Syllabi & Scheme of Examination

Learning Outcomes based Curriculum Framework

(LOCF)

For

B.Sc. Data Science (3rd & 4th Semester)

Department of Computer Science and Engineering

Chaudhary Devi Lal University

Sirsa (Haryana)

2022

BDS/3/GC4 - Digital Electronics

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to understand the core concepts of digital circuits and its applications. It describes various number systems and conversions between number systems.

Course Outcomes: After completing the course students will be able to describe the structure of logic gates and design a minimal combinatorial and sequential circuit that solves binary logical tasks.

Unit I

Number System and Codes, Boolean Algebra & Logic gates: Decimal, Binary, Hexadecimal and Octal number systems, Number base conversions, operation on numbers, Binary Coded Decimal code, ASCII Character Code, Excess-3 and gray code, Boolean Algebra and Boolean operators, Truth Tables of OR, AND, NOT, Basic postulates and fundamental theorems of Boolean algebra, truth tables, construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates.

Unit II

Minimization and Combinational Logic Design: Canonical and Standard Forms, K-map-Two Variable K-Map, Three Variable K-Map and Four Variable K-Map, Combinational circuits design- truth tables and logic circuits of adder, subtractors (Half & Full) , Multiplexers & Demultiplexers, Encoder, Decoder.

Unit III

Sequential Logic Design: Introduction of Latches and Flip flops, S-R Flip flop, J-K Flip flop, T and D type Flip flop, Clocked and edge triggered Flip flops, master slave flip flop.

Unit IV

Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register.

Text Books

1. M. Morris Mano, "Digital System Design", Pearson Education.
2. Thomas L. Floyd, "Digital Fundamentals", Pearson Education.

Reference Books

1. W. H. Gothmann, "Digital Electronics: An Introduction To Theory And Practice", Prentice Hall of India.
2. R. L. Tokheim, "Digital Principles, Schaum's Outline Series", Tata McGraw- Hill.

BDS/3/AEC3 Human Values

External Marks: 35
Internal Marks: 15

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: To create awareness on Ethics & Human Values and to understand the importance of value education in daily lives.

Course Outcomes: On completion of this course, the students will be able to understand the significance of value inputs in a classroom and start applying them in their life and profession, distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

Unit: I

Introduction to Value Education : Definition, concept, need and importance of value education, basic guidelines for value education, content and process of value education, Classification of Value Education: understanding personal values, social values, moral values & spiritual values.

Unit: II

Harmony in the Human Being: Human Being is more than just the Body, Harmony of the self with the body, Understanding myself as co-existence of the self and the body, Understanding needs of the self and the needs of the body, Understanding the activities in the self and the activities in the Body.

Unit: III

Harmony in the Family: Family as a basic unit of human interaction and values in relationships, The basics for respect and today's crisis i.e. affection, guidance, reverence, glory, Understanding Values in Human Relationships, understanding harmony in the Family as a basic unit of human interaction, Understanding the set of proposals to verify the Harmony in the Family, Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.
Present Scenario: Differentiation (Disrespect) in relationships on the basis of body, physical facilities, or beliefs.Understanding the Problems faced due to differentiation in Relationships.
Unit: IV

Harmony in the Society: understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive human goals, visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), universal order (SarvabhaumVyawastha)- from family to world family

Text Books

1. R.R. Gaur, R.Sangal,"A Foundation Course in Human Values and Professional Ethics", 2009
2. Bhatia R. & Bhatia A,"Role of Ethical Values in Indian Higher Education", 2015

Reference Books

1. A Nagraj, "Jeevan Vidya EkParichay", Divya Path Sansthan, Amarkantak,1998.

2. P.L Dhar, R.R Gaur, "Science and Humanism", Commonwealth Publishers, 1990.

3. A.N Tripathy, "Human Values", New Age International Publishers, 2003.

BDS/3/CC10 Operating System

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to get the students familiar with fundamental concepts of operating systems, namely, types of operating systems, functions of memory management module, process management module, deadlock management and file protection, etc.

Course Outcomes: Outline and define the goals, functions and types of operating system, interprocess communication, deadlock, identify the techniques of allocation of memory, processor, and disk space.

Unit - I

Operating Systems Overview: Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems.

Operating Systems Structures: Operating system services, systems calls and types of system calls, Virtual Machines, Operating systems generations.

Unit - II

Process Management: Process concepts, operations on process, inter-process communication process scheduling criteria, scheduling algorithms

Concurrency And Synchronization: Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writer's problem, dining philosopher's problem, monitors.

Unit III

Deadlocks: System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm.

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, thrashing.

Unit IV

File System: Concept of a file, access methods, directory and disk structure, file system structure, file system implementation, directory implementation, allocation methods, free-space management.

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling Algorithms, Disk Management, RAID Structure.

Text Books

1. Silberschatz A., Galvin P. B., Gagne G., "Operating System Concepts", Wiley India Pvt. Ltd.
2. Chauhan Naresh, "Principles of Operating Systems", Oxford University Press.
3. Tanenbaum A.S., "Operating System- Design and Implementation", PHI Learning.

Reference Books

1. Deitel H.M., "Operating Systems", Pearson Education.
2. Stallings William, "Operating System", PHI Learning.
3. Godbole A.S, "Operating Systems", Tata McGraw-Hill, New Delhi

BDS/3/CC11 Web Development

External Marks: 70

Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to get the students familiar with the tags, links, frames and forms used in HTML. The students will be able to design CSS using different properties.

Course Outcomes: By learning the course students can create cascade style sheets and lay out HTML elements using CSS margin and padding.

Unit I

Introduction to HTML: A brief history of HTML and the World Wide Web, creating a simple web page, types of tags in HTML, HTML tag, head tag, body tag, paragraph and line break, headings, text formatting tags, special characters, lists, tables, alignment and spanning with in the table.

Unit II

Links, Images, Forms and Frames in HTML: Linking within a web page, linking between your own web content, linking to external web content, linking to email address, placing images on a web page, turning images into links, working with forms, frames.

Unit III

Cascading Style Sheets: Working of CSS, basic style sheet, layout properties, formatting properties, using style classes and style id, Internal style sheet and inline styles, CSS properties, set colours, styling tables and hyperlinks.

Unit IV

Introduction to Javascript: Syntax rules, statements, functions, variables, objects, conditions, loops, event handlers, comments, expressions and operators, data types, working with strings, numeric array.

Text Books

1. Julie C. Meloni, "Sams TeachYourself HTML, CSS and JavaScript", Pearson Education.
2. Thomas A. Powell, "HTML & CSS-The Complete Reference", McGraw Hill Education.

Reference Books

1. Thomas A. Powell, "HTML-The Complete Reference", McGraw Hill Education.

BDS/3/CC12 Programming In Java

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to get the basic concepts and building blocks of core Java and to learn how to write moderately complex programs efficiently.

Course Outcomes: By the end of this course the student will be able to create programs using basic concepts, multithreading and GUI based concepts.

Unit I

Java: Introduction of java, basic concepts, data types, reference types, operators and its types, decision controls, control statements, loops, array, string, functions, boxing & unboxing, scope of variables.

Unit II

OOPS concepts in Java: Encapsulation, class, object, constructors, destructors, polymorphism: function overloading and operator overloading in java, inheritance, interface, abstract class, packages, exception handling.

Unit III

Multithreading in Java: Thread model, multithreading supporting classes and methods, creating single and multiple threaded programs, context switching,

Unit IV

Working with GUI in Java: Containers and components. I/O stream in Java: input and output stream, file handling operations.

Text Books

1. Darrel Ince & Adam Freeman, "Programming the Internet with Java", 2e, Addison Wesley.
2. K.A. Mughal, R.W. Rasmussen, "A Programmer's Guide to Java Certification", Addison Wesley.
3. E. Balagurusamy, "Programming with Java", 6e, Tata McGraw Hill.

Reference Books

1. Herbert Schildt, "The Complete Reference Java", 10e, Tata McGraw Hill.

BDS/3/SEC3 Digital Fluency

External Marks: 50
Internal Marks: 25

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to understand the basic concepts of computers, applications of the internet , virtual learning environments and digital editing.

Course Outcomes: At the end of this course, the student will be able to appreciate the applications of computers and digital devices in daily life.

Unit I

Basic Computer Concepts and Operations: Basic Computer Concepts and Operations, Computers in Daily Activities, Computer Components, Productivity suites for teaching and learning, Educational Programs and their uses, Basic File Handling Operations, Technology Trends in Education.

Unit II

Internet Fundamentals and Applications: Using the Internet, Internet Applications, Google Advanced Search, Web 2.0 applications for learning, Using Google forms, Internet Ethics and Security

Unit III

Virtual Learning Environments: Basics of Virtual Learning Environment, Virtual Learning Environment systems, Effective usage of Virtual Learning Environment, Investigate the Features of an LMS / VLE / CMS, Example of a Virtual Learning Environment

Multimedia Fundamentals: Multimedia Elements, Multimedia Applications in Education, Multimedia Development Environments, Basic Multimedia Production.

Unit IV

Digital Editing: Learning Objectives, Digital Editing Overview, Digital Content and Media, Digital editing tools, Editing Digital Text, Editing Digital Audio.

Importance of the following: Effective Communication Skills, Creative Problem Solving & Critical Thinking, Collaboration and Teamwork Skills , Innovation & Design Thinking, Use of tools in enhancing skills.

Text Books:

1. S P Sajjan, "Digital Fluency 2021", Ekalavya e-Educate

Reference Books:

1. "Digital Fluency Book", Cambridge Publishing Company Online.

Semester 4th

BDS/4/CC15 Data Mining & Warehousing

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to get the students familiar with different concepts of data warehouse and data mining, OLAP, Association rule mining, classification and prediction.

Course Outcomes: At the end of this course the student will be able to define the concepts of data mining, data pre-processing, outliers, data warehouse, OLAP, association rule mining, classification, prediction and cluster analysis.

Unit I

Data Mining: Introduction, Motivation, Importance, Knowledge discovery process, data mining, kind of data, functionalities, interesting patterns, classification of data mining system, applications and trends in Data Mining, major issues in Data Mining

Unit II

Data Pre-processing: Introduction and need of pre-processing, data cleaning, data integration and transformation, data reduction, discretization and concept hierarchy generation.

Unit III

Data warehouse and OLAP Technology for Data Mining: data warehouse, difference between operational database systems and data warehouse, A Multidimensional Data Model, Data warehouse Architecture, Data warehouse Implementation, data warehousing to data mining, Data warehouse usage.

Unit IV

Classification: Basic concept of classification, classification by decision tree induction, Bayesian classification, rule-based classification, classification by back propagation, and other classification methods.

Text Books

1. Ale Berson, Stephen Smith, KorthTheorling, "Data Mining", Tata McGraw Hill.
2. Pieter Adriaans and Dolf Zantinge, "Data Mining", Addison-Wesley Longman.
3. Sam Anahory, "Data Warehousing in the Real World", Addison-Wesley Longman.

Reference Books

1. Chanchal Singh, "Data Mining and Warehousing", Wiley.

BDS/4/CC16 Data Science

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to get the students familiar with the concepts and processes of data science including collection, filtering, processing, analysis and visualization.

Course Outcomes: At the end of this course, the student will be able to use data science process, modern data analytic tools, statistical concepts, data analysis techniques, Bayesian network, induction rule, fuzzy logic, data mining techniques, hadoop file system, hive, S3, cloud database, inference and visualization.

Unit I

Introduction to Data Science: Challenges of conventional systems, Data science process, Applications and features of data science, exploratory data analysis, collection of data, graphical presentation of data, classification of data, storage and retrieval of data.
Modern data analytic tools: big data, web data, evolution of analytic scalability, analytic processes and tools, analysis vs reporting.

Unit II

Data Analysis: Introduction to data analysis, types of Correlation & regression, probability, Conditional probability, random variables, analysis using mean, median, mode, standard deviation, skewness, regression modeling, multivariate analysis.

Unit III

Statistical Concepts: sampling distributions, re-sampling, statistical inference, prediction error.

Data Mining Techniques: Rule induction & neural networks- learning and generalization, competitive learning, principal component analysis and neural networks.

Unit IV

Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods, neuro fuzzy modeling.
Association Rule Mining: Clustering, outlier analysis, sequential pattern mining, temporal mining, spatial mining, web mining.

Text Books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Reference Books

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, 2012.
2. Jiawei Han, MichelineKamber, "Data Mining Concepts and Techniques", 2e, Elsevier.
3. Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly Publishers, 2013.
4. Foster Provost, Tom Fawcet, "Data Science for Business", O'Reilly Publishers, 2013.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014.

BDS/4/GC5 Statistics & Probability

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to learn the language and core concepts of probability theory and understand basic principles of statistical inference.

Course Outcomes: By learning the course, students will be able to work with continuous random variables and Compute the covariance and correlation between jointly distributed variables.

Unit I
Probability and Random Variables: Concept of probability, axioms, theorems, conditional probability, Bayes' theorem, random variables, discrete probability distributions, distribution functions, Continuous random variables.

Unit II
Mathematical Expectation: Definition of mathematical expectation, theorems on expectation, variance and standard deviation, theorems on variance, moment, theorems on moment.

Unit III

Probability Distributions: Binomial Distribution, Normal Distribution, Poisson Distribution, Uniform Distribution, Gamma Distribution, Chi-Square Distribution, Student's T and F Distribution.

Unit IV
Sampling Theory and Testing Hypothesis: Population and Sample, Random Samples, Population Parameters, Sample Statistics, Sampling Distributions, Sample Mean, Sample Variance, Tests of Hypotheses and Significance.

Text Books

1. Spiegel. M.R, Schiller. J. and Srinivasan, "Schaum's Outline of Theory and Problems of Probability and Statistics", McGraw Hill Education.
2. Milton J.S, Arnold J.C, "Introduction to Probability and Statistics", McGraw Hill Education.

Reference Books

1. A. Chandrasekaran, G. Kavitha, "Probability, Statistics, Random Processes and Queuing Theory", Dhanam Publications.
2. Johnson R.A, Gupta C.B, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education.

BDS/4/AEC4 Professional Ethics

External Marks: 35
Internal Marks: 15

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to enable the students to create an awareness on Ethics and Human Values, instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes: Upon completion of the course, the student will be able to apply ethics in society, discuss the ethical issues and realize the responsibilities and rights in the society.

Unit-I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Unit-II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

Unit -III

Professional Practices: Professions and Norms of Professional Conduct Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walkway Collapse.

Unit-IV

Global issues in Professional Ethics: Introduction Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; BioEthics, Intellectual Property Rights.

Text Books

1. R. Subramanian, "Professional Ethics", Oxford University Press, 2015.

2. Caroline Whitbeck, "Ethics in Engineering Practice & Research", 2e, Cambridge University Press, 2015.

Reference Books

1. Charles E Harris Jr, Michael S Pritchård, Michael J Rabins, "Engineering Ethics: Concepts and Cases", 4e, Cengage learning, 2015.
2. Manuel G Velasquez, "Business Ethics concepts & Cases", 6c, PHI, 2008.

BDS/4/CC17 Programming in Python

External Marks: 70
Internal Marks: 30

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objectives of this course is to get the students familiar with basic concepts of Python programming, decision making and functions, file handling and object oriented programming concepts, database programming and to implement machine learning concepts.

Course Outcomes: At the end of this course, the student will possess an understanding of designing basic and advanced applications in python.

Unit I

Introduction: Structure of a Python Program, Control flow, Interpreter shell, Tokens, Identifiers, Reserved keywords, Literals, Variables, Python basic operators.

Numeric data types: int, float, complex, using string data type, Scope of a Variable, Working with: String, List, Tuples and Dictionaries.

Unit II

Control Structures: Conditional blocks using if, else and elif, for loops in python, while loops, continue, break and else.

 Organizing python codes using functions & modules: creating modules, using modules and built-in modules.

Unit III

Object Oriented Programming: Concept of class, Object and Instances, Constructor, Class Attributes and Destructors, Built-in Class Attributes, Inheritance.

File Handling: Creating, Opening, Closing, Writing & Reading File Content, Deleting a File.

Unit IV

Python NumPy: Array Slicing, Array Indexing, Data Types, Array Shape & Reshape, Array Join, Array Split, Random.

Python Pandas: Data Frames, Read CSV

Text Books
1. Chun, J Wesley, "Core Python Programming", 2e, Pearson, 2007.
2. E. Balagurusamy, "Introduction to Computing and problems solving using Python", McGraw Hill Education, 2016.

Reference Books
1. Barry and Paul, "Head First Python", 2e, O Reilly, 2010.
2. Lutz and Mark, "Learning Python", 4e, O Reilly, 2009

BDS/4/SEC4 Cyber Security

External Marks: 50
Internal Marks: 25

Note: The question paper will consist of **nine** questions in all. **Question No. 1** will be compulsory and will consist of **seven** short questions of 2 marks each covering the whole syllabus. In addition, **8** more questions will be set unit-wise, consisting of two questions from each of the **four** units. The candidates are required to attempt **four** more questions selecting at least one question from each unit. **All questions carry equal marks.**

Course Objectives: The objective of this course is to understand the basics of web and mobile security. Cyber Security is the field of study that focuses on methods required to prevent computer systems and networks from leaking information, vandalising hardware, software, or electronic data, and misdirecting the services they provide.

Course Outcomes: By learning the course students can develop an understanding of cryptography to address security concerns.

Unit I

Introduction: Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security, Organizational Implications.

Unit II

Cyber Attacks: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors

Unit III

Ethical Hacking: Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration, testing, types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies.

Unit IV

Introduction to Cyber Forensics: Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013.

Text Books
1. Donaldson S., Siegel S., Williams, C.K., Aslam A., "Enterprise Cyber security -How to Build a Successful Cyber Defense Program against Advanced Threats", 1e, Apress, 2015.
2. Nina Godbole, Sumit Belapure, "Cyber Security", Willey, 2011.

Reference Books
1. Roger Grimes, "Hacking the Hacker", 1e, Wiley, 2017.
2. Cyber Law by Bare Act, Govt of India, IT Act 2000.