-101	Programming in C	3	-		3	25	75	-	100	3
BCA-DS-102	Internet and Web Fundamentals	3	-		3	25	75	-	100	3
BCA-DS-103	Computer Fundamentals and Organization	3	-		3	25	75	-	100	3
BCA-DS-104	Algebra and Calculus	3	-		3	25	75	-	100	3
BCA-DS-105	Self-Guided Improvement	3	-		3	25	75	-	100	3
BCA-DS-106	C Programming Lab	-		4	4	25	-	50	75	2
BCA-DS-107	Internet Fundaments Lab	-		4	4	25	-	50	75	2
BCA-DS-108	PC Software Lab	-		4	4	25	-	50	75	2
BCA-DS-109	Presentation	-		2	2	25	-		25	1
BCA-DS-110	Group Discussion	-		2	2	25	-		25	1
	Total				31	250	375	150	775	23

Note: Exam duration will be as under
   (a) Theory exams will be of 3 hours duration
   (b) Practical exams will be of 3 hours duration

BCA-DS-101: PROGRAMMINGIN C
BCA I Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory:	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. To understand the major components of computer system, programming languages and networking concepts.
2. To understand the basic building blocks of C language like variables, data types, managing I/O etc.
3. To understand the different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays, structures etc.
4. To learn about the concept of Pointers and understand functions and file handling.

SYLLABUS

UNIT - I
Overview of C: History of C, Importance of C, Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant, Structure of a C Program, printf(), scanf() Functions, Operators.

Expression: Arithmetic, relational, logical, bitwise, unary, assignment, shorthand assignment operators, conditional operators and increment and decrement operators, Arithmetic expressions, evaluation of arithmetic expression, type casting and conversion, operator hierarchy & associativity.

UNIT - II
Decision making & branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, go to statement.

Decision making & looping: For, while, and do-while loop, jumps in loops, break, continue statement, Nested loops.

UNIT - III
Functions: Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions viz. getch(), getche(), getchar(), gets(), output functions viz., putch(), putchar(), puts(), string manipulation functions.

User defined functions: Introduction/Definition, prototype, Local and global variables, passing parameters, recursion.

UNIT - IV
Arrays, strings and pointers: Definition, types, initialization, processing an array, passing arrays to functions, Array of Strings. String constant and variables, Declaration and initialization of string, Input/output of string data, Introduction to pointers. Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime. Algorithm development, Flowcharting and Development of efficient program in C.

COURSE OUTCOMES:
The student will learn:
1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors. ·
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

Text Books/Reference Books:
1. Gottfried, Byron S., Programming with C, Tata McGraw Hill
2. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
3. Balagurusamy, E., Programming in ANSI C, 4E, Tata McGraw-Hill.
4. Jeri R. Hanly& Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.
5. Yashwant Kanetker, Let us C, BPB.
6. Rajaraman, V., Computer Programming in C, PHI.
7. Yashwant Kanetker, Working with C, BPB.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-102: Internet and Web Fundamentals
BCA I Semester

No. of Credits: 3

L T P Total

3 0 0 3

Sessional: 25 Marks

Theory: 75 Marks

Total :   100 Marks

Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. This course is intended to teach the basics involved in publishing content on the World Wide Web.
2. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet
3. and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting.
4. This will also expose students to the basic tools and applications used in Web publishing.

SYLLABUS

Unit 1

Electronic Mail and Internet: Introduction, advantages and disadvantages, Userids, Pass words, e-mail addresses, message components, message composition, mailer features, E-mail inner workings, E-mail management, Mime types, Newsgroups, mailing lists, chat rooms. Introduction to networks and internet, history, Working of Internet, Internet Congestion, internet culture, business culture on internet. Collaborative computing & the internet. Modes of Connecting to Internet, Internet Service Providers(ISPs), Internet address, standard address, domain name, DNS, IP.v6.Modems and time continuum, communications software; internet tools.

UNIT 11

World Wide Web: Introduction, Miscellaneous Web Browser details, searching the www: Directories search engines and meta search engines, search fundamentals, search strategies, working of the search engines, Telnet and FTP.

Browser: Introduction to Browser, Coast-to-coast surfing, hypertext markup language, Web page installation, Web page setup, Basics of HTML & formatting and hyperlink creation, Using FrontPage Express, Plug-ins.

UNIT 111

Languages: Basic and advanced HTML, java script language, Client and Server Side Programming in java script. Forms and data in java script, XML basics.

Introduction to Web Servers: PWS, IIS, Apache; Microsoft Personal Web Server. Accessing & using these servers.

UNIT IV
Privacy and security topics: Introduction, Software Complexity, Encryption schemes, Secure Web document, Digital Signatures, Firewalls.

COURSE OUTCOMES:

At the end of the course/session the student would be able to

1. Understand the basics of internet &search engines.
2. Have a hands on HTML
3. Learn the need and basics of CSS
4. Learn the concepts of client side and server side scripting.

Text Book/ Reference Books:

1. Fundamentals of the Internet and the World Wide Web, Raymond Greenlaw and Ellen Hepp – 2001, TMH
2. Internet & World Wide Programming, Deitel,Deitel& Nieto, 2000, Pearson Education
3. Complete idiots guide to java script, Aron Weiss, QUE, 1997
4. Network firewalls, Kironjeetsyan   -New Rider Pub.
5. Alfred Glkossbrenner-Internet 101 Computing MGH, 1996

Note: Latest and additional good books may be suggested and added from time to time.
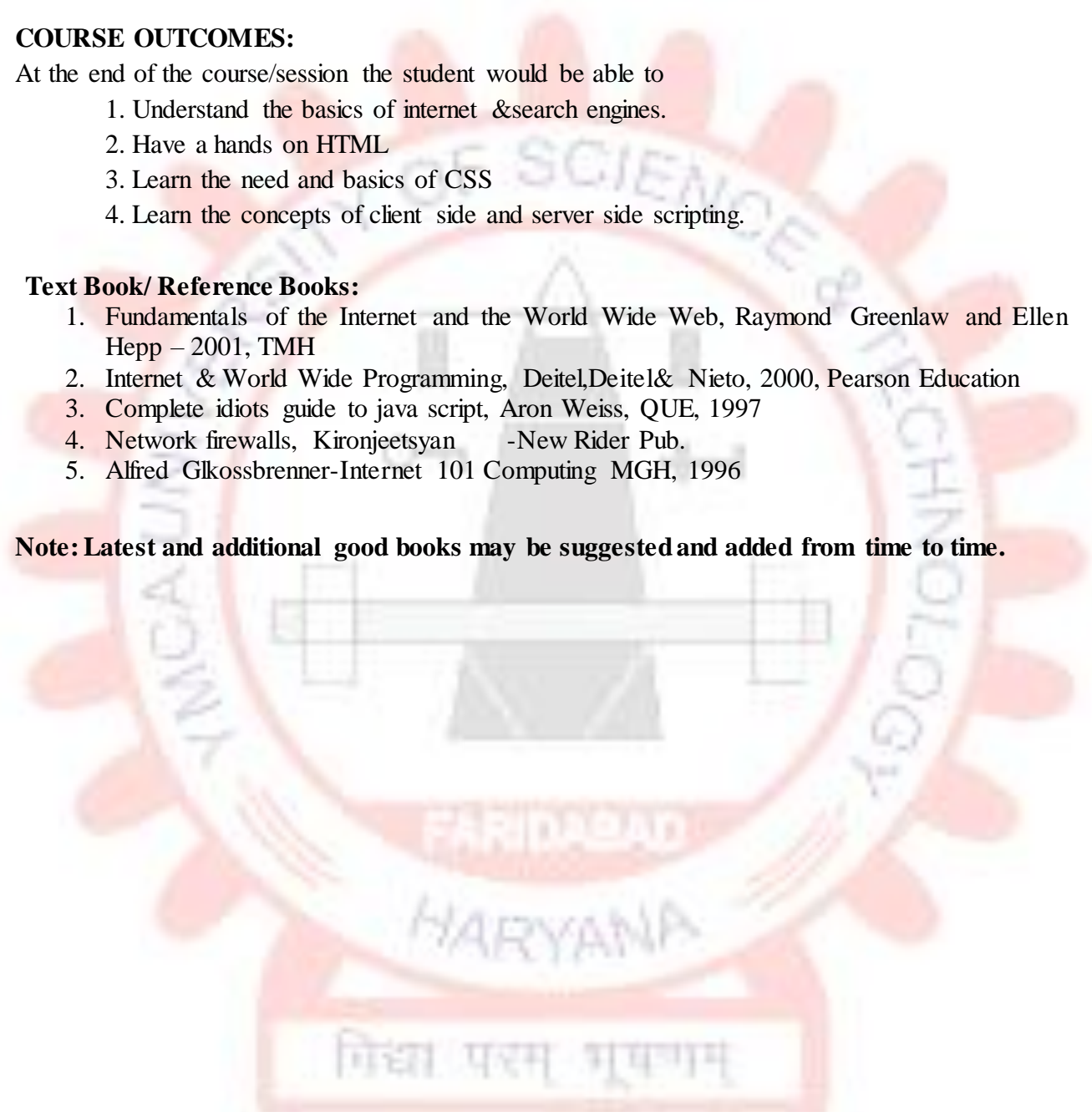
BCA-DS-103: COMPUTER FUNDAMENTALS AND ORGANIZATION
BCA I Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory:	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part I

COURSE OBJECTIVES:

1. Describe the organization and operation of a computer processor, primary and secondary memory, peripheral devices and to give computer specifications;
2. Explain the representation of data and information in computer systems, use standard word, and spreadsheets, graphics generation packages,

SYLLABUS

UNIT-I
Computer Fundamentals: Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer, Applications of computers in various Fields, I/O devices, definition of software.

UNIT- II
Memory: Flynn's classification of computers (SISD, MISD, MIMD), Concept of primary &secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory, Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks i.e. CD, DVD, virtual memory, Memory Hierarchy, Need for memory hierarchy.

UNIT-III
Computer Languages: Analogy with natural language, machine language, assembly language, high-level languages, fourth generation languages, compiler, interpreter, assembler, Linker, Loader , characteristics of a good programming language, Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Advantages and disadvantages of Structured programming.

UNIT-IV
Instruction Set Architecture: Instruction set based classification of processors (RISC, CISC, and their comparison); addressing modes: register, immediate, direct, indirect, indexed; Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow.

Overview of Networking:
What is networking? Introduction to LAN, MAN and WAN.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Understand the fundamentals of computer.
2. Understand about different types of memory and the need of memory hierarchy.
3. Learn the basics of networking.
4. Learn basic approaches of Programming

Text Books/Reference Books:
1. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
2. Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.
3. Norton, Peter, Introduction to Computer, McGraw-Hill
4. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World
5. Rajaraman, V., Fundamentals of Computers, PHI
6. Ram, B., Computer Fundamentals, Architecture & Organization, New Age International(P) Ltd.
7. Chhillar, Rajender Singh: Application of IT to Business, Ramesh Publishers, Jaipur.
8. Gill, Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co., New Delhi

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-104: ALGEBRA AND CALCULUS
BCA I Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory:	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES
1. Learn the general concept of function and its applications to real-world situations.
2. Learn to work with exponential, logarithmic and trigonometric functions and their applications in applied problems.
3. Learn the concepts of the derivative and its underlying concepts such as limits and continuity.
4. Learn to calculate derivative for various type of functions using definition and rules.
5. Apply the concept of derivative to completely analyze graph of a function.
6. Learn about various applications of the derivative in applied problems.

SYLLABUS

UNIT I
MATRICES: Symmetric – Skew-Symmetric - Orthogonal and Unitary matrices - Rank of a Matrix - Consistency - Characteristic equation – Eigen values and Eigen vectors - properties –Cayley, Hamilton's Theorem (proof not needed) - Simple applications.

UNIT II
THEORY OF EQUATIONS: Partial   Fractions- Theory   of   equations- Polynomial Equations   with   real coefficients -Irrational roots - Complex roots - Symmetric functions of roots - Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations.

UNIT III
DIFFERENTIAL CALCULUS: Rules of differentiation - Derivative of implicit function - Successive differentiation nth derivatives - Leibnitz theorem (without proof) and applications - maxima and minima of functions of two variables - Partial differentiation - Euler's Theorem.

UNIT IV
INTEGRAL CALCULUS: Integration of rational functions - algebraic expressions involving only one irrational quantity-rational functions of sinx and cosx - Trigonometric substitutions - Bernoulli's formula for integration by parts - reduction formulae - properties of definite integral -Evaluation of double and triple integrals.

COURSE OUTCOMES:

After completing this course, student will be able:

1. Plot points and equations and interpret information using the rectangular coordinate system.
   (This would include finding equations of lines, parallel lines, and perpendicular lines.)
2. Solve linear and rational equations in one variable.
3. Use mathematical equations to model real-life problems.
4. Perform operations with real and complex numbers.
5. Solve quadratic equations by factoring, completing the square, and by the quadratic formula.
6. Use function notation and identify the domain and range.
7. Solve systems of linear equations in two or three variables.
8. Learning outcomes of Calculus:
9. Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
10. Locate the x and y intercepts, any undefined points, and any asymptotes.
11. Determine asymptotes for rational expressions
12. Determine if there is any symmetry to aid in the graphing process.
13. Determine the point(s) of intersection of pairs of curves.

Text Books/Reference Books:

1. Narayanan, S. and Manicavachagom Pillay, T.K. (2015) Calculus Vol. I,II&III S.Viswanathan (Printers & publishers) Pvt. Ltd., Chennai.
2. Venkataraman, M.K., "Higher Mathematics for Engineering and Science",Third Edition, The National Publishing Co., Madras, 1986.
3. Kandasamy P, K. Thilagavathi and K. Gunavathy- Allied Mathematics aper-I, First semester, 1/e, S. Chand & Co., New Delhi, 2003
4. Stewart J - Single Variable Calculus (4th edition) Brooks / Cole, Cenage Learning 2010.
5. Tom M. Apostol - Calculus, Vol. I (second edition) John Wiley and Sons, Inc., Jan 2007.
6. Burnside W.S. and A.W. Panton - The Theory of Equations, Dublin University Press, 1954.
7. MacDuffee, C.C. - Theory of Equations, John Wiley & Sons Inc., 1954.
8. Ushri Dutta, A.S.Muktibodh and S.D. Mohagaonkar: Algebra and Trigonometry, PHI India, 2006

Note: Latest and additional good books may be suggested and added from time to time.

BCA-CC-105: SELF GUIDED IMPROVEMENT
BCA I Semester

No. of Credits: 3
L T P Total
3 0 0 3

Sessional: 25 Marks
Theory: 75 Marks
Total :   100 Marks
Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES/OUTCOMES:
1. Developing and implementing a sound self-improvement program.
2. Setting appropriate life and career goals.
3. Accepting new ideas, as it can bring positivity in life.
4. Making or creating not only self but to others also as a team.

SYLLABUS

UNIT I
SELF ANALYSIS: SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem, What is personality? Why does it matter? How do personalities develop?

UNIT-II
PERSONALITY AND CAREER CHOICE: Matching your career and personality, why it matters, Self-efficacy, Basic Personality Traits: Values, Beliefs, Interactions, Experiences, Environmental influences, The big five dimensions, Changing Your Personality, Can personalities change? Being yourself, being adaptable, Positive attitude, Individuality, Controlling emotions

UNIT III
CREATIVITY AND PERSONAL GROWTH: Out of box thinking, Lateral Thinking, Personal Growth: Ways you can try to improve, Helpful tools and exercises, setting goals, focusing on positives.

ATTITUDE AND MOTIVATION: Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette, Factors of motivation, Self-talk, Intrinsic & Extrinsic Motivators.

UNIT IV
GOAL SETTING: Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals. Time Management: Value of time, Diagnosing Time Management, Weekly Planner, To do list, Prioritizing work.

Text Books / Reference Books:

1. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
2. SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications.
3. Carnegie Dale, How to Win Friends and Influence People, New York: Simon & Schuster, 1998.
4. Thomas A Harris, I am ok, You are Ok , New York-Harper and Row, 1972
5. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-106: C PROGRAMMING LAB
BCA I Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P Total   Practical: 50 Marks
0 0   4   4   Total   :   75 Marks
                                                     Duration of Exam: 3 Hours

List of Programs:

Data Types, Expression and Operators:

1.   Write a program to add, subtract, multiply and divide two numbers.

2.   Write a program to find the average mail height & average female heights in the class (input is in the form of gender code, height).

3.   Write a program to calculate area of triangle using Heron's formula

Decision Making and Branching:

4. Write a program to check entered number is even or odd.

5. Write a program to find the number entered is positive or negative.

6. Write a program to find the largest of three numbers. (if-then-else).

7. Write a program to find roots of a quadratic equation using functions and switch statements.

Decision making & looping:

8.   Write a program to find the largest of ten numbers. (While loop)
9.   Write a program to calculate sum of n numbers using do-while loop.

10. Write a program to print the table of any entered Integer (For loop).

11. Write a program to print even series numbers.

12. Write a program to print odd series numbers.

Function and Recursion:

13. Write a program to find the sum of two numbers using function without arguments and with no return type.

14. Write a program to find the sum of two numbers using function with arguments and with no return type.

15. Write a program to find the sum of two numbers using function with arguments and with return type.

16. Write a program to swap two integers entered by the user using call by value.

17. Write a program to swap two integers entered by the user using call by Reference.

18. Write a program to find factorial of a number using function.

19. Write a program to calculate a^b using function.

20. Write a program to print Fibonacci series using recursion.

21. Write a program to generate a series of 10 Fibonacci numbers with using recursion

Arrays and String:

22. Write a program to find the sum of enter elements (Using Array)

23. Write a program using arrays to find the largest and second largest number out of given 50 numbers.

24. Write a program to add and subtract two matrices.

25. Write a program to multiply two matrices.

26. Write a program to transpose a given matrix.

27. Write a program to find length, reverse, concatenate, compare, copy, change case of a string with using string library functions. (7 programs).

28. Write a program to find length, reverse, concatenate, compare, copy, change case of a string without using string library functions (7 programs).

29. Write a program to check that the input string is a palindrome or not.

Pointers and file handling:

30. Write a program to print the value and address of a pointer variable.

31. Write a program to swap two integers entered by the user.

32. Write a program to print the value and address of a pointer of pointer variable.

33. Write a program to open a file using File Handling.

34. Write a program to copy text from a file to another file using File Handling.

BCA-DS-107: INTERNET FUNDAMENTALS LAB
BCA I Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical: 50 Marks
0 0   4   4   Total   :   75 Marks
                                               Duration of Exam: 3 Hours

List of Programs:

1. Sending and receiving mails.

2. Chatting on the net.

3. Using FTP and Tel net server.

4. Using HTML Tags (table, form, image, anchor etc.).

5. Write a program to create various types of list.

6. Write a program to create chess board and time table using table tag.

7. Write a program to create frames.

8. Write a program to use various tags in HTML.

9. Write a program to use CSS in HTML.

10. Making a Web page of your college using HTML tags

Note: At least 10 exercise to be given by the teacher concerned.

BCA-DS-108: PC SOFTWARE LAB
BCA I Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P Total   Practical: 50 Marks
0 0   4   4   Total   :   75 Marks
                                               Duration of Exam: 3 Hours

List of Programs:

1. To prepare your CV using MS Word.

2. Create a mail merge letter using MS Word.

3. Create a macro for inserting a picture and formatting the text.

4. Create a simple presentation to list simple dos commands, hardware and software using MS Power Point.

5. Add text, pictures, sounds, movies, and charts to your presentations.

6. Set up slide shows and rehearse timings for your slides.

7. Create a worksheet with 4 columns, enter 10 records and find the sum of all columns using MS Excel.

8. Create a student result sheet.

9. Create a simple bar chart to highlight the sales of a company for 3 different periods.

10. Create, record and use macro in MS Excel.

11. Sorting and filtering of data

12. Create pivot tables and pivot charts.

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – II

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		L	T	P	Total		Theory	Practical		
BCA-DS-111	Introduction to Database Management System	3	-		3	25	75	-	100	3
BCA-DS-112	Introduction to Data Structures	3	-		3	25	75	-	100	3
BCA-DS-113	Introduction to Data Science	3	-		3	25	75	-	100	3
BCA-DS-114	Professional English	3	-		3	25	75	-	100	3
BCA-DS-115	Fundamentals of Management	3	-		3	25	75	-	100	3
BCA-DS-116	Data Structures Lab	-	4		4	25	-	50	75	2
BCA-DS-117	Database Management Systems Lab	-	4		4	25	-	50	75	2
BCA-DS-118	Language Lab	-	4		4	25	-	50	75	2
BCA-DS-119	Presentation	-	2		2	25	-		25	1
BCA-DS-120	Group Discussion	-	2		2	25	-		25	1
	Total				31	250	375	150	775	23

Note: Exam duration will be as under

(a) Theory exams will be of 3 hours duration

(b) Practical exams will be of 3 hours duration

BCA -DS-111: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM
BCA II Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a Database
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

SYLLABUS

UNIT – I
Basic Concepts: Data, Information, Records and files. Traditional file–based Systems, File Based Approach-Limitations of File Based Approach, Database Approach-Characteristics of Database Approach, advantages and disadvantages of database system, components of database system, Database Management System (DBMS), Components of DBMS Environment, DBMS Functions and Components, DBMS users, Advantages and Disadvantages of DBMS, DBMS languages.

Roles in the Database Environment - Data and Database Administrator, Database Designers, Applications Developers and Users.

UNIT – II
Database System Architecture –Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances.

Data Independence–Logical and Physical Data Independence, Classification of Database Management System, Centralized and Client Server architecture to DBMS.

Data Models: Records- based Data Models, Object-based Data Models, Physical Data Models and Conceptual Modeling.

UNIT – III
Entity-Relationship Model: Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams, abstraction and integration.

Basic Concepts of Hierarchical and Network Data Model, Relational   Data Model   - Brief History, Relational   Model Terminology-Relational Data Structure,   Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints over Relations.

UNIT – IV
Relational algebra, Relational calculus, Relational database design:
Functional dependencies, Modification anomalies, Ist to 3rd NFs, BCNF, 4th and 5th NFs, computing closures of set FDs, SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, query processor, concept of security, concurrency and recovery.

COURSE OUTCOMES:
After completion of this course, students will be able to
1. Write relational algebra expressions for given query and optimize the developed expressions.
2. Design the databases using given specifications.
3. Construct the SQL queries for Open source and Commercial DBMS –MYSQL and ORACLE.
4. Understand the concept of Query Optimization and Normalization.
5. Understand the concept of Serializability.

Text Books/Reference Books:
1. Elmasri & Navathe, "Fundamentals of Database Systems", 5th edition, Pearson Education.
2. Thomas Connolly Carolyn Begg, "Database Systems", 3/e, Pearson Education.
3. C. J. Date, "An Introduction to Database Systems", 8th edition, Addison Wesley N. Delhi.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-112: INTRODUCTION TO DATA STRUCTURES
BCA II Semester

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

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 enable them to write algorithms for solving problems with the help of fundamental data structures

SYLLABUS

UNIT–I
Introduction: Elementary data organization, Data Structure definition, Data type vs. Data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-Oh notations.

Strings: Introduction, Storing strings, String operations, Pattern matching algorithms, Linear search, binary search.

UNIT – II
Arrays: Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays.

Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Garbage collection, Applications of linked lists.

UNIT – III

Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Recursion.

Queues: Introduction, Array and linked representation of queues, Operations on queues, Deques, Priority Queues, Applications of queues.

UNIT – IV

Trees: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithms using stacks, Minimum cost Spanning tree, Prim's and Kruskal's Algorithm.

Graph: Introduction, Graph theory terminology, Sequential and linked representation of graphs, Warshall's algorithm for shortest path, Dijkstra algorithm for shortest path, Operations on graphs, Traversal of graph.

COURSE OUTCOMES:
1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues, linked list and Tree, student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Text Books/Reference Books:
1. Seymour Lipschutz, "Data Structure", Tata-McGraw-Hill
2. Horowitz, Sahni& Anderson-Freed, "Fundamentals of Data Structures in C", Orient Longman.
3. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.
4. Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.
5. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structures Using C", Prentice- Hall of India Pvt. Ltd., New Delhi.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-113: INTRODUCTION TO DATA SCIENCE
BCA II Semester

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                           Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. An understanding of how the nature of the data collection, the data itself, and the analysis
2. processes relate to the kinds of inferences that can be drawn
3. Understand the limitations of data sets based on their contents and provenance
4. Knowledge of data organization, management, preservation, and reuse
5. Knowledge of what statistical analysis techniques to choose, given particular demands of
6. inference and available data
7. Knowledge of general linear models and cluster analysis methods for statistical analysis
8. Skills and knowledge in preparing data for analysis, including cleaning data, manipulating data, and dealing with missing data
9. Skills in actually analyzing data using open source data analysis tools

SYLLABUS

UNIT-I
Data Science Concept
Data science:- definition of data, data types, meaning of variables, wholeness of data analytics, data processing chain, data distributions, Paths to data science, data mining, data warehousing, difference between database and data warehouse, advices for new data scientists, introduction to cloud, artificial intelligence, Machine learning, applications in real world, learning approaches: supervised, unsupervised.

UNIT-II
Introduction to data science tools
A day in the life of a data science person, R versus Python, Data science tools and technology, Regression.

Data Science in Business
Companies start in data science, real world examples and applications, Tips for recruiting data science people, "The Final Deliverable", "The Report Structure", Data science careers and additional case studies.

UNIT-III
Big data:-Introduction to Big data, big data technologies, management of big data.

Data Science People
Things data science people say, "What Makes Someone a Data Scientist?", Data Visualization-Basic principles, ideas and tools for data visualization, types of charts: line graph, pie chart, scatter plot, bar graphs, create your own visualization of a complex dataset.

UNIT-IV
Data Science and Ethical Issues
Discussions on privacy, security, ethics A look back at Data Science, Next-generation data scientists.

COURSE OUTCOMES:
1. Students will learn how to explore new data sets.
2. Implement a comprehensive set of machine learning algorithms from scratch.
3. Master all the components of a predictive model, such as data preprocessing, feature engineering, model selection, performance metrics and hyper parameter optimization.

Text Books/Reference Books:
1. Dr. Anil Maheshwari, "Data Analytics", McGraw Hill Education (India) Private Limited.
2. Jake Vander Plas "python data science handbook",Oreilly
3. Allen B. Downey "Think Python",Oreilly
4. Hadley Wickham "Advanced R",CRC Press

Note: Latest and additional good books may be suggested and added from time to time.

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

The course focuses on the following aspects:
1. professional attitude and behavior;
2. clarity, correctness and concision in writing, as well as detailed proof-reading skills;
3. the acquisition of a varied and accurate contemporary professional vocabulary;
4. teamwork and cross-cultural awareness; and
5. discussion activities and presentations (both impromptu and formal).

SYLLABUS

UNIT-I
BASICS OF COMMUNICATION: Introduction to basics of communication: communication and its various definitions, paths of communication, process of communication, barriers to effective communication, Myths and realities about Communication, Communication Noise, 7 C's of effective Communication, corporate Communication, impact of social media on communication.

UNIT – II
VERBAL AND NON-VERBAL COMMUNICATION: Verbal Communication and its types, principles for effective oral and written communication, listening process, effective listening, Presentation skills, presentation aids, non-verbal communication - posture–gestures-eye contact–handshaking-voice modulations–sign language- proxemics- communication skills for the interviews and group discussions, soft skills.
.
UNIT – III
GRAMMAR: Synonyms/antonyms, one word substitutions, tenses, conjunctions, auxiliaries, prepositions, spotting errors.

BUSINESS WRITING: Business letter–Layout of a business letter-sales letter- letters of enquiries- orders- complaint-, notice and tenders, circulars, memos, e-mails, agendas, minutes of Meeting, letters of application and résumé writing.

UNIT – IV
PROFESSIONAL PROPOSALS AND REPORTS: Writing business proposals- characteristics and structure- Process and mechanics of report writing - types of reports -project reports - characteristics-structure-performance appraisal reports, -product appraisal reports- progress

reports, brochures, newsletters, taking official notes, Event report, Technical Articles, Editing Strategies for effective report writing, Professional writing style and language.

COURSE OUTCOMES:

After completion of the course student will be able to:

1. Understand the concept of soft skills including communication skills, listening skills, positive thinking and also will be able to enhance own personality.

2. Able to write business letters.

3. Able to write reports.

4. Able to make effective resume and will also be able to present himself/herself in interview, speeches, presentations, talks etc.

Text Books/Reference Books:

1. Vik, Gilsdorf, "Business Communication", Irwin
2. K K Sinha, "Business Communication", Himalaya Publishing House /Galgotia Publications.
3. Bovee, "Business Communication", Pearson ' PHI
4. Mohan, Banerjee, Business Communication, Mac million

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-115: FUNDAMENTALS OF MANAGEMENT
BCA II Semester

No. of Credits: 3

L T   P   Total

 3 0   0   3

Sessional: 25 Marks

Theory :   75 Marks

Total :   100 Marks

Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES

1. Enables the students to develop an understanding of management and organization.
2. The course focuses on important management functions such as planning, organizing, leading and controlling for successful managerial activities.
3. The students will learn how successful managers use organizational resources through organizational functions in order to effectively and efficiently achieve organizational objectives.

SYLLABUS

UNIT 1
Introduction: Meaning of management, Definitions of Management, Characteristics of management, Management Vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions. Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion- Seniority Vs. Merit. Training - objectives and types of training.

UNIT II
Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT III
Marketing Management: Definition of marketing, Marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT IV
Financial Management: Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

COURSE OUTCOMES:

After completion of the course student will be able to understand:

1. How organization adapt to uncertain environment.
2. Develop the process of management's 4 functions: planning, organizing, leading and controlling.
3. Evaluate leadership styles to anticipate consequences of each leadership style.
4. Identify and evaluate social corporate responsibility and ethical issues involved in business situations.

Text Books/Reference Books:

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S. Bhalla. (Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)
3. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
4. Management – Harold, Koontz and CyriloDonell (Mc.Graw Hill).
5. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
6. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
7. Management - James A.F. Stoner &R.Edward Freeman, PHI.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-116: DATA STRUCTURES LAB
BCA II Semester

No. of Credits: 2	Sessional:	25 Marks
L T P Total	Practical :	50 Marks
0 0 4 4	Total :	75 Marks
	Duration of Exam:	3 Hours

List of Programs:

1. Stack

Write a program to perform various operations like Push and Pop on Stack.

2.Linear Queue

Write a program to perform Insertion and deletion operations on Linear Queues.

3.Linked List

Write a program to perform various operations on Linked List.

4.Sorting Techniques

Write a program to implement various sorting techniques like Bubble sort, selection sort,

Insertion sort, Quick sort.

5.Searching Techniques

Write a program to implement Linear Search and Binary Search.

6.Minimum Spanning Trees

Write a program to implement Prim's and Kruskal Algorithms.

BCA-DS-117: DATA BASE MANAGEMENT SYSTEMS LAB

BCA II Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical :   50 Marks
  0 0   4   4   Total   :   75 Marks
                                         Duration of Exam: 3 Hours

List of Programs:

1. Introduction to SQL.

2. Write a program to create a table in SQL.

3. Write a program to perform various operations like Drop, Alter and Truncate on a table.

4. Write a program to perform various queries in SQL.

5. Write a program to perform Selection, Projection and Join Operations on tables.

BCA-DS-118: LANGUAGE LAB
BCA II Semester

No. of Credits: 2
L T   P   Total
0 0   4   4

Sessional: 25 Marks
Practical :   50 Marks
Total   :   75 Marks
Duration of Exam: 3 Hours

Corporate Interaction & Communication
1. Listening Comprehension

2. Pronunciation, Intonation, Stress and Rhythm

3. Common Everyday Situations: Conversations and Dialogues

4. Communication at Workplace

5. Interviews

6. Formal Presentations

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – III

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		I	T	P	Total		Theory	Practical		
BCA-DS-201	Python Programming	3	-		3	25	75	-	100	3
BCA-DS-202	Probability and Statistics	3	-		3	25	75	-	100	3
BCA-DS-203	Principles of Operating Systems	3	-		3	25	75	-	100	3
BCA-DS-204	Data Warehouse and Data Mining	3	-		3	25	75	-	100	3
As per list above	General Elective - I	3	-		3	25	75	-	100	3
BCA-17-204(B)	Environmental Science(No credit just qualifying)	3			3		50		Marks will not be added in total	No Credit
BCA-DS-205	Python Programming Lab	-		4	4	25	-	50	75	2
BCA-DS-206	Operating Systems Lab	-		4	4	25	-	50	75	2
BCA-DS-207	Presentation	-		2	2	25	-		25	1
BCA-DS-208	Group Discussion	-		2	2	25	-		25	1
BCA-DT-201	Industrial Training - I					50		50	100	3
	Total				30	275	375	150	800	24

Note: Exam duration will be as under
      (a)Theory exams will be of 3 hours duration
      (b)Practical exams will be of 3 hours duration

BCA-DS-201: PYTHON PROGRAMMING
BCA III Semester

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total   :   100 Marks
                                           Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1.   Create and execute Python programs
2.   Understand the concepts of file I/O
3.   Be able to read data from a text file using Python
4.   Plot data using appropriate Python visualization libraries

SYLLABUS

UNIT-I
Introduction to Python: Installation and Working with Python, Understanding Python Variables Python Basic Operators, Python Data Types Declaring and using Numeric data types: int, float, complex Using string data type and string operations,

Decision and Loop Control Statements: Basic decision making statements like if, else and elif , Simple for loops in python For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block

UNIT-11
Functions in Python: Introduction to functions, Syntax and Basics of Functions, Parameters and Arguments in Function, Local and Global scope of a variable, return statement, Recursive functions, Lambda function.

Python List, Tuple Sets and Dictionary Manipulations: Introduction to Lists, creating Lists, Accessing the elements of Lists, List Slicing, Python Inbuilt functions for Lists, passing Lists to a Function, Returning Lists from a function, Introduction to Tuples, Creating Tuples, Tuples Indexing and Slicing, Inbuilt functions for Tuples, Introduction to Sets, Creating Sets, Set in and Not in Operator, Python set Classes, Set operations, Introduction to Dictionaries, Creating a dictionary, Adding and replacing values in Dictionary, Formatting Dictionaries, Deleting items from Dictionaries, Simple Programs on Dictionary.

UNIT-III
Object Oriented Programming in Python: Defining Classes, The Self–parameter and Adding methods to a Class, Accessibilty, The __Init__ Method(Constructor Method), __del__ Method(Destructor Method), Method Overloading in Python, Inheritance, Types of of Inheritance

Importing Modules: Introduction to Modules, Math module, Random module.

Graphics Programming in Python: Getting Stated with the Turtle Module, Moving Turtle in any Direction, The color, bgcolor, circle and speed method of Turtle, Drawing basic shapes using Iterations, Changing color dynamically using List.

UNIT IV
Image processing in Python: Basic libraries for image processing in python such as **OpenCV, Numpy and Scipy libraries, Python Imaging Library (PIL).** Various functions in Image processing using these libraries like open() and show () image, Convert and Save() Image, Resize-thumbnails(),Converting to grayscale image − convert(),**Scaling an Image , Rotating an image , Translating an Image, Edge detection in an Image.**

File Handling in Python: Introduction to File Handling, Opening and closing a file, Writing Text and number to a file, Reading Text and number from a file, The seek() function, Binary files, Reading from and Writing into Binary files.

COURSE OUTCOMES:
      After completion of course, students would be able to:
      1. Write programs efficiently in python
      2. Effectively use numerical analysis libraries of python

Textbooks/Reference Books:
1. Martin C. Brown, Python: The Complete Reference, Tata McGraw-Hill Education.
2. Kamthane Kamthane, Programming and Problem Solving with PYTHON, Tata McGraw-Hill Education.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-202: PROBABILITY AND STATISTICS
BCA III SEMESTER

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
3 0 0 3	Total :	100 Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

1. To Apply probability theory to set up tree diagrams
2. To Apply probability theory via Bayes' Rule
3. To Describe the properties of discrete and continuous distribution functions
4. To Use method of moments and moment generating functions
5. To Assess the consistency, efficiency and unbiasedness of estimators
6. To Apply method of maximum likelihood estimation
7. To Apply the Central Limit Theorem
8. To Use statistical tests in testing hypotheses on data

SYLLABUS

UNIT I
RANDOM VARIABLES AND DISTRIBUTION FUNCTIONS: Discrete and continuous random variables - distribution function and its properties - probability mass function and probability density function - discrete and continuous probability distributions - Binomial, Geometric, Poisson, Uniform, Exponential and Normal distributions.

UNIT II
MOMENTS AND MOMENT GENERATING FUNCTIONS: Expectation of a random variable – probability generating function – properties - moment generating function.

TWO DIMENSIONAL RANDOM VARIABLES: Joint, marginal and conditional distribution functions - independence of random variables.

UNIT III
DESCRIPTIVE STATISTICS: Types of data - primary and secondary data - classification and representation of data - formation of frequency distribution - various measures of central tendency, dispersion - and their merits and demerits - concept of skewness and kurtosis.

UNIT IV

CORRELATION AND CURVE FITTING: Correlation coefficient and regression - rank correlation - curve fitting by least square methods, fitting a straight line, parabola, power curve and exponential curves. (no derivation, numerical problems only)

COURSE OUTCOMES:

After completing this course, students will be able:

1. Appreciate the importance of probability and statistics in computing and research.
2. Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries.
3. Use appropriate statistical methods in the analysis of simple datasets.
4. Interpret and clearly present output from statistical analyses in a clear concise and
5. understandable manner.

Text Books/Reference Books:

1. Richard Arnold Johnson, Irwin Miller, John E. Freund , Miller & Freund's Probability and Statistics for Engineers, Prentice Hall, 2011.
2. Dr. P. Kandaswamy, Dr. K. Thilagavathy and Dr. K. Gunavathy, Probability and Queuing Theory, Revised edition, S. Chand Publishing, 2013.
3. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill, 2nd edition.
4. Goon, A.M., M. K. Gupta and B. Das Gupta Fundamentals of Statistics- Vol. I, World Press Ltd, Kolkata, 2002.
5. Gupta, S.C. and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 2002.
6. Hogg, R.V. and A. Craig, Introduction to Mathematical Statistics, McMillan Publishing co., Inc. 1978.
7. Mood A.M., F.A. Graybill and D.C. Boes, Introduction to Theory of Statistics McGraw Hill Book Co., 1974.
8. Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Fourth Edition, Elsevier.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-203: INTRODUCTION TO OPERATING SYSTEM
BCA III Semester

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                               Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes, threads and their communication.
3. To know the components and management aspects of concurrency management viz. Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
4. To learn the mechanisms involved in memory management in contemporary OS.
5. To gain knowledge on Input/ Output management aspects of Operating systems.

SYLLABUS

UNIT – I
Fundamentals of Operating system: Introduction to Operating System, its need and operating System services, early systems, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, and Real-Time Systems. Process Management: Process concept, Operation on processes, Cooperating Processes, Threads, and Inter-process Communication.

UNIT-II
CPU Scheduling: Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Round Robin & Queue Algorithms.

Deadlocks: Deadlock characterization, Methods for handling deadlocks, Banker's Algorithm.

UNIT-III
Memory Management: Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation.

Virtual Memory: Demand paging, Performance of demand paging, Page replacement, Page replacement Algorithms, Thrashing.

UNIT-IV

File management: File system Structure, Allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.

Device Management: Disk structure, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

COURSE OUTCOMES:
After the completion of the course, the students will be able to:
1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, and Response Time.
3. For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.
5. For a given I/O device and OS (specify), develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

Text Books/Reference Books:
1. Abraham Silberschatz, Peter B. Galvin, " Operating System Concepts", Addison Wesley publishing. Co., 7th. Ed., 2004.
2. Nutt Gary, "Operating Systems", Addison Wesley Publication, 2000.
3. Andrew S. Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.
4. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition, PH, 2001.
5. Ekta Walia, "Operating Systems Concepts", Khanna Publishes, New Delhi, 2002.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-204: DATA WAREHOUSE AND DATA MINING
BCA III Semester

No. of Credits: 3			Sessional:	25 Marks
L T	P	Total	Theory :	75 Marks
3 0	0	3	Total :	100 Marks
			Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. Be familiar with mathematical foundations of data mining tools.
2. Understand and implement classical models and algorithms in data warehouses and data mining.
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Master data mining techniques in various applications like social, scientific and environmental context.
5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

SYLLABUS

UNIT-I
Data warehousing, Definition, usage and trends. DBMS vs data warehouse, Data marts, Metadata, Multidimensional data mode, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations.

Data warehouse process & architecture, OLTP vs OLAP, ROLAP vs MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

UNIT II

Data warehouse implementation, computation of data cubes, modeling OLAP data, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse.

Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications.

UNIT-III

Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification, data mining languages and standardization of data mining.

Data mining techniques: Association rules, Clustering techniques, Decision tree knowledge discovery through Neural Networks & Genetic Algorithm, Rough Sets, Support Victor Machines and Fuzzy techniques.

UNIT-IV
Mining complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data mining Text Databases and mining Word Wide Web.

COURSE OUTCOMES:
1. The students will be able to understand basic concepts of data warehouse and data mining, techniques and applications
2. The students will be able to understand the techniques to extract patterns from transactional database using Association and Apriori algorithms
3. The students will be able to understand different clustering techniques and will be able to cluster data sets
4. The students will be able to classify data set into different classes and acquire the knowledge to make predications based on classified data
5. The students will be able to understand and analyze time series data
6. The students will be able to understand types of web mining viz. content, structure and usage mining. Web content mining in detail.
7. The students can extend the Graph mining algorithms to Web mining
8. Students will understand advance applications of data mining

Text Books/References:

1. Data Warehousing In the Real World; Sam Anahory& Dennis Murray; 1997, Pearson
2. Data Mining- Concepts & Techniques; Jiawei Han &MichelineKamber- 2001, Morgan Kaufmann.
3. Data Mining Techniques; ArunPujar; 2001, University Press; Hyderbad.
4. Data Mining; Pieter Adriaans&DolfZantinge; 1997, Pearson,
5. Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, Mc Graw Hill.
6. Data warehousing System; Mallach; 2000, Mc Graw Hill.
7. Building the Data Warehouse; W.H. Inman, 1996, John Wiley & Sons.
8. Developing the Data Warehouses; W.H Ionhman,C.Klelly, John Wiley & Sons.
9. Managing the Data Warehouses; W.H.Inman, C.L.Gassey, John Wiley & Sons.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-17-204 (B): ENVIRONMENT SCIENCE
BCA III Semester

No. of Credits: 0

			Sessional:	NIL	
					50
L T	P	Total	Theory :	Marks	
					50
3 0	0	3	Total :	Marks	
			Duration of Exam:	3 Hours	

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 10 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 10 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The prime objective of the course is to provide the students a detailed knowledge on the threats and challenges to the environment due to developmental activities. The students will be able to identify the natural resources and suitable methods for their conservation and sustainable development. The focus will be on awareness of the students about the importance of ecosystem and biodiversity for maintaining ecological balance. The students will learn about various attributes of pollution management and waste management practices. The course will also describe the social issues both rural and urban environment and environmental legislation.

SYLLABUS

UNIT-I
The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems: Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of natural resources.

UNIT-II

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity and its Conservation: Introduction–Definition: genetic, species and ecosystem diversity, bio geographical classification of India, India as a mega-diversity nation, Hot-spots of biodiversity, threats to biodiversity, Conservation of biodiversity: in situ and ex-situ conservation of biodiversity.

UNIT-III

Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

UNIT-IV

Social Issues and the Environment: From Unsustainable to Sustainable Development Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Understand core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand about the disaster management and various natural calamities.
4. Understand the usage of Renewable and Non Renewable Resources.
5. Understand the Environmental Ethics and his/her responsibility towards environment.

Text Books/Reference Books:

1. Perspectives in Environmental Studies by A. Kaushik and C. P. Kaushik, New age international publishers.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi.
3. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-205: PYTHON PROGRAMMING
BCA III Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical :   50 Marks
0 0   4   4   Total   :   75 Marks
                                      Duration of Exam: 3 Hours

LIST OF PROGRAMS:

1. Write a Python program which accepts the radius of a circle from the user and compute the area.

2. Write a Python program to get the largest number from a list.

3. Write a Python program to display the first and last colors from the following list.
    color_list = ["Red","Green","White" ,"Black"].

4. Write a Python program to calculate the sum of three given numbers, if the values are equal then return thrice of their sum.

5. Write a Python program to find whether a given number (accept from the user) is even or odd, print out an appropriate message to the user.

6. Write a Python script to add a key to a dictionary.

7. Write a Python script to check if a given key already exists in a dictionary.

8. Write a Python function to sum all the numbers in a list.

9. Write a Python script to make calculator using Tkinter.

10. Write a program to implement file handling in python.

11. Write a Python script to perform various functions on Images.

BCA-DS-206: OPERATING SYSTEMS LAB
BCA III Semester

No. of Credits: 2
L T   P   Total
 0 0   4   4

Sessional: 25 Marks
Practical :   50 Marks
Total   :   75 Marks
Duration of Exam: 3 Hours

List of Programs*:*

- Study of WINDOWS 2000 Operating System.

- Administration of WINDOWS 2000 (including DNS, LDAP, Directory Services)

- Study of LINUX Operating System (Linux kernel, shell, basic commands pipe & filter

- Administration of LINUX Operating System.

- Writing of Shell Scripts (Shell programming)

- AWK programming.

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – IV

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		I	T	P	Total		Theory	Practical		
BCA-DS-211	Artificial Intelligence	3	-		3	25	75	-	100	3
BCA-DS-212	Programming in Java	3	-		3	25	75	-	100	3
BCA-DS-213	Scientific R Programming	3	-		3	25	75	-	100	3
BCA-DS-214	Computer Networks	3	-		3	25	75	-	100	3
As per list above	General Elective - II	3	-		3	25	75	-	100	3
As per list above	Audit Course (No credit just qualifying)	2			2		50		Marks will not be added in total	No Credit
BCA-DS-215	Java Programming Lab	-		4	4	25	-	50	75	2
BCA-DS-216	R Programming Lab	-		4	4	25	-	50	75	2
BCA-DS-217	Presentation	-		2	2	25	-		25	1
BCA-DS-218	Group Discussion	-		2	2	25	-		25	1
	Total				29	225	375	100	700	21

Note: Exam duration will be as under
      (a)Theory exams will be of 3 hours duration
      (b)Practical exams will be of 3 hours duration

BCA-DS-211 ARTIFICIAL INTELLIGENCE
BCA IV Semester

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                                           Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The aim of the course is to introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

SYLLABUS

UNIT - I
Overview of A.I: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success.

Problems, problem space and search: Defining   the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.

Heuristic search techniques : Generate   and   test,   hill   climbing,   best   first   search technique, problem reduction, constraint satisfaction

UNIT - II
Knowledge Representation: Definition and importance of knowledge, Knowledge representation, and various approaches used in   knowledge   representation, Issues in knowledge representation, Knowledge representation using rules, rules based deduction system, resolution.

Using Predicate Logic: Represent ting Simple Facts in logic, representing   instances   and is-a relationship, Computable function and predicate.

UNIT - III
Planning: Planning in Situational Calculus, representation for planning, partial order planning algorithm
Learning: Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning.

UNIT – IV

Expert System: Introduction, representing using domain specific knowledge, Agents and its types.

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.

COURSE OUTCOMES:

On completion of the course students will be able to
1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
2. Apply these techniques in applications which involve perception, reasoning and learning.
3. Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.
4. Acquire the knowledge of real world Knowledge representation.

Text Books/Reference Books:

1. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
2. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
3. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1999.
4. Nils J Nilsson, "Artificial Intelligence -A new Synthesis" 2nd Edition (2000), Harcourt Asia Ltd.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-212: PROGRAMMING IN JAVA
BCA IV Semester

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                                   Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The course will introduce standard tools and techniques for software development, using object oriented approach, use of a version control system, an automated build process, an appropriate framework for automated unit and integration tests.

SYLLABUS

UNIT - I
Object Oriented Methodology-1: Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure, Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs,

Object Oriented Methodology-2: Classes and Objects, Abstraction and Encapsulation, Inheritance, Method Overriding and Polymorphism.

UNIT – II
Java Language Basics*:* Introduction to Java, Basic Features, Java Virtual Machine Concepts, Primitive Data Type and Variables, Java Operators, Expressions, Statements and Arrays.

Object Oriented Concepts: Class and Objects--Class Fundamentals, Creating objects, Assigning object reference variables; Introducing Methods, Static methods, Constructors, Overloading constructors; This Keyword; Using Objects as Parameters, Argument passing, Returning objects, Method overloading, Garbage Collection, The Finalize ( ) Method.

Inheritance and Polymorphism: Inheritance Basics, Access Control, Multilevel Inheritance, Method Overriding, Abstract Classes, Polymorphism, Final Keyword

UNIT - III
Packages: Defining Package, CLASSPATH, Package naming, Accessibility of Packages, using Package Members.

Interfaces: Implementing Interfaces, Interface and Abstract Classes, Extends and Implements together. Exceptions Handling: Exception, Handling of Exception, using try-catch, Catching Multiple Exceptions, using finally clause, Types of Exceptions, Throwing Exceptions, and Writing Exception Subclasses.

UNIT - IV

Multithreading: Introduction, The Main Thread, Java Thread Model, Thread Priorities, Synchronization in Java, Interthread Communication.

I/O in Java: I/O Basics, Streams and Stream Classes, The Predefined Streams, reading from, and Writing to, Console, Reading and Writing Files, The Transient and Volatile Modifiers, Using Instance of Native Methods.

Strings and characters: Fundamentals of Characters and Strings, the String Class, String Operations, Data Conversion using Value Of ( ) Methods, String Buffer Class and Methods.

COURSE OUTCOMES:

After taking the course, students will be able to:
1. Specify simple abstract data types and design implementations, using abstraction functions to document them.
2. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
3. Name and apply some common object-oriented design patterns and give examples of their use.
4. Design applications with an event-driven graphical user interface.

Text Books/Reference Books:
1. E Balagurusamy: Programming in Java.
2. Herbert Schildt: The Complete Reference JAVA, TMH Publication.
3. Begining JAVA, Ivor Horton, WROX Public.
4. Stephen Potts: JAVA 2 UNLEASHED, Tech Media Publications.
5. Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference", 1999, TMH.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-213 SCIENTIFIC R PROGRAMMING
BCA IV SEMESTER

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                               Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

1.   an introduction to resources for continuing to develop their R skill set.
2.   the ability to perform basic data transformation, analysis and visualisation with R.
3.   a framework for applying R to their own domain-specific problems
4.   Familiarize participants with R syntax
5.   Understand the concepts of objects and assignment
6.   Understand the concepts of vector and data type

SYLLABUS

UNIT -1: Introduction to R

What is R, History of R, Installing R, Package installation, choosing IDE, first program, help in R, Some information about R commands, special values, Objects, Functions, Simple Manipulations: Vectors and numbers, Matrices and arrays, Factors, List, data Frames.

UNIT-2: Programming using R

Function Creation, scripts, Logical operators, Conditional Statements, Loops in R, switch Statement. List and Data Frames: Creating a list, Common List operations, Recursive list, creating a datagram, common data frame operations, using lapply () and sapply () functions.

Object oriented programming with R, S3 Classes, S4 Classes, Reference Classes

UNIT-3: Data handling in R

Saving and loading R data, import and export to CSV files, import and export via ODBC, Debugging Techniques in R, Statistical Graphics: Base Graphics, ggplot2

UNIT-4: Mathematical and statistical Concept using R

Maximum, Minimum, Frequency distribution, Measures of central tendency, Hypothesis testing, Correlation, Different statistical distribution.

COURSE OUTCOMES:

At the end of this course, each student will be able to:
1. Understand basic concepts such as data type and index and use them in their work.
2. Demonstrate use of basic functions.
3. Conceptualize and create loops to solve different types of problems.
4. Create their own customized functions.
5. Construct tables and figures for descriptive statistics.
6. Learn to understand new data sets and functions by themselves.

Text Books/Reference Books:
1. Sandeep Rakshit, R for Beginners, McGraw-Hill Education
2. Hadley Wickham,GarrettGrolemund , Hands-On Programming with R: Write Your Own Functions and Simulations.
3. Tilman M. Davies, The Book of R:A first course in Programming and Statistics.
4. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson
5. Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R , Springer, 2016
6. By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, A Beginner's Guide to R (Use R) Springer 2009

Note: Latest and additional good books may be suggested and added from time to time.

No. of Credits: 3			Sessional:	25 Marks
L T	P	Total	Theory :	75 Marks
3 0	0	3	Total :	100 Marks
			Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1   To develop an understanding of modern network architectures from a design and performance perspective.
2.   To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3.   To provide an opportunity to do network programming
4.   To provide a WLAN measurement ideas.

SYLLABUS

UNIT: I
OSI Reference Model and Network Architecture: Introduction to Computer Networks, Example networks ARPANET, Internet, Private Networks, Network Topologies: Bus-, Star-, Ring-, Hybrid -, Tree -, Complete -, Irregular –Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer

UNIT-II
TCP/IP: Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol, User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP, IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

UNIT-III
Local Area Networks: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links.

UNIT-IV

Introduction to Network Management: Remote Monitoring Techniques: Polling, Traps, Performance Management, Class of Service, Quality of Service, Security management, Firewalls, VLANs, Proxy Servers, Introduction to Network Operating Systems: Client-Server infrastructure, Windows NT/2000.

COURSE OUTCOMES

After taking the course, students will be able to:

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. For a given problem related TCP/IP protocol developed the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Text Books/Reference books:

1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.
2. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.
3. Business Data Communications, Fitzgerald Jerry.
4. Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition
5. Computer Networking – ED Tittel , 2002, T.M.H

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-215: JAVA Programming LAB
BCA IV Semester

No. of Credits: 2	Sessional:	25 Marks
L T P Total	Practical:	50 Marks
0 0 4 4	Total :	75 Marks
	Duration of Exam:	3 Hours

List of Programs:

1. Basics of Java: Classes and objects (Data types, Operators, Array, String)

- Write a Java program that prints all real solutions to the quadratic equation $ax2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant $b2 - 4ac$ is negative, display a message stating that there are no real solutions.

- Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.

- Write a Java program to multiply two given matrices.

- Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

- Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

- Write a Java program for sorting a given list of names in ascending order.

- Write a Java program to make frequency count of words in a given text.

2. Object Oriented Concepts:

Programs on Inheritance, Method Overloading and Overriding, Abstract class and methods, Packages and interface (at least 7 programs)

3. Advanced Concepts:

Programs on Exception and Exception handling, Multithreading, (at least 4 programs).

4. File Handling:

- Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

- Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

- Write a Java program that displays the number of characters, lines and words in a text file.

5. Applet and Event Handling:

- Develop an applet that displays a simple message.

- Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for digits and for the+, -,*, %

BCA-DS-216: R Programming LAB
BCA IV Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical: 50 Marks
  0 0   4   4   Total :   75 Marks
                                            Duration of Exam: 3 Hours

List of Programs:

1. Programs related to the basics:
1.1. Write a program in R to take input from the user (name and age) and display the values. Also print the version of R installation.
1.2. Write a program in R to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
1.3. Write an R program to create a vector which contains 10 random integer values between -50 and +50.
1.4. Write a program in R to find the factors of a given number.
1.5. Write a program in R to find the maximum and the minimum value of a given vector.

2. Programs related to the array:
2.1. Write a program in R to convert a given matrix to a 1 dimensional array.
2.2. Write a program in R to create an array of two 3x3 matrices each with 3 rows and 3 columns from two given two vectors.
2.3. Write a program in R to create an 3 dimensional array of 24 elements using the dim() function.

3. Programs related to the Data Frame:
3.1. Write a program in R to create an empty data frame.
3.2. Write a program in R to create a data frame from four given vectors.
3.3. Write a program in R to get the structure of a given data frame.
3.4. Write a program in R to get the statistical summary and nature of the data of a given data frame.
3.5. Write a program in R to extract first two rows from a given data frame.
3.6. Write a program in R to add new row(s) and column(s) to an existing data frame.

4. Programs related to the matrix:
4.1. Write a program in R to create a matrix taking a given vector of numbers as input. Display the matrix.
4.2. Write a program in R to access the element at 3rd column and 2nd row, only the 3rd row and only the 4th column of a given matrix.
4.3. Write a program in R to create two 2x3 matrix and add, subtract, multiply and divide the matrixes.

5.   Programs related to the vectors:
5.1. Write a program in R to create a vector of a specified type and length. Create vector of numeric,
complex, logical and character types of length 6.
5.2. Write a program in R to add, multiply, divide two vectors of integers type and length 3.

6.   Programs related to the List:

   6.1.   Write a program in R to create a list containing strings, numbers, vectors and a logical
value.

   6.2.   Write a program in R to create a list containing a vector, a matrix and a list and give
names to the elements in the list. Access the first and second element of the list.

   6.3.   Write a program in R to select second element of a given nested list.

7.   Write a program to Import and export file through ODBC.

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – V

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		L	T	P	Total		Theory	Practical		
BCA-DS-301	Big Data - 1	3	-		3	25	75	-	100	3
BCA-DS-302	Machine Learning - 1	3	-		3	25	75	-	100	3
BCA-DS-303	Organizational Behavior	3	-		3	25	75	-	100	3
BCA-DS-304	Intellectual Property and Rights	3	-		3	25	75	-	100	3
As per list above	General Elective - III	3	-		3	25	75	-	100	3
BCA-DS-305	Big Data – I Lab	-		4	4	25	-	50	75	2
BCA-DS-306	Machine Learning – I Lab	-		4	4	25	-	50	75	2
BCA-DS-307	Presentation	-		2	2	25	-		25	1
BCA-DS-308	Group Discussion	-		2	2	25	-		25	1
BCA-DT-301	Industrial Training - II					50		50	100	3
	Total				27	275	375	150	800	24

Note: Exam duration will be as under
    (a)Theory exams will be of 3 hours duration
    (b)Practical exams will be of 3 hours duration

BCA-DS-301: BIG DATA -1
BCA V Semester

No. of Credits: 3
L T   P   Total
3 0   0   3

Sessional: 25 Marks
Theory :   75 Marks
Total :   100 Marks
Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1. To Understand and Target Customers
2. To Take Strategic Decision
3. Cost Optimization
4. To Improve Customer Experiences

SYLLABUS

UNIT-I
Big Data - Beyond the Hype: Introduction, Why Big Data, History of Big Data, Characteristics of Big Data - The Four V's, advantages and disadvantages, Big Data Management approach, Technology challenges for Big Data, Big Data Architecture, Applications of Big Data

UNIT - II
Data Structures in Java: Linked List, Stacks, Queues, Sets, Maps, Generics: Generic classes and Type parameters, Implementing Generic Types, Generic methods, Wrapper classes, Concept of serialization.

UNIT – III
Working with Big Data: Hadoop framework, Hadoop Distributed File System (HDFS), Comparison between HDFS and Google File system, Building Blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully distributed node), YARN architecture.

UNIT – IV
MapReduce: Overview, MapReduce programming: Driver code, Mapper Code, Reducer code, Combiner, Partitioner, Sorting, Shuffling, MapReduce Jobs Execution, Hadoop Streaming, Introduction to Hive and Pig.

COURSE OUTCOMES:
After completion of this course, students will be able to
1. Optimize business decisions and create competitive advantage with Big Data analytics

2. Understand Java concepts required for developing map reduce programs
3. Derive business benefit from unstructured data
4. Learn the architectural concepts of Hadoop and introducing map reduce paradigm

TextBooks/Reference Books
1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Hadoop in Practice by Alex Holmes, MANNING Publ.
3. Seema Acharya (Author), SubhashiniChellappan, Big Data and Analytics (2015). Wiley Publication.
4. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization (2016), DT Editorial Services

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-302: MACHINE LEARNING-1
BCA V Semester

No. of Credits: 3			Sessional:	25 Marks
L T	P	Total	Theory :	75 Marks
3 0	0	3	Total :	100 Marks
			Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The purpose of machine learning is to discover patterns in your data and then make predictions based on those often, complex patterns to answer business questions, and help solve problems.

SYLLABUS

UNIT I
INTRODUCTION TO MACHINE LEARNING: Machine Learning basic concepts, Perspectives and Issues in Machine Learning, Types of Machine Learning, supervised – unsupervised – reinforcement, Data Representations: Data representation, Numerical representation, Graph representation, Applications of Machine Learning.

UNIT II
SUPERVISED LEARNING: Nearest-Neighbours, Decision Trees, Naïve Bayes, Linear classification, univariate linear regression, multivariate linear regression, regularized regression, Logistic regression, Support Vector Machines, Nonlinearity and Kernel Methods.

UNIT III
UNSUPERVISED LEARNING: Clustering: K-means, Kernel K-means, Cluster analysis, Vector Quantization, Self-Organizing Feature Map, Association Rule Mining: Apriority algorithms

UNIT IV
TECHNIQUES AND APPLICATIONS: Scalable Machine Learning, Introduction to Bayesian Learning and Inference, Recent trends in various learning techniques of machine learning and classification methods.

COURSE OUTCOMES:
After completion of course, students would be able to:

1. Extract features that can be used for a particular machine learning approach in various IOT applications.

2. To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.

2. To mathematically analyze various machine learning approaches and paradigms.

Text Books/Reference Books

1. Kevin Murphy," Machine Learning: A Probabilistic Perspective", MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer 2009 (freely available online)
3. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)‖, Third Edition, MIT Press, 2014
4. Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education.

Note: Latest and additional good books may be suggested and added from time to time.

No. of Credits: 3			Sessional:	25 Marks
L T	P	Total	Theory :	75 Marks
				100
3 0	0	3	Total :	Marks
			Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.

UNIT-1
Introduction to management: concept, nature; evolution of management thoughts –traditional, behavioral, system, contingency and quality viewpoints; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, Directing, Controlling, Problem solving and Decision making; Management control; managerial ethics and social responsibility; Management Information System (MIS).

UNIT-2
Fundamentals of Organizational Behavior: Concept, evolution, importance and relationship with other Fields; Contemporary challenges of OB; Individual Processes and Behavior – differences, Personality concept, determinant, theories and applications; Values, Attitudes and Emotions, Perception- concept, process and applications, Learning and Reinforcement; Motivation: concept, theories and applications; Stress management.

UNIT-3
Interpersonal Processes- Work teams and groups- Definition of Group, Stages of group development, Group cohesiveness, Types of groups, Group processes and Decision Making; Team Building; Conflict- concept, sources, types, management of conflict; Power and Political Behavior; Leadership: concept, function and styles.

UNIT-4
Organizational Processes and structure: organizational design: various organizational structures and their effect on human behavior; Organizational climate; Organizational culture;

Organizational change: Concept, Nature, Resistance to Change, Change Management, Implementing Change and Organizational Development.

COURSE OUTCOMES:
1. The students learn how to influence the human behavior.
2. Students will be able to understand behavioral dynamics in organizations.
3. Students will be able to apply managerial concepts in practical life.
4. Students will be able to understand organizational culture and change.

Text Books/Reference Books:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi
3. Satya Raju, Management – Text & Cases, PHI, New Delhi
4. Kavita Singh, OrganisationalBehaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding OrganisationalBehaviour, Oxford University Press, New Delhi
6. Robbins, S.P. & Judge, T.A., OrganisationalBehaviour, Prentice Hall of India, New Delhi

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-304: INTELLECTUAL PROPERTY AND RIGHTS
B.C.A V SEMESTER

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
                                                                       100
3 0   0   3   Total :   Marks
                                                     Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course is designed for students to have knowledge of all rights resulting from intellectual activity in the industrial, scientific, literary, or artistic fields, industrial designs, scientific discoveries, protection against unfair competition, literary, artistic, and scientific works, Inventions in all fields of human endeavor, trademarks, service marks, commercial names, and designations.

SYLLABUS

UNIT - I
Introduction to Intellectual Property: Concept of Intellectual Property, Kinds of Intellectual Property, Economic Importance of Intellectual Property.

Indian Theory on Private Property: Constitutional Aspects of Property, Constitutional Protection of Property and Intellectual Property, Economic Development and Intellectual Property Rights Protection.

UNIT - II
Introduction to Patents: Overview, Historical Development, Concepts: Novelty, Utility.

Patentable Subject-matter: Patent Act, 1970- Amendments of 1999,2000, 2002 and 2005, Pharmaceutical Products and Process and Patent , Protection, Software Patents, Business Method, Protection of Plant Varieties and Farmers' Rights Act, 2001, Patenting of Micro-organism.

UNIT – III
Procedure of Obtaining of Patents: Concepts of a Patent Application, Specification: Provisional, Complete, Disclosure Aspects, Claims: Principal, Dependant, Omnibus, Examination of Application, Opposition of Application, Sealing of Patents.

Working of Patents: Compulsory License: Commercialization of Inventions: License Terms of License Agreement, Assignments of Patents, Revocation of Patents.

UNIT – IV
Infringement: What is Infringement? How is Infringement determined? Who is an Infringer? Direct, Contributory and Induced, Defences of Infringement:5.2.1 Research Exemption, Invalidity, Misuse, Failure to mark, Laches and Estoppel and first sale doctrine.

COURSE OUTCOMES:

After the completion of course, students will be able to

1. Understand the concept of intellectual property rights.
2. Develop procedural knowledge to Legal System and solving the problem of intellectual property rights.
3. Understand the professional program in Company Secrataryship, Law,Business (M.B.A.), International Affairs, Public Administration and other fields.
4. Understand the concept of establishment of Legal Consultancy and Service provider.

Text Books/Reference Books*:*
1. W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
2. P. Narayana, Patent Law, Wadhwa Publication
3. Merges, Patent Law and Policy: Cases and Materials, 1996
4. Brian C. Reid, A Practical Guide to Patent Law, 2nd Edition, 1993
5. Brinkhof (Edited), Patent Cases, Wolters Kluwer.
6. Prof. Willem Hoyng& Frank Eijsvogels, Global Patent Litigation, Strategy and Practice, Wolters Kluwer.
7. Gregory Stobbs, Software Patents Worldwide, Wolters Kluwer.
8. Feroz Ali Khader, The Law of Patents- With a special focus on Pharmaceuticals in India, Lexis Nexis Butterworths Wadhwa, Nagpur.
9. Sookman, Computer Law, 1996
10. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property (2009). Eastern Book Company, Lucknow.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-305: BIG DATA -I LAB
BCA V Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical: 50 Marks
0 0   4   4   Total :   75 Marks
                                           Duration of Exam: 3 Hours

List of Programs:

1. Installation of Hadoop.

2. To perform HDFS Shell basic operations.

3. Write a program to cut, copy and paste the file or directory from HDFS to the local file system.

4. Write a program to get status of a file in the HDFS.

5. Write a program that using Hadoop APIs to do the "ls" operation for listing all files in HDFS.

6. Implementation of MapReducer as follows (Running the WordCount program): -

    Modify the given example: WordCount

- • Main function – add an argument to allow user to assign the number of Reducers.

- • Mapper – Change WordCount to CharacterCount (except " ")

- • Reducer – Output those characters that occur >= 20 times

    After finishing part I, SORT the output of part I according to the number of times using the mapreduce programming model.

6. Java Programming examples on Stack, Queue and Linked List

7. Implementation of wrapper classes in java

8. Implementation of Java objects using the concept of serialization.

BCA-DS-306: MACHINE LEARNING- I LAB
BCA V Semester

No. of Credits: 2
L T   P   Total
0 0   4   4

Sessional: 25 Marks
Practical: 50 Marks
Total :   75 Marks
Duration of Exam: 3 Hours

List of Programs: -

1. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.
2. Print both correct and wrong predictions.
3. Write a program to implement feature scaling & feature standardization of pre-processing & compare its result with KNN algorithm.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
5. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Estimate the accuracy of decision classifier on cancer dataset using 5-fold cross-validation.
7. Write a program to implement Support vector machine algorithm on sample dataset.
8. Write a program to implement Simple Linear Regression on a sample dataset.
9. Write a program to implement Multi-Variate Linear Regression on a sample dataset.
10. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
11. Write a program to construct a Bayesian network considering medical data like heart patient or diabetes dataset.
12. Using a dataset with known class labels compare the labeling error of the K-means algorithm. Measure the error by assigning a class label to each example. Assume that the number of clusters is known. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.
13. Print both correct and wrong predictions.
14. Write a program to implement feature scaling & feature standardization of pre-processing & compare its result with KNN algorithm.

15. Write a program to demonstrate the working of the decision tree based ID3 algorithm.

16. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

17. Estimate the accuracy of decision classifier on cancer dataset using 5-fold cross-validation.

18. Write a program to implement Support vector machine algorithm on sample dataset.

19. Write a program to implement Simple Linear Regression on a sample dataset.

20. Write a program to implement Multi-Variate Linear Regression on a sample dataset.

21. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets

22. Write a program to construct a Bayesian network considering medical data like heart patient or diabetes dataset.

23. Using a dataset with known class labels compare the labeling error of the K-means algorithm. Measure the error by assigning a class label to each example. Assume that the number of clusters is known.

YMCA University of Science and Technology, Faridabad
BCA Scheme of Studies / Examination
Semester – VI

Course No.	Course Title	Schedule				Sessional Marks/ Internal	Marks for End Term Examination		Total Marks	Credits
		L	T	P	Total		Theory	Practical		
BCA-DS-301	Big Data – II	3	-		3	25	75	-	100	3
BCA-DS-302	Machine Learning – II	3	-		3	25	75	-	100	3
BCA-DS-303	Employability Skills	3	-		3	25	75	-	100	3
BCA-DS-304	Bio Informatics	3	-		3	25	75	-	100	3
As per list above	General Elective - IV	3	-		3	25	75	-	100	3
BCA-DS-305	Big Data – II Lab	-		4	4	25	-	50	75	2
BCA-DS-306	Machine Learning – II Lab	-		4	4	25	-	50	75	2
BCA-DS-307	Presentation	-		2	2	25	-		25	1
BCA-DS-308	Group Discussion	-		2	2	25	-		25	1
	Total				27	225	375	100	700	21

Note: Exam duration will be as under
   (a) Theory exams will be of 3 hours duration
   (b) Practical exams will be of 3 hours duration

BCA-DS-311: BIG DATA II
B.C.A VI SEMESTER

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
                                                                   100
3 0   0   3   Total :   Marks
                                           Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches.

SYLLABUS

UNIT – I
Hadoop I/O The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT – II
Pig: Introduction, Pig Architecture, Pig Latin Data model, Pig Latin operators, Pig Diagnostic operators, Pig Data manipulation, built-in functions, user defined functions, Scripting with Pig Latin

UNIT – III
Hive: Getting Started with Apache Hive, Hive architecture, working with Hive Data Types, Creating and Managing Databases and Tables, views and indexes, Hive Data Manipulation Language, Querying and Analyzing Data.

UNIT – IV
Spark: Introduction, Spark Architecture, Advantages over traditional data approaches, Spark Ecosystem, Spark for Big Data processing and its applications

COURSE OUTCOMES:
1. To introduce programming tools PIG & HIVE in Hadoop ecosystem.
2. Preparing for data summarization, query, and analysis.
3. Applying data modeling techniques to large data sets.
4. Creating applications for Big Data analytics.
5. Building a complete business data analytic solution.

Text Books/Reference Books
1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Hadoop in Practice by Alex Holmes, MANNING Publ.
3. Seema Acharya (Author), SubhashiniChellappan, Big Data and Analytics (2015). Wiley Publication.
4. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization (2016), DT Editorial Services

Note: Latest and additional good books may be suggested and added from time to time.

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
		100
3 0 0 3	Total :	Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course is designed to help students learn to design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.

SYLLABUS

UNIT-1
COMBINING DIFFERENT MODELS: Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods: Boosting, Bagging, Random Forests.

UNIT- II
DIMENSIONALITY REDUCTION: Dimensionality Reduction, Linear Discriminant Analysis – Principal Component Analysis, Kernel PCA– Factor Analysis – Independent Component Analysis

UNIT –III
LEARNING WITH NEURAL NETWORKS: Perceptron, multilayer neural networks, learning neural networks structures – Deep Learning and Feature Representation Learning

UNIT IV
REINFORCEMENT LEARNING: Reinforcement Learning overview, Elements of Reinforcement Learning, Generalization in reinforcement learning, policy search, adaptive dynamic programming.

COURSE OUTCOMES:
After completing this course, student will be able
      1. To have a good understanding of numerical approaches to learning (optimization and integration).

2. Develop an idea of how to choose a probabilistic model to describe a particular type of data.

3. To know how to evaluate a learned model in practice.

4. To understand the role of machine learning in massive scale automation.

5. Understand the mathematics necessary for constructing novel machine learning solutions.

Text Books/Reference Books

1. K. P. Murphy, ―Machine Learning: A probabilistic perspective, MIT Press, 2012.
2. M. Mohri, A. Rostamizadeh, and A. Talwalkar, ―Foundations of Machine Learning, MIT Press, 2012.
3. D. Barber, ―Bayesian Reasoning and Machine Learning, Cambridge University Press, 2012.
4 . P. Flach, ―Machine Learning: The art and science of algorithms that make sense of data, Cambridge University Press, 2012.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-313: EMPLOYABILITY SKILLS
B.C.A VI SEMESTER

No. of Credits: 3	Sessional:	25 Marks
L T P Total	Theory :	75 Marks
		100
3 0 0 3	Total :	Marks
	Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
1.   Review and evaluate your personal attributes and employability skills which are necessary for successful employment and career development.
2.   Investigate employment opportunities, complete a job application including a CV for for a specific job opportunity.
3.   Understanding of employability skills and personal attributes in relation to job selection methods
4.   Understanding of the skills and attributes required to maintain and successfully develop in employment.

SYLLABUS

UNIT –I
VERBAL ABILITY and BASIC QUANTITATIVE APTITUDE: Synonyms**,** Antonyms and One word substitutes, Speed, Time and Distance, Time and Work, Linear Equations, Progressions (Sequences & Series), Permutation and Combination, Probability, Functions, Set Theory, Number Systems, LCM and HCF, Percentages, Collection and Scrutiny of data: Primary data, questionnaire and schedule; secondary data, their major sources including some government publications

UNIT II
LOGICAL REASONING – I: Number and Letter Series, Calendars, Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism. Blood Relations; concept of a statistical population and sample from a population; qualitative and quantitative data.

UNIT-III
MEASURES OF CENTRAL TENDENCY: Objective of averaging, characteristics of good average, types of average, arithmetic mean of grouped and ungrouped data, correcting incorrect values, weighted arithmetic mean, median - median of grouped and ungrouped data merit and

limitation of median, computation of quartile, decile and percentile Mode - calculation of mode of grouped and ungrouped data, merits and limitation of mode, relationship between mean, median and mode. Geometric mean and Harmonic mean.

UNIT-IV
PRESENTATION OF DATA: Construction of tables with one or more factors of classification; Diagrammatic and Graphical representation of non-frequency data; Frequency distribution, cumulative frequency distribution and their graphical representation - histogram, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Data Interpretation – Introduction and approach

COURSE OUTCOMES:

After completing this course student will be able:

1. To help students explore their values and career choices through individual skill assessments
2. To make realistic employment choices and to identify the steps necessary to achieve a goal
3. To develop and practice self-management skills for the work site
4. To explore and practice basic communication skills
5. To learn skills for discussing and resolving problems on the work site
6. To assess and improve personal grooming
7. To promote safety awareness including rules and procedures on the work site

Text Books/Reference Books:

1. Bajpai, N. Business Statistics, Pearson, 2010
2. Sharma J.K., Business Statistics, Pearson Education India, 2010.
3. Richard I Levin, David S. Rubin: Statistics for Management, Pearson Prentice Hall Education Inc. Ltd, NewDelhi, 5th Ed.
4. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, WestPublishing Company, 1996.
5. CAT Complete course, UPKAR publications

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-314: BIO INFORMATICS
B.C.A VI SEMESTER

No. of Credits: 3

L T   P   Total

3 0   0   3

Sessional: 25 Marks

Theory :   75 Marks

Total :   100Marks

Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

The basic objective is to give students an introduction to the basic practical techniques of bioinformatics. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems. The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems.

SYLLABUS

UNIT-I

HISTORY, SCOPE AND IMPORTANCE: Important contributions - sequencing development - aims and tasks of Bioinformatics - applications of Bioinformatics – challenges and opportunities - Computers and programs – internet - world wide web – browsers – EMB net – NCBI.

UNIT-II

DATABASES - TOOLS AND THEIR USES: Importance of databases - nucleic acid sequence databases - protein sequence data bases - structure databases - bibliographic databases and virtual library - specialized analysis packages.

UNIT-III

INTRODUCTION TO BIOINFORMATICS ALGORITHMS: Algorithms and   Complexity Biological algorithms versus computer algorithms – The change problem –Correct versus Incorrect Algorithms – Recursive Algorithms – Iterative versus Recursive Algorithms – Big-O Notations – Algorithm Design Techniques.

UNIT-IV

UNIX COMMANDS: Advanced Unix Commands-Introduction-ls-cat-more-, Advanced Unix commands-mv-rm-rmdir-uniq-sort-, Advanced Unix commands-grep. PERL: Introduction to Perl-scalars, Arrays-Using standard Perl Modules-Perl regular expressions I.

BIOPERL: Installation and usage of bioperl modules

COURSE OUTCOMES:

1. The basic objective is to give students an introduction to the basic practical techniques of bioinformatics. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems.
2. The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems
3. The student will be aware about the bioinformatics methods including accessing the major public sequence databases, use of the different computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages.
4. The students will be able to predict the secondary and tertiary structures of protein sequences.

Text Books / Reference books

1. T K Attwood, D J parry-Smith, Introduction to Bioinformatics, Pearson Education, 1st Edition, 11th Reprint 2005.

2. S. Ignacimuthu, S.J., Basic Bioinformatics, Narosa Publishing House, 1995.

3. Neil C. Jones and Pavel A. Pevzner, An Introduction to Bioinformatics Algorithms, MIT Press, First Indian Reprint 2005.

4. Harshawardhan P BAL, Perl Programming for Bioinformatics, Tata McGraw Hill, 2003.

Note: Latest and additional good books may be suggested and added from time to time.

BCA-DS-315: BIG DATA –II LAB
BCA VI Semester

No. of Credits: 2   Sessional: 25 Marks
L T   P   Total   Practical: 50 Marks
   0 0   4   4   Total   :   75 Marks
                                                          Duration of Exam: 3 Hours

List of Programs:

I) Working with Pig using various built-in and user-defined functions.

1. Installation of Cloud era to work with Pig.

2. Execute various commands and queries.

3. Loading data

4. Produce histogram.

5. Sum the word counts for each word length using the SUM function with the FOREACH GENERATE command.

6. Copy the data file into HDFS.

7. Importing CSV files, creating tables in pig.

8. Facebook analysis by installing plug-into see the details like: liked pages of friends etc. and many other activities.

II) Working with Hive

1. Installation of Hive

2. Introduction to Hive shell

3. Making a script file in Hive.

4. Loading dataset, loading tables.

5. Creating tables, creating databases, editing tables.

6. Apply various queries like:

7. Different ways of querying through Interactive shell window or using Hive script.

III) Introduction to Spark framework and Spark installation

1. Understand the purpose of SparkContext.
2. Initialize Spark with the various Programming Languages.
3. Passing functions to Spark and run some Spark Examples.

BCA-DS-316: MACHINE LEARNING –II LAB
BCA VI Semester

No. of Credits: 2   Sessional: 25 Marks
L   T   P   Total   Practical: 50 Marks
0   0   4   4   Total :   75 Marks
                                                        Duration of Exam: 3 Hours

List of Programs:
1. Compute the accuracy of different classifiers (KNN, Naïve Bayes and SVM), considering a test data set.
2. Develop a machine learning method to classify your incoming mail.
3. Develop a machine learning method to Predict stock prices based on past price variation.
4. Estimate the precision, recall, accuracy, and F-measure of the decision tree classifier on the text classification task.
5. Write a program to implement Random Forest Approach using sample dataset.
6. Write a program to implement dimensionality reduction using Principal component Analysis.
7. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
8. Develop a machine learning method to implement recommendation system to rate movies, books, etc.

GEC-DS-1 DISCRETE STRUCTURES

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
                                                                100
3 0   0   3   Total :   Marks
                                            Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:
1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Use counterexamples.
5. Apply logical reasoning to solve a variety of problems.

SYLLABUS

UNIT I
Set Theory and Propositional Calculus: Introduction to set theory, Set operations, Algebra of sets, Duality, Finite and Infinite sets, Classes of sets, Power Sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Equivalence relations and partitions , Partial ordering relations and lattices.

UNIT II
Function and its types: Composition of function and relations, Cardinality and inverse relations Introduction to propositional Calculus: Basic operations: AND (^), OR(v), NOT(~), Truth value of a compound statement, propositions, tautologies, contradictions.

UNIT III:
Techniques of Counting and Recursion and recurrence Relation: Permutations with and without repetition, Combination. Polynomials and their evaluation, Sequences, Introduction to AP, GP and AG series, partial fractions, linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

UNIT IV

Algebraic Structures: Definition and examples of a monoid, Semigroup, Groups and rings, Homomorphism, Isomorphism and Automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Cosets, Lagrange's theorem.

COURSE OUTCOMES:

1. For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
2. For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
3. For a given a mathematical problem, classify its algebraic structure
4. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
5. Develop the given problem as graph networks and solve with techniques of graph theory

Text Books/Reference Books:

1. Discrete Mathematics by Johnson Bough R., 5th Edition, PEA, 2001.
2. Concrete Mathematics: A Foundation for Computer Science, Ronald Graham, Donald Knuth and Oren Patashik, 1989, Addison-Wesley
3. Mathematical Structures for Computer Science, Judith L. Gersting, 1993, Computer Science Press.
4. Applied Discrete Structures for Computer Science, Doerr and Levasseur, (Chicago: 1985,SRA)
5. Discrete Mathematics by A. Chtewynd and P. Diggle (Modular Mathematics series), 1995, Edward Arnold, London
6. Schaums Outline series: Theory and problems of Probability by S. Lipshutz, 1982, McGraw-Hill Singapore
7. Discrete Mathematical Structures, B. Kolman and R.C. Busby, 1996, PHI
8. Discrete Mathematical Structures with Applications to Computers by Tembley& Manohar, 1995, Mc Graw Hill.
9. Elements of Discrete Mathematics,C.L Liu, 1985, McGraw Hill

Note: Latest and additional good books may be suggested and added from time to time.

<center>

GEC-DS-2
PRINCIPLES OF SOFTWARE ENGINEERING

</center>

No. of Credits: 3			Sessional:	25 Marks	
L T	P	Total	Theory :	75 Marks	
3 0	0	3	Total :	100Marks	
			Duration of Exam:	3 Hours	

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

1. To enable the students to apply a systematic application of scientific knowledge in creating and building cost effective software solutions to business and other types of problems.
2. To make the students understand project management concepts & their metrics.
3. To make the students understand requirement engineering and its models (Information, functional, behavioral).
4. To make the students understand to develop quality software, its maintenance & introduce about software reliability.

SYLLABUS

UNIT I
Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.
Software Requirements   Analysis & Specifications:
Requirement engineering, requirement elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS .

UNIT – II
Software Project Management Concepts: The Management spectrum, The People, The Problem, The Process, The Project.
Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Management.

UNIT – III
Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics
Software Implementation: Relationship between design and implementation, Implementation issues and programming support environment, Coding the procedural design, Good coding style

UNIT – IV

Software Testing: Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing, Debugging Activities.

Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

COURSE OUTCOMES:

The student will be able to

1. Understand Software life cycle models and have a knowledge of different phases of Software life cycle.

2. Identify, formulate, review, estimate and schedule complex software projects using principles of mathematics.

3. Create a bug free software with good design and quality by using appropriate techniques and modern engineering and IT tools.

4. Analyze verification, validation activities, static, dynamic testing, debugging tools and techniques and importance of working in teams.

Text Books/Reference Books:

1.   Pressman : Software Engineering, TMH.
2.   K.K Aggarwal & Yogesh Singh: Software Engineering, New Age International Publishers.
3.   Jalote, Pankaj : An Integrated Approach to Software Engineering, Narosa Publications.
4.   Ghezzi, Carlo : Fundaments of Software Engineering, PHI.
5.   Fairely, R.E. : Software Engineering Concepts, McGraw-Hill.
6.   Lewis, T.G.: Software Egineering, McGraw-Hill.
7.   Shere : Software Engineering & Management, Prentice Hall.

 Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-3
COMPUTER ORGANIZATION-1

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100Marks
                                                   Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The basic objective of this course is to give students an introduction of**:**
1. How Computer Systems work and the basic principles.
2. Concept of computer architecture and Micro programming.

SYLLABUS

UNIT – I
Information Representation: Number Systems, Binary Arithmetic, Fixed-point and Floating-point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode

UNIT – II
Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions and Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions – Venn Diagram, Karnaugh Maps.

UNIT – III
Digital Logic: Introduction to digital signals, Basic Gates–AND, OR, NOT, Universal Gates and their implementation – NAND, NOR, Other Gates – XOR, XNOR etc. NAND, NOR, AND-ORINVERT and OR-AND-INVERT implementations of digital circuits, Combinational Logic – Characteristics, Design Procedures, analysis procedures, Multilevel NAND and NOR circuits.

UNIT – IV
Combinational Circuits: Half-Adder, Full-Adder, Half Subtractor, Full-Subtractor, Parallel binary adder/ subtractor, YMCA University of Science & Technology Faridabad Page 8 Encoders, Decoders, Multiplexers, Demultiplexers, Comparators, Code Converters, BCD to Seven-Segment Decoder.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Understand the working of logic families and logic gates
2. Design & implement combinational logic circuits
3. Understand the various code converters

Text Books/Reference Books:

1. Gill, Nasib Singh and Dixit J.B.: Digital Design and Computer Organisation, University Science Press (Laxmi Publications), New Delhi.
2. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
3. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd.
4. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd.
5. Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill
6. Note: Latest and additional good books may be suggested and added from time to time.

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-4 OPERATION RESEARCH

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
                                                                               100
3 0   0   3   Total :   Marks
                                                        Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course aims at familiarizing the students with quantitative tools and techniques, which are frequently applied to business decision-making & to provide a formal quantitative approach to problem solving and an intuition about situations where such an approach is appropriate.

SYLLABUS

UNIT I
DEVELOPMENT–DEFINITION–CHARACTERISTICS AND PHASES: Types of models– operation Research models – applications. ALLOCATION : Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT II
TRANSPORTATION PROBLEM: Formulation–Optimal solution, unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem Traveling Salesman problem.
REPLACEMENT : Introduction, Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement. staffing problem, equipment renewal problem.

UNIT III
SYSTEM RELIABILITY: Introduction-Definition-Failure Rates-Bath-tub shaped failure rate(Hazard Rate)-Reliability of systems-series arrangement and parallel arrangement-methods of assuring reliability. Software Reliability - Comparison of Software and Hardware Reliability- Development of Software Reliability Models- Parameter Estimation of Models and Prediction of Reliability Levels- criteria to Compare Software Reliability models.

UNIT IV
INFORMATION THEORY-Introduction, measure of Information, binary unit of information entropy, properties of average measure of entropy, important relations for various entropies, set of

axioms for an entropy function, uniqueness theorem, communication system, noiseless channel, Channel capacity, efficiency and redundancy, executed mutual information, encoding.

WAITING LINES : Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals, exponential service times with infinite population single channel Poisson arrivals.

COURSE OUTCOMES:
After completing this course student will be able:
1. Identify and develop operational research models from the verbal description of the real system.
2. Understand the mathematical tools that are needed to solve optimisation problems.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the model and the solving technique, analyse the results and
5. propose recommendations in language understandable to the decision-making processes in Management Engineering.

Text books / Reference Books:
1. Operations Research / S.D.Sharma-Kedarnath
2. Introduction to O.R/Taha/Pearson
3. Operation Research/A.P.VERMA/SK KATARIA AND SONS
4. Operations Research/P.K.GUPTA & D.S.HIRA
5. Software Reliability / John D.musa ,Anthony Iannino and KajuzuhiraOkumoto/ Mc-Grawhill

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-5 SOFTWARE TESTING

No. of Credits: 3			Sessional:	25 Marks
L T	P	Total	Theory :	75 Marks
				100
3 0	0	3	Total :	Marks
			Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
3. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
4. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
5. To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
6. To understand software test automation problems and solutions.
7. To learn how to write software testing documents, and communicate with engineers in various forms.

SYLLABUS

UNIT I:
Software testing principles: Types of Debugging and testing, fundamentals of test process, Need for testing, Psychology of testing, Testing economics, Software Verification & Validation, types of testing.

UNIT – II
Testing strategies: White box testing techniques: Control Flow based testing -Statement coverage, Branch Coverage, Path Coverage; Data flow based testing, Mutation testing, Automated code coverage analysis, Black box testing techniques: Boundary value analysis, Robustness testing, Equivalence partitioning, Cause-effect graphing, Syntax testing - Finite state testing; Levels of testing - Unit, Integration and System Testing; Acceptance testing: α, β, and γ testing.

UNIT – III

Testing object oriented software: Challenges, Differences from testing non-Object Oriented Software, Class testing strategies, Class Modality, State-based Testing, Message Sequence Specification. Testability and related issues: Design for Testability - Observability & Controllability - Built-in Test – Design by Contract - Precondition, Post condition and Invariant - Impact on inheritance - Applying in the real world Regression Testing – Challenges.

UNIT – IV

Miscellaneous topics: Automated Tools for Testing - Static code analyzers, Test case generators, GUI Capture/Playback, Stress Testing, Testing Client-server applications, Testing compilers and language processors, Testing web-enabled applications, Ad hoc testing: Buddy testing, pair testing, Exploratory testing, Agile and extreme testing.

COURSE OUTCOMES:

After completion of this course, Student will be able to understand
1. the concept of software.
2. how software works.
3. how to find errors, bugs in the software.
4. different testing strategies with advantages and disadvantages.

Text Books/Reference Books:

1. GlenfordJ.Myers, "The Art of Software Testing", 2/e, John Wiley & Sons
2. Mathur P Aditya, Foundations of Software Testing, Pearson Education, 2008
3. D. Srinivasan & R. Gopalaswamy, Software Testing – Principles & Practices, Pearson Education
4. Robert V.Binder, "Testing Object-Oriented Systems: Models Patterns and Tools", Addison Wesley.
5. Patton Ron, Software Testing, 2/e, Pearson education.
6. Limaye G. M., Software Testing – Principles, Techniques, and Tools, Tata McGraw Hill.

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-6 COMPUTER ORGANIZATION-II

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                                   Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

The basic objective of this course is to give students an introduction of**:**
1. The basic principles for accessing I/O devices and memory unit.
2. Concepts of advanced processors, parallel and pipelining techniques.

SYLLABUS

UNIT – I
Sequential Logic: Characteristics, Flip-Flops, Clocked RS, D type, JK, T type and Master-Slave flip-flops. State table, state diagram and state equations. Flip-flop excitation tables

UNIT – II
Sequential Circuits: Designing registers–Serial Input Serial Output (SISO), Serial Input Parallel Output (SIPO), Parallel Input Serial Output (PISO), Parallel Input Parallel Output (PIPO) and shift registers. Designing counters – Asynchronous and Synchronous Binary Counters, Modulo-N Counters and Up-Down Counters

UNIT – III
Memory & I/O Devices: Memory Parameters, Semiconductor RAM, ROM, Magnetic and Optical Storage devices, Flash memory, I/O Devices and their controllers.

UNIT – IV
Instruction Design & I/O Organization: Machine instruction, Instruction set selection, Instruction cycle, Instruction Format and Addressing Modes. I/O Interface, Interrupt structure, Program controlled, Interrupt-controlled & DMA transfer, I/O Channels, IOP.

COURSE OUTCOMES:

1. Design & analyse sequential logic circuits
2. Acquire basic knowledge of digital logic families & semiconductor memories
3. Acquire basic knowledge of computer architecture.

Text Books/Reference Books:

1. Gill, Nasib Singh and Dixit J.B.: Digital Design and Computer Organisation, University Science Press (Laxmi Publications), New Delhi.
2. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
3. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd.
4. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd.
5. Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill.

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-7
MULTIMEDIA TECHNOLOGIES

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory :	75 Marks
			100
3 0 0 3		Total :	Marks
		Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

The course is designed for students:

1. Those who want to broaden their knowledge by including multimedia studies.
2. Looking for a foundation from which to pursue advanced topics in multimedia studies.
3. Professional developers who want a technical foundation for developing applications with distributed multimedia components.
4. Networks professionals who needs to manage multimedia delivery service.

SYLLABUS

UNIT I
Basics of Multimedia Technology: Computers, communication and entertainment; multimedia an introduction; framework for multimedia systems; multimedia devices; CD- Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; LANs and multimedia; internet, World Wide Web & multimedia distribution network ATM& ADSL; multimedia servers & databases; vector   graphics;   3D graphics programs; animation techniques;   shading; anti-aliasing; morphing; video on demand.

UNIT II
Image Compression & Standards: Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; PEG-objectives and architecture; JPEG-DCT encoding and quantization, JPEG statistical coding, JPEG predictive lossless coding; JPEG performance; overview of other image file formats as GIF, TIFF, BMP, PNG etc.

UNIT III

Audio & Video: Digital representation of sound; time domain sampled representation; method of encoding the analog signals; sub band coding; fourier method; transmission of digital sound; digital audio signal processing; stereophonic & quadraphonic signal processing; editing sampled sound; MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface; digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.

UNIT IV

Virtual Reality: Applications of multimedia, intelligent multimedia system, desktop virtual reality, VR operating system, virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems. Applications of environment in various fields.

COURSE OUTCOMES:

1. Course focuses on multimedia information representation and relevant signal processing aspects, multimedia networking and communications, and multimedia standards especially on the audio, image and video compression.
2. The students are expected to achieve a basic understanding of multimedia systems. With such background equipment, students would be able to evaluate more advanced or future multimedia systems.
3. To learn various multimedia authoring systems and various networking aspects used for multimedia applications.
4. Develop various Multimedia Systems applicable in real time
5. Understand about Design interactive multimedia software and apply various networking protocols for multimedia applications.

Text Books/Reference Books

1. Multimedia: Sound & Video, Lozano, 1997, PHI, (Que)
2. Multimedia: Production, planning and delivery, Villamil & Molina,Que, 1997
3. Multimedia on the PC, Sinclair, BPB
4. Multimedia: Making it work, Tay Vaughan, fifth edition, 1994, TMH.
5. Multimedia in Practice by Jeff coate Judith, 1995,PHI.
6. Multimedia Systems by Koegel, AWL x Multimedia Making it Work by Vaughan.
7. Multimedia Systems by John .F. Koegel, 2001, Buford.
8. Multimedia Communications by Halsall & Fred, 2001,AW.

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-8 PRINCIPLES OF ACCOUNTING

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory :   75 Marks
Total :   100Marks
Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course introduces students to the world of accounting and assumes no prior knowledge of the subject area. It will be demonstrated how a practical understanding and interpretation of accounting reports and other accounting tools can improve decision-making and add value for company stakeholders.

SYLLABUS

UNIT I
Meaning and nature of accounting, Scope of financial accounting, Interrelationship of Accounting with other disciplines, Branches of Accounting, Accounting concepts and convention, Accounting standards in India.

UNIT – II
Journal, Rules of Debit and Credit, Sub Division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal, Sales Return Journal, Ledger, Trial Balance

UNIT-III
Preparation of Final Accounts, Profit & Loss Account, Balance Sheet without adjustments and with adjustments.

UNIT – IV
Meaning of Inventory, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories-FIFO, LIFO and Weighted Average Method, Concept of Deprecation, Causes of Depreciation, Meaning of Depreciation Accounting, Method of Recording Depreciation, Methods of Providing Depreciation

COURSE OUTCOMES:
1. This course will impart knowledge to the students regarding preparation of financial statements their analysis.
2. The students will be able to understand applications of cost accounting and cost control

techniques like standard costing etc.

3. The course will help them to take better managerial decisions.

4. Students will be able to know about budget control technique

Text Books/Reference books

1. Maheshwari, S.N. and Maheshwari, S. K., (2009) An Introduction to Accountancy, Eighth Edition, Vikas Publishing House.
2. Gupta R. L., & Gupta V.K., "Principles & Practice of Accounting", Sultan Chand & Sons,1999.
3. Tulsian, P.C., (2009) Financial Accountancy, 2nd edition, Pearson Education.
4. Monga J R, "Introduction to Financial Accounting", Mayur Paperbacks, 2010. [R3] Raja Sekaran/Lalitha, "Financial Accounting", Pearsons

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-9 MANAGEMENT INFORMATION SYSTEM

No. of Credits: 3		Sessional:	25 Marks
L T P Total		Theory :	75 Marks
			100
3 0 0 3		Total :	Marks
		Duration of Exam:	3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:

The course provides a foundation in the theory and practical application of information systems within an organization. Managing, analyzing, designing, and implementing an MIS will be the focus of the course. Strategic value, methodologies, quality, decision making, modeling, re-engineering, software, hardware, and ethics will all be included. This course in an introduction to Management Information Systems solutions through business-driven information systems.

SYLLABUS

UNIT – I

The meaning and role of MIS: What is MIS?. Decision support systems, systems approach, the systems view of business, MIS Organization within the company. Management Organizational theory and the systems approach: Development of organization theory, management and organizational behavior, management, information, and the systems approach.

UNIT – II
Information Systems for decision making: Evolution of an information system, Basic Information Systems, decision making and MIS, MIS as a technique for making programmed decisions, decision assisting information systems. Strategic and project planning for MIS: General business planning, appropriate MIS response, MIS planning – general, MIS planning – details.

UNIT – III
Conceptual system design: Define the problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual designs and select one, document the system concept, prepare the conceptual design report.

UNIT IV

Implementation, evaluation and maintenance of the MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train and operating personnel, computer related acquisitions, develop forms for data collection and information, dissemination, develop the files, test the system, cut over, document the system, evaluate the MIS, control and maintain the system. Pitfalls in MIS development: Fundamental weaknesses, soft spots in planning, design problems, implementation: The TAR PIT.

COURSE OUTCOMES:

1. Relate the basic concepts and technologies used in the field of management information systems.
2. Compare the processes of developing and implementing information system.
3. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
4. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

Text books/Reference Books:

1. R. G. Murdick, J. E. Ross and J. R. Clagget, "Information Systems for Modern Management", 3rd Edition by, PHI – 1994.
2. Parker, Charles Case, Thomas, "Management Information System: Strategy & Action", 2nd Edition, TMH, 1993

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-10 MATLAB

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
                                                                              100
3 0   0   3   Total :   Marks
                                                      Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
The course is intended to assist undergraduates in leFarning the basics of programming in general and programming MATLAB in particular. Basics of programming in MATLAB will be covered, with the goal of having students become comfortable enough to continue learning MATLAB and other programming languages on their own.

SYLLABUS

UNIT 1
Introduction to Programming
Components of a computer, working with numbers, Machine code, Software hierarchy.

Programming Environment
 MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

UNIT 2
Graph Plots
Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save.

UNIT 3
 Procedures and Functions
 Arguments and return values, M-files, Formatted console input-output, String handling.

Control Statements
 If, Else, Else-if, Repetition statements: While, for loop.

UNIT 4
Manipulating Text
Writing to a text file, Reading from a text file, Randomizing and sorting a list, searching a list.

GUI Interface

Attaching buttons to actions, Getting Input, Setting Output.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Learn basics of Programming environment of MATLAB.
2. Understand how to use control statements in MATLAB
3. Understand how to manipulate text using MATLAB.

Text Books/Reference Books:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004.
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.

Note: Latest and additional good books may be suggested and added from time to time.
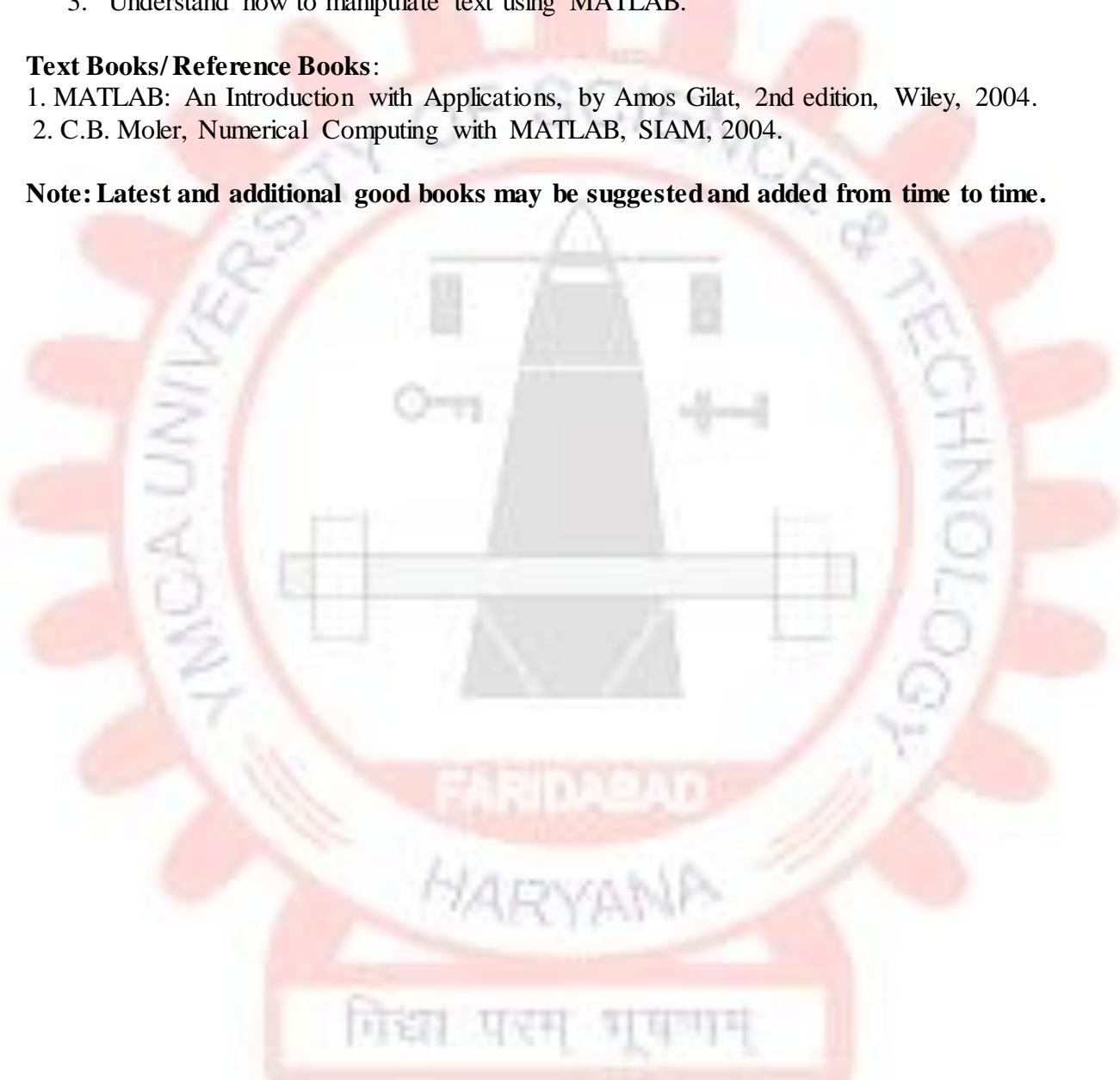
GEC-DS-11 BUSINESS ECONOMICS

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total :   100 Marks
                                                             Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
To integrate the basic concepts of economics with the tools of mathematics and statistics in order to analyze and make optimal business decisions.

SYLLABUS

UNIT I
Introduction to Business Economics and Fundamental concepts: Nature, Scope, Definitions of Business Economics, Difference Between Business Economic and Economics, Contribution and Application of Business Economics to Business. Micro Vs. Macro Economics. Opportunity Costs, Time Value of Money, Marginalism, Incrementalism, Market Equilibrium and Forces, Risk, Return and Profits.

UNIT II
Demand Analysis & Elasticity of Demand: Objectives, Meaning, Law of Demand, Movement Vs. Shift in Demand Curve, Measurement of Elasticity of Demand, Factors Affecting Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand, Advertising Elasticity of Demand and Expectation Elasticity of Demand. Demand Forecasting: Need, Objectives and Methods (Brief)

UNIT III
Consumer Behavior: Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility. Ordinal Utility Approach: Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium.

Theory of Production: Meaning and Concept of Production, Factors of Production, production function, ISO Quants. Fixed and Variable Factors. Law of Variable Proportion (Short Run Production Analysis), Law of Returns to a Scale (Long Run Production Analysis).

UNIT IV

Cost Analysis & Price Output Decisions: Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale. Explicit Cost and Implicit Cost, Private and Social Cost. Pricing Under Perfect Competition, Pricing Under Monopoly, Control of Monopoly, Price Discrimination, Pricing Under Monopolistic Competition, Pricing Under Oligopoly.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.
2. Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
3. Analyze the complexities associated with management of the group behavior in the organization.
4. Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

Text Books/Reference Books:

1. Chaturvedi, D.D. and S. L. Gupta; *Managerial Economics,* Brijwasi Publishers, 2003.
2. Diwedi, D.N.; *Managerial Economics,* Vikas Publishers, 2003.
3. Mehta, P. L.; *Managerial Economics,* Sultan Chand & Sons., 2003.
4. Koutsoyiannis, A.; *Modern Micro Economics,* Macmillan Press Ltd., 2003.
5. Dwivedi, D.N.; *Microeconomics: Theory and Applications*, Pearson Education, 2003.
6. Peterson, Lewis; *Managerial Economics,* 4th Pearson Education, 2002.

Note: Latest and additional good books may be suggested and added from time to time.

GEC-DS-12 E-BUSINESS

No. of Credits: 3   Sessional: 25 Marks
L T   P   Total   Theory :   75 Marks
3 0   0   3   Total   100 Marks
                                               Duration of Exam: 3 Hours

Note: Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

COURSE OBJECTIVES:
This course introduces the concepts, vocabulary, and procedures associated with E-Commerce and the Internet. The student gains an overview of all aspects of E-Commerce. Topics include development of the Internet and E-Commerce, options available for doing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.

SYLLABUS

UNIT - I
Electronic Commerce: Overview of Electronic Commerce, Scope of Electronic Commerce, Traditional Commerce vs. Electronic Commerce, Impact of E-Commerce, Electronic Markets, Internet Commerce, e-commerce in perspective, Application of E Commerce in Direct Marketing and Selling, Obstacles in adopting E-Commerce Applications; Future of E-Commerce.

UNIT - II
Value Chains in electronic Commerce: Supply chain, Porter's value chain Model, Inter Organizational value chains, Strategic Business unit chains, Industry value chains. Security Threats to E-commerce: Security Overview, Computer Security Classification, Copyright and Intellectual Property, security Policy and Integrated Security, Intellectual Property Threats, electronic Commerce Threats, Clients Threats, Communication Channel Threats, server Threats.

UNIT - III
Implementing security for E-Commerce: Protecting E-Commerce Assets, Protecting Intellectual Property, Protecting Client Computers, Protecting E-commerce Channels, Insuring Transaction Integrity, Protecting the Commerce Server. Electronic Payment System: Electronic Cash, Electronic Wallets, Smart Card, Credit and Change Card.

UNIT - IV
Business to Business E-Commerce: Inter-organizational Transitions, Credit Transaction Trade Cycle, a variety of transactions. Electronic Data Interchange (EDI): Introduction to EDI, Benefits

of EDI, EDI Technology, EDI standards, EDI Communication, EDI Implementation, EDI agreement, EDI security.

COURSE OUTCOMES:
After completion of course, students would be able to:
1. Understand the basic concepts of electronic transactions.
2. Study of various types of business models and customer relationship management.
3. Students will be able to understand about various business strategies and marketing strategies.
4. Study of various legal and ethical issues related to electronic transactions.
5. Study of intellectual property rights and its importance.
6. Study of Entrepreneurship management
7. Study of analyzing the external environment, the competition and designing the framework for establishing a venture capital.
8. Study of business intelligence and knowledge management tools.

Text Books/Reference Books:
1. R.Kalakota and A.B.Whinston,Readings in Electronic Commerce, Addison Wesley.
2. David Kosiur, Understanding E- Commerce, Microsoft Press, 1997.
3. Soka, From EDI to Electronic Commerce, McGraw Hill, 1995.
4. David whitely, E-commerce Strategy, Technology and application, Tata McGraw Hill.
5. Gary P. Schneider and Jame Perry, Electronic Commerce Thomson Publication.
6. Doing Business on the Internet E-COMMERCE S. Jaiswal;Galgotia Publications.
7. E-Commerce An Indian Perspective; P.T.Joseph; S.J.; PHI.
8. E-Commerce; Efrain Turbon; Jae Lee; David King; H.Michael Chang.

Note: Latest and additional good books may be suggested and added time to time.

NGF College of Engineering & Technology

Career Scope of BCA Data Science (BCA-DS)

BCA-DS Program at NGFCET: An Overview

The **Bachelor of Computer Applications – Data Science (BCA-DS)** program at **NGFCET (New Green Field College of Engineering and Technology)** under the **Department of Computer Science** is designed to meet the growing demand for **data-driven professionals**.

The course focuses on **programming, data analysis, machine learning, data visualization, and cloud computing**, making graduates highly sought-after in the **IT, finance, e-commerce, healthcare, and consulting industries**.

💼 2. Job Opportunities for BCA-DS Graduates

With **Data Science** becoming a **high-demand field** across the globe, BCA-DS graduates from NGFCET have access to **diverse and well-paying job roles**.

💡 Top Job Roles for BCA-DS Graduates

- **Data Scientist:** Analyzing and interpreting complex data to help businesses make data-driven decisions.

- **Data Analyst:** Collecting, processing, and visualizing data insights for business optimization.

- **Machine Learning Engineer:** Designing AI models and algorithms for automation and predictions.

- **Data Engineer:** Building and managing data infrastructure and pipelines.

- **Business Intelligence (BI) Analyst:** Creating reports and dashboards to help in decision-making.

- **Cloud Data Engineer:** Managing data on cloud platforms (AWS, Azure, GCP).

- **AI Engineer:** Building and deploying artificial intelligence models.

- **Data Visualization Expert:** Presenting data insights through interactive dashboards and reports.

💰 3. Average Salary Packages for BCA-DS Graduates

✅ In India IN

The **demand for data science professionals** is rapidly growing, resulting in **high salary packages** even for entry-level roles.

- **Entry-Level (0–2 years):** ₹4 – ₹8 LPA

- **Mid-Level (3–5 years):** ₹10 – ₹18 LPA

- **Experienced Professionals (5+ years):** ₹20 – ₹35 LPA

✔️ **High-Paying Specializations:**

- **Data Engineering & Cloud:** ₹12 – ₹25 LPA

- **AI and Machine Learning:** ₹15 – ₹30 LPA

- **Big Data & Analytics:** ₹18 – ₹35 LPA

✅ **In Delhi-NCR Region**

Being located in **NCR** gives NGFCET students an advantage, as the region is home to **numerous MNCs, IT companies, and startups**, which offer better salaries and job opportunities.

- **Entry-Level (0–2 years):** ₹5 – ₹9 LPA

- **Mid-Level (3–5 years):** ₹12 – ₹20 LPA

- **Experienced Professionals (5+ years):** ₹25 – ₹40 LPA

✔️ **Top NCR Companies Hiring Data Science Graduates:**

- **IT and Tech:** TCS, Infosys, Wipro, HCL, and Tech Mahindra.

- **Fintech and E-commerce:** Paytm, Zomato, Flipkart, and Amazon India.

- **Consulting and MNCs:** Deloitte, KPMG, Accenture, and EY.

- **Startups:** Several data-driven startups in **Noida and Gurgaon** offer competitive salaries and equity options.

🌎 **Opportunities Abroad**

BCA-DS graduates with **data science certifications and experience** are highly employable **globally**. Countries like the **USA, Canada, Germany, UK, and Australia** have a massive demand for **data professionals**.

- **USA:** $80,000 – $150,000 per year (~₹65L – ₹1.2Cr)

- **Canada:** CAD 60,000 – 110,000 per year (~₹35L – ₹65L)

- **Germany:** €50,000 – €90,000 per year (~₹45L – ₹80L)

- **UK:** £40,000 – £90,000 per year (~₹40L – ₹90L)

- **Australia:** AUD 85,000 – 140,000 per year (~₹45L – ₹75L)

✔️ **Top Global Companies Hiring Data Science Graduates:**

- **USA:** Google, Meta, Amazon, Microsoft, Tesla.

- **Canada:** Shopify, IBM, Amazon Canada.

- **Germany:** SAP, Siemens, Bosch.

- **UK:** Barclays, Deloitte, HSBC.

- **Australia:** Atlassian, Canva, Commonwealth Bank.

🚀 4. Career Advancement through Certifications

To **enhance employability**, BCA-DS students at NGFCET should pursue **industry-relevant certifications**:

- **Cloud and Big Data:**
  - AWS Certified Data Analytics
  - Google Cloud Professional Data Engineer

- **Data Science & AI:**
  - IBM Data Science Professional Certificate
  - TensorFlow Developer Certification
  - Microsoft Certified: Azure AI Engineer

- **Programming and Tools:**
  - Python for Data Science (Coursera)
  - SQL and Database Management Certifications
  - Tableau and Power BI (for data visualization)

🌐 5. Remote Work and Freelancing Opportunities

With **data science skills**, BCA-DS graduates can also explore **remote and freelance work**, offering flexibility and access to **global clients**.

- **Freelancing Platforms:** Upwork, Fiverr, Freelancer, and Toptal.

- **Remote Companies:** Automattic, GitLab, and Zapier regularly hire remote data professionals.

- **Freelance Income:** Skilled BCA-DS freelancers can earn **₹1,00,000 – ₹3,00,000/month** depending on their expertise and client base.

- **Work From Home (WFH)** offers the flexibility to perform job duties remotely, allowing employees to maintain productivity and balance personal responsibilities from the comfort of their own space

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📚 6. Higher Education Opportunities

BCA-DS graduates aiming for **higher studies** can pursue:

- **MCA (Data Science):** Specialized master's program to enhance technical expertise.

- **MSc in Data Science:** Offered by reputed universities in India and abroad.

- **MBA (Business Analytics):** Combining data science skills with business acumen.

- **PG Diploma in AI, ML, or Big Data:** Short-term courses for specialized skills.

- **MS in Data Science (Abroad):** High-paying opportunities in countries like the **USA, Canada, and Germany**.

🔥 **7. Opportunities in Civil Services, Government and Public Sectors**

- **Government & Public Sector:** Graduates often get career opportunities in civil services through UPSC, IES, and state exams. Graduates can secure PSU jobs in BHEL, ONGC, and ISRO via GATE. Government sectors like NIC, DRDO, and defense recruit for IT roles, ensuring stable and rewarding public sector careers.

🔥 **8. Key Takeaways: Why BCA-DS at NGFCET is a Great Career Choice**

✅ **Proximity to NCR Tech Hub:** Access to **Delhi, Gurgaon, and Noida**, which offers extensive job opportunities.

✅ **Campus Placement Support:** NGFCET conducts regular placement drives, job fairs, and internship programs with **top tech companies**.

✅ **Industry-Aligned Curriculum:** The BCA-DS program includes **hands-on learning, projects, and certifications** in data science.

✅ **Internships and Projects:** Collaboration with MNCs and startups ensures practical industry exposure.

✅ **Higher Education and Certifications:** Guidance for **MCA, MSc, and certifications** to enhance skills and job prospects.

🎯 **9. Tips to Maximize Career Prospects During BCA-DS**

🔥 To boost employability and salary potential, BCA-DS students should:

✔️ **Work on real-world projects:** Build a strong GitHub profile with data science projects.

✔️ **Participate in hackathons:** Compete in Kaggle competitions and data science challenges.

✔️ **Pursue internships:** Apply for **data analyst and machine learning internships** to gain practical experience.

✔️ **Get certified:** Industry-recognized certifications in **Python, SQL, and data visualization** add value to your resume.

✔️ **Develop communication skills:** Essential for roles like **BI analyst and data consultant**.

🌟 **Final Verdict: BCA-DS at NGFCET – A Gateway to Lucrative Data Science Careers**

✔️ **NGFCET's BCA-DS program** offers **excellent job prospects** with access to the **booming NCR tech sector**.

✔️ With **hands-on learning, certifications, and industry exposure**, graduates can land **high-paying jobs** in India and abroad.

✔ The **demand for data science professionals** ensures continuous growth and attractive salary packages.

✔ Pursuing a **BCA in Data Science at NGFCET** under the expert guidance of **Prof. (Dr.) Kuldeep Tomar** and the **learned faculty members** equips students with **cutting-edge skills in data analytics, machine learning, and artificial intelligence**. With **state-of-the-art infrastructure, industry-aligned curriculum, and practical learning experiences**, students gain a **competitive edge** in the job market.

✔ NGFCET's strategic location in the **NCR tech hub** further enhances career prospects, offering **diverse job opportunities** with attractive salary packages in India and abroad. Graduates are well-prepared for **high-demand roles** in IT, finance, healthcare, and emerging tech sectors, making BCA-DS a **gateway to a successful and rewarding career**.