

Teacher Name :Dr.V.B.Waghmare

Class	Subject	Total Units	Completed Units	Remaining Units
B.Sc.Part II Semester-III	2DSC03CSC31 Operating System-I	3	Unit -1: Introduction to Operating System: What Operating Systems Do, Computer-System Organization, Computer- System Architecture, Operating-System Structure, Operating-System Operations: Process Management, Memory Management, Storage Management, Protection and Security Distributed Systems, Special-Purpose Systems, Computing Environments, OperatingSystem Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Virtual Machines, Operating-System Generation, System Boot. Unit -2: Process Management: Processes-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Examples of IPC Systems Thread- Threads. CPU Scheduling- Scheduling Criteria, Scheduling Algorithms (First-Come, First-Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling, Multilevel Queue Scheduling). Unit -3: Introduction to Linux: Linux History and architecture of Linux system, Shell, Types of Shell's, Kernel, Kernel shell relationship, Login, Logout, Remote login, GPU(General Purpose Utilities) clear, script, cal, who, bc, wc, head, tail, inodes, structure of regular file, file manipulation commands, change file access permissions with chmod command, directories, directory management commands- cd, mkdir, rmdir. Simple filters- cut, paste, sort, tr, Advanced filters-sed, grep, gawk.	NIL
B. Sc. Part – II Semester -IV	DSC-VII: 2DSC03CSC41: Operating System-II	3	Unit -1: Memory Management: Main Memory-Swapping , Contiguous Memory Allocation , Paging , Structure of the Page Table, Segmentation , Example: The Intel Pentium, Virtual Memory-Demand Paging, Copy-on-Write, Page Replacement (FIFO, Optimal, LRU, MFU,LFU), Allocation of Frames, Thrashing, Memory-Mapped Files Unit -2: Storage Management: File-System Interface-File Concept, Access Methods, Directory Structure, File-System Mounting , File Sharing , Protection, File-System Structure, File-System Implementation, Directory	NIL

			Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, I/O Systems-I/O Hardware, Application I/O Interface, Kernel I/O Subsystem. Unit -3: Linux Scripting: Writing and running the shell script, read, echo, decisions and loop control structure, file tests, exit, command line arguments, exporting shell variable, arrays, shell function, writing data entry script to create data files, data validations before storing on hard disk.	
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M. Sc. Computer Science Part – I: Semester – I	RMD19CSC11 Research Methodology	3	UNIT- I: Fundamentals of Research Methodology: Meaning, Objectives, Motivation and Types of Research, Research Approaches. Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done? Criteria of Good Research, research process and steps involved Hypothesis: Meaning, function and types of hypotheses; Null/Alternative hypothesis, Literature survey, sources of information, review. Ethical issues and intellectual property rights. Publication process, selection of journals, citation index, impact factor, h-index, i10 index, Journal Cite Score, Google scholar index, Research gate, Academia, etc. 20 UNIT- II: Interpretation and Report Writing Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation. Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports. Mechanics of Writing a Research Report: Writing preliminaries, main body of research, references and bibliography. Precautions for Writing Research Reports. Meaning and importance of workshop, seminar, conference, symposium, etc. in research. Plagiarism- Concept and significance of plagiarism. Writing tools: Grammarly, Answerthepublic, Quillbot, Notion, Buzzsumo, Copyscape, Chatgpt, ginger. Referencing and citation tools: Endnote, Mendeley, Jabref, Zotero. 20 UNIT- III: Computer Applications and Research Methods Database Search engines: Google Scholar, Researchgate,	NIL
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			Wiki- Databases, Science Direct, SciFinder, Scopus, infibinet, Cambridge structural database, Web of Science, Indian Citation Index. Publishers in Computer Science: IEEE, Taylor and Francis, Elsevier, Springer, Science Direct, Wiley. Computer based laboratory, statistics and data interpretation, Computer based information systems for e.g docking, Scilab. Softwares for Computer Science: Python, Numpy, Pandas, Google Colab, Matlab, SPSS, Latex. Research Areas, Emerging Technologies and Future Directions: Quantum Computing, Blockchain, Research Design, Data Collection: Quantitative and qualitative data, Data Analysis, Statistical analysis in computer science research, Qualitative data analysis methods, Data visualization techniques	
M. Sc. Computer Science Part – II: Semester – IV	DSE19CSC41 Remote Sensing and GIS	3	Unit I: Concepts and Foundations of Remote Sensing Introduction, Energy Sources, Electromagnetic Radiation and Spectrum, Radiation Principles (Plank's Law, Stephen Boltzman law) Interaction of EMR with the Earth Surface (Wien's Displacement law, Kirchoffs Law), Types of Remote Sensing and its Advantages, Characteristics of Remote Sensing, Use of different Platforms and Sensors, Elements of Photographic System, Basic Principle of Photogrammetry, Multispectral, Thermal and Hyperspectral Sensing, Earth Remote Satellites, Microwave and Lidar Sensing, Applications of Remote Sensing. UNIT- II Geographic Information System Definition and History of GIS, Need for GIS, Components of GIS, Fundamental operations of GIS, Basic Geographic Concepts and Maps, GIS computer Structure Basics, GIS Data Models, GIS Input and Data Storage, GIS query, Measurement, Classification, GIS output and Virtualization. UNIT- III Overview of Remote Sensing and GIS Development Introduction, Types of Remote Sensing and GIS software, Installation of Open Source software, Usage, Case Studies of Remote Sensing and GIS, Data sources and Achieves.	NIL
B.Sc.III: Semester – V	DSC03CSC51 Computer Network	3	Unit -1: Fundamentals of Software Engineering & System Analysis: Introduction to Software Engineering: Definition, Importance, and Characteristics of Software, System Development Life	NIL

			Cycle (SDLC). Classical Models: Waterfall, Spiral, V-Model, Agile. Modern Software Development Trends (DevOps, CI/CD). System Analysis & Requirements Engineering: Definition of a System, Elements & Characteristics, Types of Systems (Open, Closed, Static, Dynamic, etc.). Requirement Analysis & Specification: Functional & Non-functional Requirements, Requirement Gathering Techniques (Interviews, Surveys, Prototyping), Software Design & Architecture. Design Approaches: Top-down, Bottom-up. Unit -2: Software Project Management & Quality Assurance: (Project Planning & Scheduling (Gantt Chart, PERT, CPM), Estimation Techniques (COCOMO, Function Point Analysis), Risk Management in Software Projects. Version Control & Change Management (Git, GitHub). Software Quality Assurance (SQA): Software Quality Factors (Reliability, Maintainability, Usability), Software Testing & Debugging: Testing Levels: Unit, Integration, System, Acceptance, Testing Types: White Box, Black Box, Regression, Security Testing. Manual vs. Automated Testing (Selenium, JUnit, PyTest), Alpha & Beta Testing. Unit -3: Software Deployment, Maintenance & Case Studies Change Over Strategies (Direct, Parallel, Phased, Pilot), Software Maintenance (Corrective, Adaptive, Perfective, Preventive), Reverse Engineering & Reengineering. Emerging Trends in Software Engineering: Agile Methodologies (Scrum, Kanban, XP), Cloud-Based Software Development, DevOps & Continuous Integration/Continuous Deployment (CI/CD), Security in Software Development (OWASP, Secure SDLC) Case Studies & Industry Applications: College Admission System, Library Management System, Bank Management System, E-commerce System (Amazon-like Platforms), Cloudbased Applications (Google Drive, Microsoft Azure, AWS).	
B.Sc.III: Semester – VI	DSC-XIII: DSC03CSC61: Advanced Computer Network	3	Unit -1: Advanced Networking & Security: (TCP/IP for System Administrators, Basic Network Configurations (IP, Subnet, Routing) Linux Firewall (Netfilter, iptables, firewall), VPN & Secure Network Access.	NIL

			Network Authentication: Kerberos, OpenLDAP, System and Network Security Essentials. Unit -2: Internet Services & Protocols: Domain Name System (DNS) – Structure, Configuration, Web Hosting & Apache Web Server Configuration. Email Services: SMTP, POP, IMAP, Security in Email, Secure Communication: SSH (Secure Shell), TLS, SSL. Network File Transfer Services: FTP, SFTP, NFS. Authentication & Directory Services: OpenLDAP Server, Samba, LDAP. Unit -3: Intranet Services & Cloud Networking: Network File Systems (NFS, DFS, Samba), Dynamic Host Configuration Protocol (DHCP) Database Servers & Web Technologies: MySQL, LAMP Applications, Virtualization & Cloud Computing Basics, Introduction to Container Networking (Docker, Kubernetes) Introduction to Network Automation & Monitoring Tools (Wireshark, Nagios, Zabbix)	
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Dr. V.B. Waghmare
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Vivekanad College Kolhapur

(An Empowered Autonomous Institute)

Department of Computer Science

SYLLABUS COMPLETION REPORT

ACADEMIC YEAR 2025-2026

Teacher Name :Dr.I.K.Mujawar

Class	Subject	Total Units	Completed Units	Remaining Units
B.Sc.Part -I Semester-I	DSC-II: 2DSC03CSC12 Introduction to DBMS-I	3	Unit-1: Introduction to DBMS: Database, DBMS – Definition, Overview of DBMS, File processing system vs DBMS, Limitation of file processing system, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture, Users of DBMS, Data models - Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network) Unit-2: Entity Relationship Model: Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER), Entity Relationship Diagram (ERD). Unit- 3: MySQL: DDL Statements - Creating Databases, Using Databases, MySQL datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables, Backing Up and Restoring databases DML Statements – Viewing the structure of a table insert, update, delete, select – all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause. Functions – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) DCL Statements (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges)	NIL

B. Sc. Part – I Semester -II	DSC-IV: 2DSC03CSC22: Introduction to DBMS-II	3	Unit-1: Relational data model: Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint Unit-2: ER to The Relational Model: Entity to Table, Relationship to tables with and without key constraints. Introduction to Functional Dependencies and Normalization – 1NF, 2NF, 3NF Relational Algebra operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division) Unit-3: MySQL: MySQL Joining Tables – inner join, outer join (left outer, right outer, full outer) Subqueries – sub queries with IN, EXISTS, sub queries restrictions, Nested sub queries, ANY/ALL clause, correlated sub queries Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control MySQL – Stored functions, procedures, cursor, trigger, views (creating, altering dropping, renaming and manipulating views)	NIL
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B.Sc. Part III Semester-V	DSE03CSC51 Introduction to Java Programming	3	Unit -1: Introduction to Java Programming Language: History of Java , Features of Java, Comparison of Java and C++ , Java Environment, Java Tools – jdb, javap, javadoc, Java IDEs Structure of java program, First java program, Types of Comments, Data types, Variables, Operators, Keywords, Naming Convention, Declaring 1D, 2D array, Decision Making (if, switch), Looping(for, while), Type Casting, Accepting input using Command line argument, Accepting input from console. Unit -2: Object Oriented Concepts in Java: Defining Your Own Classes, Access Specifiers (public, protected, private, default), Array of Objects, Constructor, Overloading Constructors and use of 'this' Keyword, static block, static Fields and methods, Object class methods, String Class, Inner class, Packages, Wrapper Classes , Garbage Collection, Memory allocation for objects, Constructor, Implementation of Inheritance, use of	NIL
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			super keyword, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes, Use of final keyword related to method and class, abstract class and abstract methods, Defining and Implementing Interfaces, Object Cloning. Unit -3: Exception Handling, GUI components using AWT and Swing: Exception types, Using try catch and multiple catch, Nested try, throw, throws and finally, Creating User defined Exceptions, Assertions, Basics of AWT and Swing, their Difference, Layout Manager, Layouts, Components: JButton, JLabel, JText, JTextArea, JCheckBox and JRadioButton, JList, JComboBox, JMenu and JPopupMenu Class, JMenuItem and JCheckBoxMenuItem, JRadioButtonMenuItem, JScrollBar, Dialogs (Message, confirmation, input), JFileChooser, JColorChooser, Event Handling: Event sources, Listeners, Mouse and Keyboard Event Handling, Adapters.	
B.Sc. Part III Semester-VI	DSE-II: DSE03CSC61: Advanced Java Programming	3	Unit -1: Multithreading and Collection in Java (10 Lectures) Introduction to Multithreading, Creating and Managing Threads, Thread Priorities, Thread Synchronization and Inter-thread Communication, Java Concurrency Framework, Collection Overview, Collection Interfaces, Collection classes, User defined classes in collection, Comparators, Legacy classes and interfaces. Unit -2: Java Database Connectivity (JDBC) (10 Lectures) Overview of JDBC architecture, JDBC drivers and database connections, Executing SQL Queries with JDBC, CRUD operations with JDBC, Batch processing and transaction management, Connection Pooling and Data Source, Implementing connection pooling, Using Data Source for efficient database connections, Advanced JDBC Features, Callable Statements and stored procedures, Result Set types Unit -3: Java Server Pages (JSP) and Java Servlets (10 Lectures) Introduction to JSP, JSP Life Cycle, JSP Elements, JSP Implicit Objects, JSP Form Handling and Request Processing, JSP Session Management, JSP Exception Handling, JSP Expression Language (EL), JSP Standard Tag Library (JSTL), JSP Database Connectivity (JDBC), Introduction to	NIL

			Servlets, Setting Up the Servlet Environment, Servlet API and Interfaces, Handling Requests and Responses, Servlet Session Management, Servlet Communication, Servlet Filters and Listeners, JDBC Connectivity in Servlets	
M. Sc. Computer Science Part – I: Semester – I	DSC19CSC12 Advanced Database Techniques	3	Query Processing and Optimization Translating SQL Queries into Relational Algebra and Other Operators, Algorithms for External Sorting Algorithms for SELECT Operation, Implementing the JOIN Operation, Algorithms for PROJECT and Set Operations, Implementing Aggregate Operations and Different, Types of JOINS, Combining Operations Using Pipelining, Parallel Algorithms for Query Processing, Query Trees and Heuristics for Query Optimization, Choice of Query Execution Plans, Use of Selectivities in Cost-Based Optimization, Cost Functions for SELECT Operation, Cost Functions for the JOIN Operation, Overview of Query Optimization in MySQL 20 UNIT- II Transaction Management, Concurrency Control, and Recovery Techniques The Concept of a Transaction, Transactions and Schedules, Concurrent Execution of Transactions, Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques, Validation (Optimistic) Techniques and Snapshot Isolation Concurrency Control, Granularity of Data Items and Multiple Granularity Locking, Deadlock and Deadlock Handling-Deadlock Avoidance (wait-die, wound-wait), Deadlock Avoidance (Wound-Wait, Wait-die), Deadlock Detection and Recovery (Wait For Graph) Recovery Concepts, NO-UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm, Recovery in Multidatabase Systems, Database Backup and Recovery from Catastrophic Failures 20 UNIT- III Introduction of Distributed Databases Definition of Distributed databases and Distributed Database Management System (DDBMS), Promises of DDBMS, Complicating Factors, Problem Areas, DDBMS Architecture: DBMS standardization, Architectural models for DDBMS, Distributed database design:	NIL

			Design problem of distributed systems, Design, strategies (top-down, bottom-up), Fragmentation, Allocation and replication of fragments. Introduction to NoSQL Introduction to NoSQL Systems, Features of NoSQL, Advantage and Disadvantage of NoSQL, The CAP Theorem, Document-Based NoSQL Systems and MongoDB, NoSQL Key-Value Stores, Column-Based or Wide Column NoSQL Systems, NoSQL Graph Databases and Neo4j	
M. Sc. Computer Science Part – I: Semester – II	DSC19CSC22 Digital Image Processing	3	Unit I: Basics of Digital Image Processing: Overview of digital image processing, Image acquisition and representation, Image enhancement techniques, Image Transforms and Filtering Image transforms (Fourier, DCT): Image filtering in the spatial and frequency domains, Convolution and correlation, Image Compression Lossless and lossy compression techniques: Image compression standards (JPEG, PNG), Transform coding and quantization, Color Image Processing Color models and representations: Color image enhancement and correction, Color image compression 20 UNIT- II : Image Segmentation: Techniques for image segmentation, Region-based and boundary-based segmentation, Thresholding and clustering methods, Object Recognition and Classification Feature extraction and representation: Pattern recognition in images, Machine learning in image classification, Image Morphology Dilation and erosion operations: Structuring elements and morphological operations Applications of morphological operations, Computer Vision Applications Introduction to computer vision: Object tracking and detection, Image-based 3D reconstruction 20 UNIT- III: Image Restoration: Degradation models and restoration techniques, Blind and nonblind restoration, Wiener filtering and constrained least squares restoration, Wavelet Transform in Image Processing Introduction to wavelet transforms: Wavelet-based image compression, Waveletbased image denoising, Medical Image Processing Basics of medical imaging: Image processing applications in medical diagnosis, Challenges and advancements in medical image	NIL

			processing, Deep Learning for Image Processing Convolutional Neural Networks (CNNs) for image analysis: Transfer learning and fine-tuning for image tasks, Applications of deep learning in image processing	
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Dr.I.K.Mujawar
 (Assistant Professor)




Dr.V.B.Waghmare
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(EMPOWERED AUTONOMOUS)

Teacher Name :Dr.R.Y.Patil

Class	Subject	Total Units	Completed Units	Remaining Units
B.Sc.Part -I Semester-I	2DSC03CSC11 Problem Solving using COMPUTERS-I	3	Unit -1: Introduction to Programming Languages: Programming languages, their classification and characteristics, language translators and language translation activities, Planning the Computer Program, what is program and programming paradigms, Concept of problem Solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation Techniques of Problem Solving: Algorithms, Flowcharting, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming Unit -2: Building Blocks of Program: Data, Data Types, Data Binding, Variables, Constants, Declaration, Operations on Data such as assignment, arithmetic, relational, logical or Boolean, ternary, bitwise, increment or decrement operators. Introduction to Python Programming: Features, Structure of a Python Program (Python Shell Indentations, Comments), Python Interpreter, Writing and executing simple program, Basic Data Types: numbers (int, long, float, complex), strings, Declaring variables, Performing assignments, arithmetic operations, Sequence Control – Precedence of operators, Type conversion, Simple input-output (print(), raw_input(), input()) Unit -3: Logics: Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops, else clause with while and for loop Control statements: Terminating loops, skipping specific conditions (break, continue, pass) Numeric Functions: abs(), ceil(), floor(), max(), min(), pow(), sqrt() String Manipulation: Declaring strings, String immutability, unicode string (u'String'), escape sequences (\), Operations on String (Concatenation (+), Repetition (*), Slicing ([index]), Range Slicing([start:end] or [:end] or [start:] , Member ship operator (in, not in)), String Functions : capitalize(), len(), lower(), swapcase(), upper())	NIL
B. Sc. Part – I Semester -II	DSC-III: 2DSC03CSC21 PROBLEM	3	Unit -1: Introduction to Programming Languages: Programming languages, their classification and characteristics, language	

	SOLVING USING COMPUTERS-II		translators and language translation activities, Planning the Computer Program, what is program and programming paradigms, Concept of problem Solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation Techniques of Problem Solving: Algorithms, Flowcharting, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming Unit -2: Building Blocks of Program: Data, Data Types, Data Binding, Variables, Constants, Declaration, Operations on Data such as assignment, arithmetic, relational, logical or Boolean, ternary, bitwise, increment or decrement operators. Introduction to Python Programming: Features, Structure of a Python Program (Python Shell Indentations, Comments), Python Interpreter, Writing and executing simple program, Basic Data Types: numbers (int, long, float, complex), strings, Declaring variables, Performing assignments, arithmetic operations, Sequence Control – Precedence of operators, Type conversion, Simple input-output (print(), raw_input(), input()) Unit -3: Logics: Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops, else clause with while and for loop Control statements: Terminating loops, skipping specific conditions (break, continue, pass) Numeric Functions: abs(), ceil(), floor(), max(), min(), pow(), sqrt() String Manipulation: Declaring strings, String immutability, unicode string (u'String'), escape sequences (\), Operations on String (Concatenation (+), Repetition (*), Slicing ([index]), Range Slicing([start:end] or [:end] or [start:] , Member ship operator (in, not in)), String Functions : capitalize(), len(), lower(), swapcase(), upper()	NIL
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B.Sc. Part III Semester-V	DSC03CSC53 Internet Technologies-I	3	Unit -1: Introduction to Flask Understanding Flask as a Micro Framework: (10 Lectures) Characteristics of Flask: Lightweight, modular, flexible, and extensible. Who Uses Flask? Real-world applications and industry adoption. Setup Tools and pip: Installing Python, Installing Flask. Working with Virtual	
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			Environments (venv/virtualenv): Creating a new virtual environment, Activating and deactivating virtualenv, Adding and removing packages within virtualenv. Application Structure: Initialization of a Flask App, Routes and View Functions, Server Startup & Running Flask Applications. The Request-Response Cycle, Application and Request Contexts, Request Dispatching, Handling Responses in Flask, Command-Line Options with Flask-Script, Building the First Simple Flask Application. Unit -2: Jinja2 Templating & Frontend Integration: Introduction to the Jinja2 Template Engine, Rendering Templates in Flask, Jinja2 Fundamentals: Variables, Expressions, and Output, Comments and Escaping, Control Structures (Loops, Conditionals), Using Filters for Data Formatting, Template Inheritance & Includes: Modularizing templates for better maintainability, Using Twitter Bootstrap with Flask: Flask-Bootstrap for responsive UI, Custom Error Pages (404, 500, etc.), Managing Static Files in Flask: Handling CSS, JavaScript, and images, Linking Static Assets in Templates. Unit -3: Handling Forms & User Interaction: Cross-Site Request Forgery (CSRF) Protection in Forms, Creating & Managing Form Classes in Flask, HTML Rendering of Forms, Form Handling in View Functions: Retrieving user input Processing form data, Redirects & User Sessions, Flask Flash Messages for User Notifications Server-Side Form Validation: Ensuring valid user input, Custom validation methods, Creating Custom Fields & Validation Rules.	NIL
B.Sc. Part III Semester-VI	DSC-XV: DSC03CSC63: Internet Technologies-II	3	Unit -1: Database Integration & Management: (10 Lectures) Overview of SQL & MySQL Databases. Introduction to Python Database Frameworks Working with Flask-MySQL: Database Configuration in Flask, Connecting Flask with MySQL, Model Definition & Relationships, Performing Database Operations: Creating Tables, Inserting, Updating, and Deleting Records, Querying Data using Flask, Using Databases in View Functions, Interacting with Databases from the Python Shell. Unit -2: User Authentication & Security: Authentication Extensions for Flask, Building an Authentication System: Creating an Authentication Blueprint, User	

		Authentication using Flask-Login, Handling User Logins & Sessions: Preparing the User Model for Logins, Protecting Routes & Restricting Access, Adding Login and Logout Functionality, Implementing User Registration: New User Registration Flow, Adding a Registration Form, Storing & Validating User Data. Unit -3: Application Deployment & Production: Understanding Deployment Workflow, Logging & Debugging Errors in Production, Cloud Deployment Strategies: Deploying Flask on Cloud Platforms (Heroku, PythonAnywhere), Deploying Flask Apps with Hosting Services, Handling Production vs Development Environments, Deploying Application Updates & Maintenance	NIL
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Dr.R.Y.Patil
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Department of Computer Science

SYLLABUS COMPLETION REPORT

ACADEMIC YEAR 2025-2026

Teacher Name :Shubhangi Bais

Class	Subject	Total Units	Completed Units	Remaining Units
B. Sc. Part – III (Semester –V)	DSC-X: DSC03CSC52: Software Engineering	3	Unit -1: Fundamentals of Software Engineering & System Analysis: Introduction to Software Engineering: Definition, Importance, and Characteristics of Software, System Development Life Cycle (SDLC). Classical Models: Waterfall, Spiral, V-Model, Agile. Modern Software Development Trends (DevOps, CI/CD). System Analysis & Requirements Engineering: Definition of a System, Elements & Characteristics, Types of Systems (Open, Closed, Static, Dynamic, etc.). Requirement Analysis & Specification: Functional & Non-functional Requirements, Requirement Gathering Techniques (Interviews, Surveys, Prototyping), Software Design & Architecture. Design Approaches: Top-down, Bottom-up. Unit -2: Software Project Management & Quality Assurance: Project Planning & Scheduling (Gantt Chart, PERT, CPM), Estimation Techniques (COCOMO, Function Point Analysis), Risk Management in Software Projects. Version Control & Change Management (Git, GitHub). Software Quality Assurance (SQA): Software Quality Factors (Reliability, Maintainability, Usability), Software Testing & Debugging: Testing Levels: Unit, Integration, System, Acceptance, Testing Types: White Box, Black Box, Regression, Security Testing. Manual vs. Automated Testing (Selenium, JUnit, PyTest), Alpha & Beta Testing. Unit -3: Software Deployment, Maintenance & Case Studies Change Over Strategies (Direct, Parallel, Phased, Pilot), Software Maintenance	NIL

			(Corrective, Adaptive, Perfective, Preventive), Reverse Engineering & Reengineering. Emerging Trends in Software Engineering: Agile Methodologies (Scrum, Kanban, XP), Cloud-Based Software Development, DevOps & Continuous Integration/Continuous Deployment (CI/CD), Security in Software Development (OWASP, Secure SDLC) Case Studies & Industry Applications: College Admission System, Library Management System, Bank Management System, E-commerce System (Amazon-like Platforms), Cloudbased Applications (Google Drive, Microsoft Azure, AWS).	
B. Sc. Part – III Semester -VI	DSC-XIV: DSC03CSC62: Object Oriented Software Engineering	3	Unit -1: Fundamentals of Object-Oriented Analysis & UML: (10 Lectures) Introduction to Object-Oriented Concepts: Class & Object, Encapsulation, Inheritance, and Polymorphism, Aggregation and Composition. Introduction to Object-Oriented Analysis & Design (OOAD), Need for OOAD, Object-Oriented vs. Traditional Software Development, Advantages of Object-Oriented Modeling, Unified Modeling Language (UML) Basics, Overview of UML & Conceptual Model, UML Architecture and Diagrams, UML Notations and Elements. Unit -2: Object-Oriented Modeling & Design Patterns: Unified Process & UML Diagrams: Unified Process Model & Phases (Inception, Elaboration, Construction, Transition), UML Structural Diagrams: Class Diagram, Object Diagram, Package Diagram, Component Diagram, Deployment Diagram. UML Behavioral Diagrams: Use Case Diagram, Activity Diagram, Sequence Diagram, Statechart Diagram, Advanced Object-Oriented Design Concepts. System Design Process & Model Partitioning: Concurrency & Subsystem Allocation, Task, Data, and Resource Management, Design Patterns & Best Practices.	NIL

			Unit -3: Object-Oriented Implementation: Mapping Object Model to Database Schema: Object-Relational Mapping (ORM), Relational vs. NoSQL Database Design for OO Applications, Popular ORM Tools (Hibernate, Django ORM, SQLAlchemy), Object-Oriented Software Testing: Testing Strategies for OO Systems Unit Testing, Integration Testing, System Testing, ObjectOriented Test Case Design, Emerging Trends in OO Software Development. Agile & DevOps in OOAD, Microservices and Distributed Object-Oriented Systems, Cloud-Native Object-Oriented Applications, AI and Automation in OO Software Engineering.	
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M. Sc. Computer Science Part – I: Semester – I	DSC-I (DSC19CSC1): Problem Solving using Python	3	Unit I:Basics of Python Programming History of Python, Python Features, Python Installation, Python Implementation, Character Set, Data Types, print() function, input() function, eval() function, Number/String formatting, Built in Functions, Operators and Expression, Precedence and Associativity, Decision Making Statements, Looping statements, Functions, Strings, Creating List, Indexing, Slicing, List functions, List searching and sorting, Creating Tuples, Operations on Tuples, Creating Sets, Set Operations, Creating a Dictionary, Methods of Dictionary, Traversing Dictionaries 20 UNIT- II :File Handling, Exception Handling and Object-Oriented Programming File Operations, seek () function, Binary Files, Accessing and Manipulating Files and Directories on a Disk, Built in Exceptions, User Defined Exceptions, Elements of OOP, Classes, Object, Constructor, Constructor Overloading, Destructors, Inheritance and its types, Class Interface and Abstract Classes, Operator Overloading, Methods to overloading Binary Operators 20 UNIT- III :Graphics Programming with Turtle- Turtle Module, Drawing	NIL
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			Different Shapes, Moving Turtle to any Direction and Location, The color, bgcolor and Speed Method of Turtle, Drawing with Colors, Drawing Basic Shapes using Iterations, Changing Color Dynamically, Turtles to Create Charts, GUI Programming with Tkinter- Tkinter Module, Tkinter Widgets- Lable, Button, Checkbutton, ListBox, Menubutton, Menu, Radiobutton, Scrollbar, Frame, Canvas, Text, Scale, Message, MessageBox, Entry, Geometry- Grid, Pack, Place Geometry Manager, Numpy- Creating Arrays, Indexing, Slicing, Shape, Reshape, Iteration, Sorting, Pandas- Series, Attributes and Methods of Series, DataFrame, Attributes and Methods of DataFrames, Reading CSV, JSON, Matplotlib- Pyplot, plot, SubPlot, plotting types of plot, 2D-3D plotting	01
M. Sc. Computer Science Part – I: Semester – II	DSC-III (DSC19CSC2): Advanced Java Programming	3	UnitI: Advanced Java Concepts and Language Features Introduction to Advanced Java, Overview of Advanced Java, Importance of Advanced Java in modern software development, Introduction to swing, event handling, Multithreading, understanding multithreading and concurrency, Synchronization and thread safety, Java I/O and Serialization, File I/O operations in Java, Serialization and deserialization, Working with different streams in Java. UnitII: Introduction to JDBC Overview of JDBC architecture, JDBC drivers and database connections, Executing SQL Queries with JDBC, CRUD operations with JDBC, Batch processing and transaction management, Connection Pooling and Data Source, Implementing connection pooling, Using Data Source for efficient database connections, Advanced JDBC Features, Callable Statements and stored procedures, Result Set types and concurrency control, Handling large datasets and streaming, ORM (Object-Relational Mapping) with Hibernate, Introduction to Hibernate framework, Mapping Java objects to database tables, Hibernate	NIL

			Query Language (HQL) and Criteria API. UnitIII: Introduction to Servlets Overview of Servlet technology, Servlet life cycle and request handling, Java Server Pages (JSP), JSP syntax and directives, JSP expressions, declarations, and actions, Servlets and JSP Configuration in Web Applications, Deployment descriptors and web.xml, Servlet and JSP configuration in a web project, Java EE Web Applications, Building robust web applications using Java EE, Integrating servlets and JSP in a web project, Session Management and Security, Managing user sessions in web applications Implementing security features in Java web applications.	
M. Sc. Computer Science Part – II: Semester – III	DSC-V (DSC19CSC3): Mobile Application Development with Flutter	3	UnitI:Introduction to Flutter: Features of Flutter, Advantages and Disadvantages of Flutter, Flutter Benefits, how flutter works? Flutter Installation, Architecture of Flutter Application, Introduction to Dart Programming: Basic Programming, OOP Concepts, Exception Handling, Debugging, Asynchronous Programming 20 UNIT- II :Introduction to Layouts: Widgets-Types, Gestures, Statement Management, State management, Scoped Model, Navigation and Routing, UI Design-Styles and Assets, Fonts, Model API, Lists and Grids, Drawing and Painting, Animation on Flutter. 20 UNIT- III: Database Concepts: SQLite-Cloud Fire store, Internalization of Flutter-Using intl Package, Flutter and Firebase: Firebase and its features, integrating firebase, User Authentication, Testing, Debugging and Deployment	NIL
M. Sc. Computer Science Part II: Semester III	DSC-VI (DSC19CSC32): Artificial Intelligence	3	UnitI:Introduction to Artificial Intelligence Definitions, History, Goals of AI, AI approaches, AI Techniques, Branches and Applications of AI, Intelligent Agents- Characteristics, Structures, Types, Problem Solving methods, Search and Control Strategies, Search Techniques- Blind (-BFS, DFS, DLS, Iterative Deepening, Search, Bidirectional Search, Uniform cost Search), Heuristics (Generate and test, Hill Climbing, Best First search, Constraint	NIL

			Satisfaction, Mean-End Analysis, A*, AO*) 20 UNIT- II: Knowledge Representation, Reasoning, Planning and Game Theory KR introduction, approaches, methods, Logic, Propositional Logic, Predicate Logic, KR using rules, KR and Reasoning, Approaches to reasoning, Symbolic reasoning, Statistical Reasoning, Semantic Nets, Frames, Classical Planning, Automated Planning, Algorithms for Classical Planning, Heuristics for Planning, Hierarchical Planning, Overview of Game Theory, Mini-max theorem, Taxonomy of Games, Tic-tac-toe game, evaluation, Alpha-Beta pruning 20 UNIT- III Trends in Artificial Intelligence Artificial Neural Network Introduction, biological neuron model, Model of artificial neuron, Artificial neuron – basic, elements, activation functions, Neural network architectures, Learning Methods in Neural Networks, Classification of learning algorithms, Single-Layer NN System, Learning algorithms for training, Applications of ANN. Fuzzy Set Theory and Fuzzy Systems Introduction to Fuzzy Sets, Fuzzy Set Theory, Fuzzy Memberships, Fuzzy Operations, Fuzzy Properties, Fuzzy Relations, Fuzzy Systems, Fuzzy System elements, Fuzzification, Fuzzy Inference, Fuzzy rule based systems
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S.B.Bais
Ms. Shubhangi B. Bais
 (Assistant Professor)



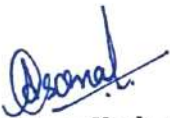
V.B.
Dr. V. B. Waghmare
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 (AN EMPOWERED AUTONOMOUS INSTITUTE)

Teacher Name: Ms. S. V. Aundhakar

Class	Subject	Total Units	Completed Units	Remaining Units
B.Sc. II nd Year (Sem-III)	Object Oriented Programming 2DSC03CSC32	3	Unit -1: Introduction to Object Oriented Programming: Programming Paradigms, What Is Object-Oriented Programming?, Features of OOP, Advantages and disadvantage of OOP, Function Overloading, Operator Overloading, Static and Dynamic Binding, Constructors and Destructors, Techniques of Object-Oriented Programming, When to use OOP?, Applications of OOP. Unit -2: Classes and Objects: Python Classes, Objects, Specifying attributes and behaviors, instance methods, instance attributes, static methods, constructor, types of constructors(default, parameterized), class methods as alternative constructor, constructor overloading, method overloading. Unit -3: Inheritance and Polymorphism Inheritance in Python (Syntax, Advantages,), Access Modifiers in Python, Types of Inheritance (single, multiple, multilevel, hierarchical and hybrid), Polymorphism-Method Overriding, magic methods and Operator Overloading.	NIL
B.Sc.II nd Year (Sem-IV)	Algorithm Analysis and Data Structures 2DSC03CSC42	3	Unit -1: Abstract Data Type: Introduction: Abstractions, Abstract Data Types, Data Structures, General Definitions; The Data Abstract Data Type: Defining the ADT, Using the ADT, Preconditions and Postconditions, Implementing the ADT; Bags: The Bag Abstract Data Type, Selecting a Data Structure, List-Based Implementation; Iterates: Designing an Iterator, Using Iterators; Application: Student Records, Designing a Solution, Implementation Algorithm Analysis: Complexity Analysis: Big-O Notation, Evaluating Python Code; Evaluating the Python List; Amortized Cost; Application: The Sparse Matrix, List-Based Implementation, Efficiency Analysis. Unit -2: Linked Structure: The singly Linked List: Traversing the node, Searching for a node, Prepending Nodes, Removing Nodes;The Bag ADT Revisited: A linked List Implementation, Comparing Implementations, Linked list iterators; More Ways to Build a Linked List:Using a Tail Reference, The sorted linked list; The Sparse Matrix Revisited: An array of Lined list implementation, Comparing the Implementations; Applications: Polynomials, Polynomial	NIL

			Operations, The Polynomial ADT, Implementation. Advanced Linked List: The Doubly Linked List: Organization, List Operations; Circular Linked List: Organization, List Operation Multi-Linked Lists: Multiple Chains, The sparse Matrix; Complex Iterators; Application: Text Editor, Typical Editor Operations, The EDIT Buffer ADT, Implementation. Unit -3: Stacks and Queues The Stack ADT: Implementing the stack, using a python list, using a linked list, Stack Applications: Balanced Delimiters, Evaluating Postfix Expression; Applications: Solving a Maze: Backtracking, Designing a solution, The Maze ADT, Implementation The Queue ADT;Implementing the Queue:Using a Python List, Using a Circular Array, Using a Linked List Priority Queues: The priority Queue ADT, Implementation: Unbounded Priority Queue, Implementation :Bounded Priority Queue ;Application : Computer Simulation : Airline Ticket Counter, Implementation.	
M.Sc. II nd Year (Sem-IV)	Natural Language Processing DSC19CSC42	3	Unit-1 : Introduction to NLP Overview of NLP, Key challenges in NLP (ambiguity, context, language variation), Brief History and Evolution of Natural Language Processing (NLP), Basic Linguistic Concepts, Language Structure (Phonology, Morphology, Semantics), Tokenization, sentence segmentation, and POS tagging, Regular Expressions and Finite-State Automata in NLP, Syntactic Parsing, Dependency Parsing, Probabilistic Parsing Models, Applications of Syntactic Parsing. Unit-II: Semantic Analysis and Advanced NLP Tasks Semantic Parsing, Lexical Semantics: Word Meaning and Relations, Synonymy, Antonymy, Hyponymy, Word Sense Disambiguation, Distributional Semantics: Word Embeddings, Word2Vec, and GloVe, Named Entity Recognition (NER) and Linking, Relationship Extraction. The text classification problem, Feature Selection, Naive Bayes text classification, k nearest neighbors, Support Vector Machine, Flat Clustering, K means algorithm Hierarchical clustering. Morphology and Part of Speech Tagging, Morphology. Part of speech Tagging Rule Based Part of Speech, Tagging, Markov Models Hidden Markov Models, Viterbi algorithms, Maximum Entropy	NIL

			Models - Hidden Markov Models, Viterbi algorithms, Maximum Entropy Models. Sequence Processing with Recurrent Networks, Simple Recurrent Neural Networks Applications of Recurrent Neural Networks, Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Subwords and Characters. Unit-III Semantic Analysis & NLP Applications: Text Parsing: Syntax Parsing, Grammar formalisms and treebanks, Parsing with Context Free Grammars, Features and Unification, Statistical parsing and probabilistic CFGs (PCFGs), Semantic Analysis, Lexical semantics and word-sense, disambiguation, Compositional semantics. NLP Applications: Information Extraction, Introduction to Named, Entity Recognition and Relation Extraction, Question Answering, Text Summarization, Dialog System: Machine Translation.	
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Sonal Aundhakar
 (Assistant Professor)




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Teacher Name: Ms. N. R. Hude				
Class	Subject	Total Units	Completed Units	Remaining Units
M.Sc. IInd Year (Sem-IV)	Software Project Management (DSC19CSC41)	3	Introduction to Project: Management What is Project? What is Project Management?, History of Project Management, Program and Project Portfolio Management, The Role of the Project Manager, Ethics in Project Management, Project Management Software, A Systems View of Project Management, Organizational Structures, Stakeholder Management, Project Phases and the Project Life Cycle, Information Technology Projects, Project Management Process Groups, Mapping the Process Groups to the Knowledge Areas, Developing an Information Technology Project Management Methodology, What Is Project Integration Management?, Strategic Planning and Project Selection, Developing a Project Charter, Developing a Project Management Plan, Directing and Managing Project Execution, Monitoring and Controlling Project Work, Integrated Change Control Project Scope, Time, Cost and Quality Management: What Is Project Scope Management?, Collecting Requirements, Defining Scope, Work Breakdown Structure, Verifying and Controlling Scope, The Importance of Project Schedules, Defining, Sequencing and Estimating Activities, Developing and Controlling the Schedule, The Importance of Project Cost Management, Principles of Cost Management, Estimating Costs, Determining the Budget, Controlling Costs, The Importance of Project Quality Management, What Is Project Quality Management? , Planning Quality, Performing Quality Assurance, Performing Quality Control, Tools and Techniques for Quality Control, Modern Quality Management Human Resource, Project Communication, Risk and Procurement Management: What Is Project Human Resource Management?, Keys to Managing People, Developing the Human Resource Plan, Developing the Human Resource Plan, Developing the Project Team, Managing the Project Team, Planning Communications, Distributing Information, Managing Stakeholders, Reporting Performance, Suggestions for Improving Project Communications, Planning Risk Management, Common Sources of Risk, Identifying Risks, Performing Qualitative Risk Analysis, Performing Quantitative Risk Analysis, Planning Risk Responses, Monitoring and Controlling Risks, Planning Procurements, Conducting Procurements, Administering Procurements, Closing Procurements, Software Metrics- The scope of software metrics, Size-oriented metrics, Function oriented, Software metrics data collection, Analyzing software data, Measuring size, structure, external attributes, Software Reliability-Measurement and prediction, Resource measurement, Productivity, teams and tools, Quality Standards-CMM-5 levels, KPA's, PSP/TSP, SIX Sigma	NIL

NRHude
Ms. N. R. Hude
(Assistant Professor)



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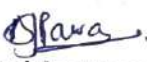
Teacher Name: Ms. M.J.Pawar

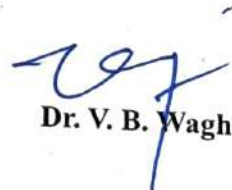
Class	Subject	Total Units	Completed Units	Remaining Units
M.Sc. I Year (Sem-I)	Design and Analysis of Algorithm (DSE19CSC11)	3	Unit-I Algorithm Analysis: Introduction to algorithms, characteristics of algorithm, designing algorithms, Algorithm design techniques, Analysis of an algorithm, asymptotic notations, Analysis of recursive algorithms. Solving recurrence relation: Substitution method, recursion tree method, master method. Divide and Conquer approach: Binary Search, Sorting (Merge Sort, Quick Sort). Hashing: Hashing, Hash tables, Hash functions: Division method, Mid-Square method, Folding method. Collision and Collision resolution techniques: Collision resolution by Open Addressing and Collision resolution by Chaining. UNIT- II Data Structures: Stacks, Queues, Linked list, Trees, Graph. Trees: Tree terminologies, Tree traversal: Inorder, Preorder and Postorder. Binary tree: Types of binary tree, Binary search tree: Operations on binary search tree. AVL tree, B-trees. Graphs: Introduction, Terminologies associated with graph. Types of graph, Representations of graph: Sequential representation and Linked List representation, Traversing Graphs: Breadth-first search, Depth-First Search. Topological sort. Minimum Spanning trees: Kruskal's algorithm, Prim's algorithm, Shortest paths algorithm UNIT- III Greedy Algorithm: General Characteristics of greedy algorithms, Elements of Greedy Strategy. Problem solving using Greedy Algorithm: Activity selection problem, Job Scheduling Problem, Huffman code. Backtracking: Introduction, N Queen Problem, Subset Sum and Hamiltonian Cycle. Branch and Bound: Introduction, 0/1 Knapsack, Travelling Salesman problem. Dynamic Programming: General method, applications-Matrix chain multiplication, optimal binary search trees.	NIL
M.Sc. I Year (Sem-II)	Data Mining and Data Warehousing (DSE19CSC21)	3	Unit-I Introduction to Data Mining: Overview of data mining concepts, Applications and challenges in data mining, Data mining process and methodologies Introduction to data warehousing: Architecture of data warehouses, ETL (Extract, Transform, Load)	NIL

			processes, Data Warehouse Design and Implementation Dimensional modeling: Star and snowflake schemas, Data warehouse implementation best practices, Data Preprocessing in Data Mining Data cleaning, integration and transformation: Handling missing values and outliers, Data reduction and discretization UNIT- II Data Mining Techniques and Algorithms: Classification and Regression, Decision trees and rule-based classifiers, Naive Bayes and k-Nearest Neighbors (k-NN), Regression analysis in data mining, Clustering and Association Rule Mining K-means clustering and hierarchical clustering: Apriori algorithm for association rule mining, Evaluating clustering and association results, Text and Web Mining, Techniques for mining unstructured data, Sentiment analysis and opinion mining, Mining data from the web, Data Mining Tools and Applications, Overview of popular data mining tools (e.g., Weka, RapidMiner): Case studies and applications of data mining in different domains UNIT- III Advanced Topics in Data Mining and Emerging Trends: Advanced Data Mining Techniques, Ensemble methods (bagging, boosting), Support Vector Machines (SVM), Deep learning for data mining, Spatial and Temporal Data Mining, Mining spatial data patterns, Time series analysis and temporal data mining Applications of spatial and temporal data mining Data Warehousing and Big Data: Integrating data warehousing with big data technologies, Challenges and opportunities in big data analytics, Real-time data warehousing, Ethical and Privacy Issues in Data Mining, Ethical considerations in data mining, Privacy-preserving data mining techniques, Regulatory compliance and data governance	
M.Sc. II nd Year (Sem-III)	Cyber Security (DSE19CSC31)	3	Unit-I Introduction of Cyber Security Introduction of Cyber Security, Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control and Cryptography, Network Vulnerabilities: Overview of vulnerability scanning, Open Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe,	NIL

			Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning (Netcat, Socat), Network Sniffers and Injection tools. UNIT- II Cyber Security Attacks Web-based Attacks (Injection Attack, DNS Spoofing, Session, Hijacking, Phishing, Brute Force, Denial of Service, Distributed Denial of Service, Dictionary, Attack, URL Interpretation, File Inclusion Attack, Man in the Middle Attack), System-based Attacks (Virus, Worm, Trojan Horse, Backdoors, Bots), Types of Cyber Attackers. Cyber Security Tools- Cyber Security Goals, Tools for Confidentiality - Encryption, Access control, Authentication, Authorization, Physical Security, Tools for Integrity - Backups, Checksums, Data Correcting Codes, Tools for Availability - Physical Protections, Computational redundancies. UNIT- III Cyber Security Principles, Technologies, Challenges and Risk Awareness Cyber Security Principles, Data Security Consideration, Firewalls, Types of Firewalls, Basics of Virtual Private Network, Basics of Intrusion Detection, Digital Signature and Types of Digital Signature, Importance of Security Standards, ISO/IEC 27001 and 27002, NIST Cyber Security Framework, Common Criteria, Cyber Security Challenges, Challenges associated with the evolution of ransom ware, block chain, Internet of Things (IoT), Artificial Intelligence, Server less Apps, Security Analysis Benefits and Steps, Quantitative and Qualitative Security Risk Analysis.	
M.Sc. II nd Year (Sem-IV)	Cryptography and Network Security (DSC19CSC43)	3	Unit-I Cryptography: Concepts and Techniques Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks, Cryptanalysis- The Affine Cipher, The Substitution Cipher, The Vigenere Cipher, The Hill Cipher, The Stream Cipher Unit-II Symmetric Key Algorithms Linear Cryptanalysis- Piling-up Lemma, Linear Approximation of S-boxes , Differential	NIL

		Cryptanalysis, Symmetric Key Cryptography, Data Encryption Standards (DES), International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard (AES) Hash Functions-Birthday and Hashing, MD4, MD5 Asymmetric Key Algorithms Asymmetric Key Algorithms, RSA algorithm, Symmetric Asymmetric Key Cryptography Together, Digital Signatures, ElGamal Signature Scheme, Variants of ElGamal Signature, Scheme, Knapsack Algorithm Unit-III-Digital Certificates and Public Key Infrastructure Digital Certificates, Private Key Management, Challenges and Response in Secret Key Setting, The PKIX model, Public Key Cryptography Standards, Challenges and Response in Public Key Setting, The ElGamal Cryptosystem, The Diffie-Hellman Problem, PKI and Security User Authentication and Kerberos Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Key Distribution Center - Key Predistribution, Session Key Distribution Schemes- Kerberos, Re-keying and Logical Key Hierarchy, Security Handshake Pitfall	
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Manisha Pawar
 (Assistant Professor)


Dr. V. B. Waghmare