Rayat Shikshan Sanstha's
YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA
(Autonomous)

Constitute College of

Karmaveer Bhaurao Patil University, Satara

Reaccredited by NAAC with 'A+' Grade

Proposed Syllabus For

Master of Science

Part - I

Computer Science

Syllabus to be implemented w. e. f. June 2024 As Per NEP-2020

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Syllabus for M.Sc. Part - I
Title: Computer Science
Year of Implementation: The syllabus will be implemented from June, 2024 onwords
Preamble:

As per the NEP 2020 guidelines this updated syllabus is prepared for first year undergraduate students of Computer Science. Master of Science is an integrated academic degree in faculty of science. This is endeavour to initiate the process towards an era of knowledge. The students from science faculty should also be competent for this change in the technology. In this year, a student will able to understand Computer languages and technologies to build software with confidence. In the subject, the student will also get a basic and proper knowledge in the field of Computer Science and IOT.

Program Outcomes :

PO No.	PO Statement
	After completing the Master of Science in Computer Science students will be able to-
PO-1	Advanced Knowledge and Understanding
PO-2	Research and Analytical Skills
PO-3	Project Management and Development
PO-4	Critical Thinking and Innovation
PO-5	Career Readiness

Program Specific Objectives :

1. The students are expected to understand the fundamentals, principles, concept and recent developments in computer science.

2. The practical course is framed in relevance with theory courses to improve understanding of various concepts in computer science.

3. It is expected to inspire and boost interest of students in Computer Science.

Program Specific Outcomes :

PSO No	POS Statement
PSO-1	Understand basics of computer science
PSO-2	Develop the ability to apply the knowledge acquired in classroom and laboratories to specific problems in theoretical and experimental computer science
PSO-3	Identify the area of interest in the academic research and development.
PSO-4	Perform job in various fields like IT, agriculture, healthcare, public services and business etc.
PSO-5	Be an entrepreneur with precision, analytical mind, innovative thinking, and clarity of thought, expression and systematic approach

Duration: Two Year full time

Pattern: Semester examination

Medium of Instruction: English

Structure of the Course: M.Sc –I   Semester-I

Level	Sem	Course Code	Course Title	No of Hours Per Week	Credits
6	**I**	MCST 411	Design and Analysis of Algorithm	4	4
		MCST 412	Principle of programming Languages	4	4
		MCST 413	Advanced Database Management Systems	4	4
		MCST 414 E-I	Advanced Networking		
		MCST 414 E-II	Blockchain Technology	2	2
		MCST 415	Research Methodology	4	4
		MCSP 416	Practical Course I: LAB I Based On (MCST 411,412)	4	2
		MCSP 417	Practical Course II: LAB II Based On (MCST 413,414)	4	2
Total					**22**

Structure of the Course: M.Sc. -I   Semester-II

Level	Sem	Course Code	Course Title	No of Hours Per Week	Credits
6	**II**	MCST 421	Python programming	4	4
		MCST 422	Cloud Computing	4	4
		MCST 423	Cyber Security And Laws	4	4
		MCST 424 E-I	Digital Image Processing	2	2
		MCST 424 E-II	Mathematical And Statistical Foundations		
		MCST 425	Research Project	8	4
		MCSP 426	Practical Course III: Lab III Based On(MCST421,422)	4	2
		MCSP 427	Practical Course IV: Lab IV Based On(MCST423,424)	4	2
Total					22

SEMESTER I
MCST411: DESIGN& ANALYSIS OF ALGORITHMS

Course Objectives: Student should be able to…

1. Learn the algorithms and to learn basic analysis techniques and understand the use of asymptotic notation.
2. Understand different design strategies and greedy method.
3. Identify classical problem and solutions and learn a variety of useful algorithms.
4. Understand classification of problems.

Credits 4	SEMESTER-I MCST411: Design& Analysis of Algorithms	No. of hours per unit/ credits
UNIT I	**Basics of Algorithms**	**(15)**
	1.1 Basics of Algorithms , Space complexity , Time complexity, worst casebest case-average case , complexity, asymptotic notation ,Recursive and non-recursive algorithms. 1.2 Sorting algorithms (insertion sort, heap sort, bubble sort) ,Sorting in linear time: counting sort. 1.3 concept of bucket and radix sort ,Searching algorithms: Linear, Binary, Divide and conquer strategy ,General method, control abstraction , Binary search, Merge sort, Quick sort , Comparison between Traditional Method of Matrix . 1.4 Multiplication vs. Strassen's Matrix Multiplication.	
UNIT II	**Greedy Method**	**(15)**
	2.1 Knapsack problem, Job sequencing with deadlines, Minimum-cost spanning trees: Kruskal and Prim's algorithm. 2.1 Optimal storage on tapes, Optimal merge patterns, Huffman coding , Shortest Path :Dijkstra's Algorithm Graphs : Traversals. 2.2 Topological sort, Minimum spanning trees, single source shortest path. 2.3 All pair shortest path, Maximum flow problems.	
UNIT III	**Dynamic Programming**	**(15)**
	3.1 Principle of optimality, Matrix chain multiplication , 0/1 Knapsack Problem i)Merge & Purge ii)Functional Method. 3.2 Bellman Ford Algorithm ,All pairs Shortest Path Floyd- Warshall Algorithm. 3.3 Longest common subsequence, ,String editing, Travelling Salesperson problem.	
UNIT IV	**Backtracking and Problem Classification**	**(15)**
	4.1 General method , Fixed Tuple vs. Variable Tuple Formulation , n-Queen's problem • Graph coloring problem. 4.2 Hamiltonian cycle , Sum of subsets. 4.3 Problem Classification - Nondeterministic algorithm • The class of P, NP, NP-hard and NP -Complete problems • Cook's theorem.	

Course Outcomes: After completion of syllabus, student will be able to…

1. explain Algorithmic complexity and analysing the same
2. develop an understanding of various techniques and methods to design algorithms
3. make and apply the algorithm and solve real-world problems
4. analyze traditional algorithms and apply to various problems.

Reference Books:

1. Sandeep Sen, *"Design and Analysis of Algorithms: A Contemporary Perspective"*, Cambridge University Press, 2029
2. Rajesh K. Shukla, *"Analysis and Design of Algorithms: A Beginner's Approach"*, Wiley, 2025.
3. Jungnickel, *"Graphs, Networks and Algorithms"*, Springer, 2022.
4. Steven Skiena, *"The Algorithm Manual"*, Springer, 2020.
5. T. Cormen, C. Leiserson, & R. Rivest, *"Introduction to Algorithms"*, MIT Press, 2009.
6. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, *"Computer algorithms"*, Silicon Pr Publication, 2007

MCST 412: Principles of Programming Language Learning

Course Objectives: Student should be able to…

1. Introduce and compare programming language designs
2. Learn new languages more quickly
3. Understand basic language implementation techniques
4. Learn small programs in different programming Languages

Credits 4	SEMESTER-I MCST 412: Principles of Programming Language Learning	No. of hours per unit/ credits
UNIT I	**Introduction, Names, Scopes, and Bindings**	**(18)**
	1.1 The Art of Language Design, The Programming Language Spectrum, 1.2 Study of Programming languages, Compilation and Interpretation , Programming Environments. 1.3 The Notion of Binding Time, Object. Lifetime and Storage Management, Static Allocation- (Stack-Based Allocation, Heap-Based Allocation, Garbage Collection Scope Rules),Static Scoping. 1.4. Nested Subroutines, Declaration Order, Dynamic Scoping The meaning of Names in a Scope , Aliases. 1.5. Overloading, Polymorphism and Related Concepts, the Binding of Referencing Environments, Subroutine Closures, First-Class Values and Unlimited Extent, Object Closures Macro Expansion.	
UNIT II	**Functional Programming in Scala**	**(12)**

	2.1 Strings, Numbers, Control Structures. 2.2 Classes and Properties. Methods, Objects, Functional Programming. 2.23 List, Array, Map, Set.	
UNIT III	**Data Abstraction and Object Orientation**	**(15)**
	3.1 Object-Oriented Programming, Encapsulation and Inheritance Modules. 3.2 Classes, Nesting (Inner Classes), Type Extensions, Extending without Inheritance, Initialization and Finalization. 3.3 Choosing a Constructor, References and Values, Execution Order, Garbage Collection, Dynamic Method Binding, Virtual- and NonVirtual Methods. 3.4 Abstract Classes, Member Lookup, Polymorphism, Object Closures, Multiple Inheritance, Semantic Ambiguities, Replicated Inheritance.	
UNIT IV	**Control Flow**	**(15)**
	4.1 Expression Evaluation, Precedence and Associativity, Assignments, Initialization. 4.2 Ordering Within Expressions, Short-Circuit Evaluation , Structured and Unstructured Flow, Structured Alternatives to goto, Sequencing. 4.3 Selection - Short-Circuited Conditions, Case/Switch Statements Iteration , Iteration - Enumeration-Controlled Loops. 4.4 Combination Loops, Iterators, Logically Controlled Loops Recursion, Recursion - Iteration and Recursion, Applicative- and Normal-Order Evaluation.	

Course Outcomes: After completion of syllabus, student will be able to…

1. design and get knowledge of, and ability to use, language features used in current programming languages.
2. prepare student to think about programming languages analytically:
3. evaluate key concepts in the implementation of common features of programming languages.
4. implement object-oriented Programming concepts.

Reference Books:

1. Robert W. Sebesta, *"Concepts of Programming Languages"*, Eighth Edition, Pearson Education,2026
2. Michel L. Scott, *"Programming Language Pragmatics"*, Kaufmann Publishers, An Imprint of Elsevier, USA, 2025
3. Rajiv Chopra, *"Principles of Programming Languages"*, I K International Publishing House, 2024 4.Alvin Alexander, "Scala Cookbook", O'REILLY publication, 2023

MCST413: Advanced Database Management System

Course Objectives: Student should be able to…

1. Learn different types of databases.
2. Study of query languages and active databases.
3. Be familiar with the indexing techniques.
4. Learn how to solve complex and recursive queries.

Credits 4	SEMESTER-I MCST413: Advanced Database Management System	No. of hours per unit/ credits
UNIT I	**Query Processing and Evaluation**	**(15)**
	1.1 Measures of Query Cost, Selection Operation, Sort Join Operation, other Operations Evaluation of Expression. 1.2 Transformation of Relational Expressions, Role of Relational Algebra and Relational Calculus in query optimization, Estimating Statistics of Expression, 1.3 Choice of Evaluation Plans, Views and query processing, Storage and query optimization	
UNIT II	**Transaction Management and Recovery**	**(15)**
	2.1 Advanced feature of Transactions, Enhanced Lock Based and timestamp-based Protocols. 2.2 Multiple Granularity, Multi-version Schemes, Deadlock Handling, 2.3 Weak Levels of Consistency, Concurrency in Index Structures, Recovery and Atomicity. 2.4 Recovery with Concurrent Transaction, Buffer Management, Advanced Recovery Techniques, Remote Backup Systems, Use of SQL in recovery, Examples of e-transactions.	
UNIT III	**Database Security and Authorization**	(15)
	3.1 Levels of database security, Access control, Multilevel security, Statistical database security. 3.2 Audit trails in the databases, Examples of e security.	
UNIT IV	**Distributed Databases**	**(15)**
	4.1 Centralized versus non centralized Databases, Homogeneous and Heterogeneous DDBMS and their comparison. 4.2 Functions and Architecture, Distributed database design, query processing in DDBMS. 4.3 Distributed concurrency management, deadlock management, Distributed Commit Protocols: 2 PC and 3 PC. 4.4 Concepts of replication servers .	

Course Outcomes: After completion of syllabus, student will be able to…

1. demonstrate the basics of query evaluation and heuristic query optimization techniques.
2. apply Concurrency control and recovery mechanisms for the desirable database problem.
3. elaborate purpose of security details to database.
4. design and implement the database system with the fundamental concepts of DBMS.

Reference Books:

1. A. Silberschatz, H. F. Korth S. Sudershan, *Database System Concepts*, McGraw Hill, 6th Edition 2020.
2. Thomas Connolly, Carolyn Begg, *Database Systems: A Practical Approach to Design, Implementation and Management,*6th Edition,2022
3. Pramod J. Sadalage and Marin Fowler, *NoSQL Distilled: A brief guide to merging world of Polyglot persistence,* Addison Wesley, 2022
4. Shashank Tiwari ,*ProfessionalNoSql*, Wiley ,2021
5. R. Elmasri S. B. Navathe, *Fundamentals of Database Systems*, Addison Wesley, 2025
6. Raghu Ramakrishnan, *Database Management Systems*,Mcgraw-Hill,4th edition,2025

MCST414:E1: Advanced Networking

Course Objectives: Student should be able to...

1. understand the concept of security and its applications
2. study of various detection and prevention techniques in diversified environments
3. learn various vulnerabilities, threats and attacks
4. introduce globally competent post graduates with enhanced domain knowledge and skills attaining professional excellence.

Credits 4	SEMESTER-I MCST414:E1: Advanced Networking	No. of hours per unit/ credits
UNIT I	**Introduction to Network layers and Protocols**	**(15)**
	1.1 Introduction to networking, TCP/IP Protocol Model, IP Addressing- Address Space. 1.2 Network Address Translation, Notations, Internet Protocol- Datagram format. 1.4 fragmentation, IPV4, IPV6, Virtual Private network technology. 1.5 Mobile IP – Addressing, Agents, Efficiency in Mobile IP.	
UNIT II	**Transport Layer Protocols**	**(15)**
	2.1 User Datagram Protocol-User datagram, UDP Services, UDP Applications. 2.2 Transmission Control Protocol- TCP services, TCP Features. 2.3 State Transition Diagram, Flow Control, Error Control, TCP congestion, SCTP- Services. 2.4 features, flow control, error control.	

UNIT III	**Classification of Network Attacks & Cryptographic Techniques**	**(15)**
	3.1 Basic Security Concepts, History Of Network Security, Data Security Vs. Network Security. 3.2 Computer And Network Attacks, Introduction To Vulnerabilities, Threats And Attacks. 3.3 Layers Of Attacks, Spoofing, Sniffing, Malware: Viruses, Worms, Trojan horses ,Ciphers. 3.4 Cryptography Cryptographic systems, Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Encryption and Decryption Techniques.	
UNIT IV	**Application Layer &Protocols**	**(15)**
	4.1 WWW, HTTP, File Transfer- FTP, TFTP, Electronic mail – architecture. 4.2 web based mails ,email security, SMTP,POP,IMAP, MIME ,SNMP, DNS – Concept of domain name space, DNS Operations ,DHCP- Static and Dynamic allocation. 4.3 DHCP operations, Remote Login – TELNET and SSH.	

Course Outcomes: After completion of syllabus, student will be able to…
1. design and choose appropriate security model
2. specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
3. use specific frameworks as per applications need.
4. evaluate working knowledge of datagram and internet.

Reference Books:

1. William Stallings, *"Cryptography and Network Security: Principle and Practice"*, Pearson, 5th Edition, 2027
2. B.M.Harwani , *"Advanced Computer Networks"*, DT Editorial Services, Dreamtech New Delhi-2024.
3. Tanenbaum, A. S., *"Computer Networks"*, Prentice Hall, Upper Saddle River, New Jersey, 5 th Ed., 2023
4. Mark Stamp, *"Information Security: Principles and Practice"*, John Wiley and Sons, 2021.
5. Behrouz A. Forouzan, *"TCP/IP Protocol Suite"*, McGraw Hill, 4th Ed., 2020.

MCST414:E2: Blockchain Technology

Course Objectives: Student should be able to…
1. Understand the history, types and applications of lockchain
2. Acquire knowledge about cryptography and consensus algorithms.
3. Study of how to deploy projects using Web3j.
4. Identify the design blockchain based applications.

Credits 4	SEMESTER-I MCST414:E2: Blockchain Technology	No. of hours per unit/ credits
UNIT I	**Introduction to Blockchain**	**(15)**
	1.1 Distributed DBMS – Limitations of Distributed DBMS. 1.2 Introduction to Block chain – History, Definition. 1.3 Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes. 1.4 Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.	
UNIT II	**Blockchain Architecture**	**(15)**
	2.1 Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- 2.2 Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS). 2.3 Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET).	
UNIT III	**Blockchain-Based Futures System**	**(15)**
	3.1 Project presentation- Futures smart contract: Blockchain oracles- Web3j: 3.2 Setting up the Web3J- Installing web3j- Wallet creation, Java client: 3.3 The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract.	
UNIT IV	**Blockchains in Business and Creating ICO**	**(15)**
	4.1 Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in 4.2 Ethereum- Why are privacy and anonymity important? - The 4.3 Ethereum Enterprise Alliance- Blockchainas-a-Service- Initial Coin Offering (ICO): Project setup for ICO 4.4 implementation- Token contracts- Token sale contractsContract security and testing the code.	

Course Outcomes: After completion of syllabus, student will be able to…

1. discuss and describe the history, types and applications of Blockchain
2. explain familiarity with cryptography and Consensus algorithms.
3. create and deploy projects using Web3j.
4. implement an ICO on Ethereum

Reference Books:

1. Imran Bashir, *"Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained"*, 2nd Edition, Packt Publishing Ltd, March 2028.
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, *"Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger"*, Packt Publishing Limited, 2028
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, *"Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction"*, Princeton University Press, 2026.
4. Andreas M. Antonopoulos , *"Mastering Bitcoin: Unlocking Digital Cryptocurrencies"*, O'Reilly Media Inc2025

MCST 415: Research Methodology

Course Objectives: Student should be able to…

1. Study the basic knowledge on the fundamentals of research methodology.
2. Understand to present research in scientific manner.
3. Get acquainted with different statistical tools in modern research.
4. Understand the relationship between computational research.

Credits 4	MCST 415: Research Methodology	No. of hours per unit/ credits
UNIT I	**Introduction to Research Methodology I**	(15)
	1.1 Research Methods vs. Methodology i) Introduction. ii) Types: Library research, field research, laboratory research. 1.2 Defining a Research Problem i) Concept. ii) Selecting the research problem. iii)Techniques involved in defining problem. iv)Conclusion of the problem. 1.3 Research Design i)Need for research design. ii) Concept in research design. iii)Types of research design. 1.4 Developing a Research Plan i) Need. ii) Essential characteristics of research plan.	

UNIT II	**Introduction to Research Methodology II**	**(15)**
	2.1 Reporting Practical and Project Work	
	i)Structure of report ii)Title, authors and their institution, abstract, keywords, abbreviations.	
	iii)IMRAD technique a) Introduction b) Material and methods	
	c) Result discussion and conclusion d) Acknowledgements.	
	2.2 Preparing a Grant Proposal for Research Project 2.3 Manuscript Submission to Research Journals	
	i)Statement of proposal.	
	ii) Ethical considerations.	
	iii) Publishing editorial issues.	
	iv) Preparation and submission.	
UNIT III	**Descriptive Statistics**	**(15)**
	3.1 Importance of statistics in computer science	
	i) Samples and Population	
	ii) Types of data, random sampling methods and sampling errors, scales and variables, accuracy and precision.	
	3.2 Measures of Central Tendency	
	i) Mean (arithmetic, geometric, harmonic), median, percentile and mode.	
	ii) Measures of dispersion – mean deviation, standard deviation and variance.	
	iii) Measures of a) Skewness, b) Kurtosis.	
UNIT IV	**Hypothesis Testing**	**(15)**
	4.1 Introduction to Hypothesis Testing	
	i) Null hypothesis ii) Alternate hypothesis.	
	4.2 Statistical Tools	
	i) Significance level, type I and type II errors, p-value, one tailed and two tailed tests.	
	ii)Distribution of sample	
	means, standard error and	
	confidence interval, Degrees of freedom iii)Equality of two	
	population means, proportions: t- tests and z-test	
	4.2 Chi square test - test for goodness of fit, independence and homogeneity	
	iv) F test and ANOVA	

Course Outcomes: Students will be able to...

1. Design a research plan.
2. Present research in scientific language.
3. Analyse research data employing computational tools.
4. Statistically signify the importance of research data.

References: -

1. N. Gurumani, *Scientific thesis writing and Paper presentation*, (MJP Publishers, Chennai, 2010)

2. C. R. Kothari, *Research Methodology; Methods and Techniques*,2 ndEd, (New Age International Publishers, New Delhi, 2004)

3. Irfan Ali Khan and Atiya Khanum, *Fundamentals of Biostatistics*. 3 rd (Ukaaz, Publications, Hyderabad, 2004)

4. Robert R. Sokal and F. James Rohlf, *Introduction to Biostatistics*,2ndEd, (Dover Publications, INC. Mineola, New York,1969)

5. P.N. Arora, P.K.Malhan , *Biostatistics*, (Himalaya Publishing House, Mumbai, 2006)

MCSP 416 Practical Lab I
(Based on MCSP 411,412 courses)

Course Objectives: Student should be able to...
1. Understand how to implement different algorithms.
2. Understand searching algorithms.
3. Understand implementation of Object-Oriented concepts.
4. Understand the concept of methods and its implementation.

Credits 4	SEMESTER-I	No. of hours per unit/ credits (60)
	MCSP 411:LAB I	

	1. Write a program to Sorting Algorithms
	2. Write a program to Searching Algorithms
	3. Write a program to Warshall's Algorithm
	4. Write a program to Knapsack Problem
	5. Write a program to Shortest Paths Algorithm
	6. Write a program to Bellman Ford Algorithm
	7. Write a program to Minimum Cost Spanning Tree
	8. Write a program to All Pairs Shortest Paths
	9. Programs based on Control Structures
	    a. Write a program to calculate average of all numbers between n1 and n2(eg.100 to 300 Read values of n1 and n2 from user)
	    b. Write a program to calculate factorial of a number.
	    c. Write a program to read five random numbers and check that random numbers are perfect number or not.
	    d. Write a program to find second maximum number of four given numbers.
	    e. Write a program to display largest and smallest element of the Set
	10. Programs on Classes and Objects
	    a. Create abstract class Order (id, description). Derive two classes Purchase Order & Sales Order with members Vendor and Customer. Create object of each Purchase Order and Sales Order. Display the details of each account.
	    b. Create abstract class Shape with abstract Functions volume () and display (). Extend two classes Cube and Cylinder from it. Calculate volume of each and display it.
	11. Programs on List
	    a. Create Lists using five different methods(Lisp style, Java style, fill, range and tabulate methods)
	    b. Create two Lists and Merge it and store the sorted in ascending order.
	12. Programs on Set Write a program to create two sets and find common elements between them.
	    a. Write a program to display largest and smallest element of the Set
	    b. Write a program to merge two sets and calculate product and average of all elements of the Set	

13. Program on String and array Manipulation.	

Course Outcomes: Students will be able to...

1. implement different algorithms.
2. apply cryptographic algorithms of encryption and description
3. perform the programs on Classes and Objects to implement Object Oriented concepts.
4. perform the programs on collections to implement data structure concepts.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni &Sanguthevar Rajasekaran, *"Computer algorithms"*,SiliconPr Publication, 2007.

2. T. Cormen, C. Leiserson, & R. Rivest, *"Introduction to Algorithms"*, MIT Press, 2009.

3. Steven Skiena*,"The Algorithm Manual"*, Springer, 2020.

4. Jungnickel, *"Graphs, Networks and Algorithms"*, Springer, 2022.

5. Rajesh K. Shukla, *"Analysis and Design of Algorithms: A Beginner's Approach"*,Wiley, 2025.

6. Sandeep Sen, *"Design and Analysis of Algorithms: A Contemporary Perspective"*, Cambridge University Press, 2029.

7. Michel L. Scott, *"Programming Language Pragmatics"*, Kaufmann Publishers, An Imprint of Elsevier, USA, 2025.

8. Robert W. Sebesta, *"Concepts of Programming Languages"*, Eighth Edition,Pearson Education,2026.

9. Alvin Alexander, *"Scala Cookbook"*, O'REILLY publication, 2023.

10. Rajiv Chopra, *"Principles of Programming Languages"*, I K International Publishing House, 2024.

11. Dowek, *"Principles of Programming Languages"*, Springer, 2009.

12. Shashank Tiwari *,"ProfessionalNoSql"*,Wiley ,2021

MCSP 417 Practical Lab II
(Based on MCSP 413,414 courses)

Course Objectives: Student should be able to...

     1. Understand the basics of SQL.

     2. Study of procedures with Syntax.

     3. Study the basics of Computer Networks.

     4. Study of IP Ethernet Settings.

Credits 2	SEMESTER-I	No. of hours per unit/ credits (60)
	MCST 413 LAB II	
	1. Implement DDL and DML 2. Use of Single row and aggregate functions 3. Implement Joins and Sub queries 4. Write Anonymous blocks and control structures 5. Programs on Cursors 6. Programs on Functions and Procedures 7. programs on Exception Handling and triggers 8. programs on DBA Concepts 9. programs on XML, DTD, XQuery Representations 10. programs on Views 11. Study of commands in networking 12. Study of Network Devices in Detail. 13. Demonstrate windows security features 14. Study of data security features. 15. Demonstarte IP ethernet settings 16. Implementing an IP Addressing Scheme 17. Demonstrate how to Secure Emails. 18. Observing Static and Dynamic Routing 19. Study of Data Encryption Standard(DES) 20. Implement the signature scheme for digital signature standard(Euclidean algorithm)	

Course Outcomes: Students will be able to...

     1. Use the basics of SQL and construct queries using SQL.

     2. Apply procedures with Syntax

     3. Differentiate between Computer Networks

     4. Apply IP Ethernet Settings.

Reference Books:

1. Rafael C. Gonzalez and Richard E. Woods, *"Digital Image Processing"*, Third Edition, - Pearson Education, 2008.

2. S Sridhar, *"Digital Image Processing",* Oxford University Press, 2026.

3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, *"Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction",* Princeton University Press, 2026.

4. William Stallings, *"Cryptography and Network Security: Principle and Practice"*, Pearson, 5th Edition, 2027

5. B.M.Harwani, *"Advanced Computer Networks"*, DT Editorial Services, Dreamtech New Delhi-2024.

6. Tanenbaum, A. S., *"Computer Networks"*, Prentice Hall, Upper Saddle River, New Jersey, 5 th Ed., 2023

SEMESTER II
Course V
MCST 421: Python Programming

Course Objectives: Student should be able to...
1. understand of programming language paradigm.
2. introduce the file operations in python.
3. identify object oriented programming language python.
4. learn and implement database concepts in python.

Credits 4	SEMESTER-II MCST 421: Python Programming	No. of hours per unit/ credits
UNIT I	**Python String, List and Dictionary Manipulations**	**(15)**
	1.1 Using string data type and string operations, building blocks of python programs 1.2 Understanding string in build methods, List manipulation using in build methods. 1.3 Dictionary manipulation Programming using string, list and dictionary in build functions	
UNIT II	**Python File Operation and Python Exceptions**	**(15)**
	2.1 Reading config files in python. 2.2 Writing log files in python, Read functions, read (), readline() and readlines() , Write functions, write() and writelines() ,. 2.3 Manipulating file pointer using seek Programming using file operations, 2.4 Exception handling: assert statement, except clause - with no exceptions and multiple exceptions, Try - finally, raising exceptions, user-defined exceptions	
UNIT III	**Object Oriented Programming**	**(15)**
	3.1 classes and objects, Inheritance, Regular Expressions, Multithreaded Programming: 3.2 Thread Module, creating a thread, synchronizing threads, multithreaded priority queue 3.3 Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module,	
UNIT IV	**Creating the GUI Form, Database Interaction and Libraries**	**(15)**
	4.1 Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu. 4.2 Message, Radiobutton, Layout Management, SQL Database connection using python. 4.3 Creating and searching tables Reading and storing config information on database, Numpy, Pandas. Matplotlib ,Scipy Only Introduction	

Course Outcomes: Students will be able to...

1. explain and use basics of Python
2. solve problems by using Python language.
3. evaluate projects by using Python Framework.
4. create application with help of python libraries.

Reference Books:

1. Greg Michaelson, *"An Introduction to Functional Programming Through Lambda Calculus"* ,Dover Publications Inc.,2021.

2. Jan van Eijck , Christina Unger, *"Computational Semantics with Functional Programming"*, Cambridge University Press, 2022 .

3. Charles Dierbach, *"Introduction to Computer Science Using Python: A Computational Problem-Solving Focus"*, John Wiley & Sons, 2023.

4. Kenneth C. Louden, *"Programming Languages: Principles and Practice"*, Course Technology Inc., 2021.

5. Richard L. Halterman, *"LEARNING TO PROGRAM WITH PYTHON"*, Southern Adventist University, 2021.

6. Dusty Phillips, *"Python 3 Object-oriented Programming Second Edition"*, Packt Publishing, 2025

7. Adrian Holovaty and Jacob Kaplan-Moss, *"The Definitive Guide to Web Development Done Right"*, Apress Publishing, 2020

Semester II
Course VI
MCST 422: Cloud Computing

Course Objectives: Student should be able to...

1. Learn the principles and paradigm of cloud computing
2. Study to appreciate the role of virtualization technologies
3. Identify design and deploy cloud infrastructure
4. Understand cloud security issues and solutions

Credits 4	SEMESTER-II MCST 422: Cloud Computing	No. of hours Per unit/ credits
UNIT I	**Introduction to Cloud Computing**	**(15)**
	1.1 Overview, Evolution of Cloud Computing, Types of Cloud, Desired Features of a Cloud. 1.2 Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers. 1.3 Platform as a Service Providers, Multitenant Technology. Cloud-Enabling Technology: Broadband Networks and Internet Architecture. 1.4 Data Center Technology. Infrastructure as a Service, Platform as a Service, Software as a Service, Cloud Deployment Models	
UNIT II	**Cloud Models & Services:**	**(15)**
	2.1 Cloud Models – Benefits of Cloud Models, Public, Private, Hybrid, and Community Clouds. 2.2 Types of Clouds Services: SaaS, PaaS, IaaS, DaaS, MaaS, CaaS. Service Providers: Google App Engine, Microsoft Azure, 2.3 Amazon EC2, IBM, Sales Force; Introduction to MapReduce, GFS, HDFS, Hadoop Framework.	
UNIT III	**Essentials & Collaborating with Cloud:**	**(15)**
	3.1 Hardware and Infrastructure – Clients, Security, Network, Services; Accessing Cloud – Platforms, Web Applications. 3.2 Web APIs, Web Browsers; Cloud Storage – Overview, Cloud Storage Providers; Standards – 3.3 Application, Client, Infrastructure, Service; Centralizing Email Communications. 3.4 Collaborating on Calendars, Schedules & Task Management, Event Management, Project Management and Contact Management	
UNIT IV	**Virtualization and Security for Cloud**	**(15)**
	4.1 Introduction to Virtualization Technologies, Load Balancing and Virtualization. 4.2 Understanding Hyper visors, Virtual Machines Provisioning and Manageability Virtual Machine 4.3 Migration Services, Provisioning in the Cloud Context Virtualization of CPU.	

| | 4.4 Memory , I/O Devices, Virtual Clusters and Resource management, Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security | |

Course Outcomes: Students will be able to...

1. explain the fundamental principles of distributed computing.
2. evaluate the distributed computing environments built from lower level services.
3. design the importance of virtualization in distributed computing and enabled the development of Cloud Computing.
4. analyze the performance of Cloud Computing.

Reference Books:

1. Brian J.S. Chee and Curtis Franklin, *"Cloud Computing: Technologies and Strategies of the Ubiquitous DataCenter"*, CRC Press, 2029.

2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *"Mastering Cloud Computing: Foundations and Applications Programming*", McGraw Hill, 2023.

3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, *"Distributed and Cloud Computing, From Parallel Processing to the Internet of Things"*, Morgan Kaufmann Publishers, 2022.

Semester II
Course VII

MCST 423: Cyber Security and Laws

Course Objectives: Student should be able to …

1. study the concepts of Cyber Security
2. understand and defend computer systems and networks from cyber security attacks
3. introduce the cyber law and Rights in Cyberspace
4. identify Cyber Torts and Dispute Resolution in Cyberspace

Credits 4	SEMESTER-II MCST 423: Cyber Security and Laws	No. of hours per unit/ credits
UNIT I	**Introduction to Cyber Security**	**(15)**
	1.1 Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy. 1.2 Need for a Nodal Authority, Need for an International convention on Cyberspace. 1.3 Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. 1.4 Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	
UNIT II	**Securing Web Applications and Servers**	**(15)**
	2.1 Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Intrusion Detection and Prevention: Intrusion, Physical Theft. 2.2 Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques. 2.3 Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.	
UNIT III	**Introduction to Cyber Law and Rights in Cyberspace**	**(15)**
	3.1 Computer and its impact in society, Roles of International Law, the state and Private Sector in Cyberspace. 3.2 Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2023, Need for Cyber Law, 3.3 Cyber Jurisprudence at Indian Level, Freedom of speech and expression in cyberspace. Right to access cyberspace-access to internet, Right to privacy, Right to data protection	

UNIT IV	Cyber Torts and Dispute Resolution in Cyberspace	(15)
	4.1 Different offences under IT act, 2000, Different types of civil wrongs under the IT act 2000. 4.2 Interface with copyright law, Interface with patent law, Concept of Jurisdiction, Indian context of Jurisdiction and IT Act, 2000. 4.3 Dispute resolutions, Impact of cyber warfare on privacy, identity theft, International law governing Censorship, online privacy, copyright regulations. 4.4 Online Intermediaries in the governance of Internet, Social Networking Sites, Human Rights, Trademarks and Domain name related issue	

Course Outcomes: Students will be able to...

1. realize the need for Cyber Security
2. explain the need for Security in day to day communications
3. analyze the cyber law and rights in cyberspace
4. evaluate Cyber Torts and Dispute Resolution in Cyberspace

Reference Books:

1. John R. Vacca, *"Computer and Information Security Handbook"*, Morgan Kaufmann, 3rd Edition, 2027

2. Joseph Pelton , Indu B.Singh, *"Digital Defense: A Cybersecurity Primer"*, Copernicus, 2025

3. Brian Craig, *"Cyberlaw: The Law of the Internet and Information Technology"*, Lexis Nexis publishing, 2024

4. Jason Andress, Steve Winterfeld, *"Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners2nd Edition"*, Syngress publishing, 2023

5. Alfred Basta and Wolf Halton, *Computer Security Concepts, Issues and Implementation, Cengage Learning*, 2020

6. Preston Gralla, *"How Personal and Internet Security Work"*, Que Publications, 2004

Semester II

Course VIII
MCST 424: E1: Digital Image Processing

Course Objectives: Student should be able to…
1. Learn the fundamental concepts of digital image processing.
2. Study basic image processing operations.
3. Understand image analysis algorithms.
4. Identify current applications in the field of digital image processing.

Credits 4	SEMESTER-II MCST 424: Digital Image Processing	No. of hours per unit/ credits
UNIT I	**Fundamentals of Image Processing**	**(15)**
	1.1 Steps in image processing, human visual system, Sampling & quantization, representing digital images. 1.2 Spatial &gray-level resolution, Image file formats, Basic relationships between pixels, Distance Measures. 1.3 Basic operations on images-image addition, subtraction, logical operations, scaling, translation, rotation. 1.4 Image Histogram, Color fundamentals & models – RGB, HSI YIQ.	
UNIT II	**Image Enhancement, Restoration and Compression**	**(15)**
	2.1 Spatial domain enhancement: Point operations-Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. 2.2 Filtering operations- Image smoothing, Image sharpening. Frequency domain enhancement: 2D DFT, Smoothing and Sharpening in frequency domain. 2.3 Homomorphic filtering. Restoration: Noise models, Restoration using inverse filtering and Wiener filtering. Types of redundancy, Fidelity criteria, Lossless compression – Run length coding. 2.4 Huffman coding, Bit-plane coding, Arithmetic coding. Introduction to DCT, Wavelet transform. Lossy compression – DCT based compression, Wavelet based compression. Image and Video Compression Standards – JPEG, MPEG.	
UNIT III	**Image Segmentation and Morphological Operations**	**(15)**
	3.1 Image Segmentation: Point Detections, Line detection, Edge Detection- First order derivative – Prewitt and Sobel. Second order derivative – LoG, DoG, Canny. 3.2 Edge linking, Hough Transform, Thresholding – Global, Adaptive. Otsu's Method. Region Growing, Region Splitting and Merging. 3.3 Morphological Operations: Dilation, Erosion, Opening, Closing, Hit-or-Miss transform, Boundary Detection, Thinning, 3.4 Thickening, Skeleton.	
UNIT IV	**Object Recognition and Applications**	**(15)**
	4.1 Feature extraction, Patterns and Pattern Classes, Representation of Pattern classes. 4.2 Types of classification algorithms, Minimum distance classifier, Correlation based classifier, Bayes classifier.	

4.3 Applications: Biometric Authentication, Character Recognition, Content based Image Retrieval, Remote Sensing, Medical application of Image processing	

Course Outcomes: Students will be able to...

1. evaluate fundamentals of Image Processing
2. analyze image segmentation and morphological operations.
3. develop and implement algorithms for digital image processing.
4. apply image processing algorithms for practical object recognition applications.

Reference Books:

1. S Jayaraman, S Esakkirajan, T Veerakumar, *"Digital Image Processing"*, Tata McGraw Hill Publication, 2027.
2. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, *"Digital Image Processing Using MATLAB"*, Second Edition, - Tata McGraw Hill Publication, 2020.
3. Rafael C. Gonzalez and Richard E. Woods, *"Digital Image Processing"*, Third Edition, - Pearson Education, 2008.

Semester II
Course IX
MCST424:E2: Mathematical and Statistical Foundation

Course Objectives: Student should be able to...
1. introduce the notion of vector space.
2. study of to work out algebra of linear transformations.
3. identify the connection between linear transformation and matrices.
4. learn eigen values, eigen vectors and its connection with real life situation.

Credits 4	SEMESTER-II MCST424:E1: Mathematical and Statistical Foundation	No. of hours per unit/ credits
UNIT I	**Vector Spaces**	**(15)**
	1.1 Vector space, Subspace, Sum of subspaces, direct sum, Quotient space. 1.2 Homomorphism or Linear transformation, Kernel and Range of homomorphism 1.3 Fundamental Theorem of homomorphism, Isomorphism theorems, Linear Span, Finite dimensional vector Space. 1.4 Linear dependence and independence, basis, dimension of vector space and Subspaces.	
UNIT II	**Linear Transformations**	**(15)**
	2.1 Linear Transformation, Rank and nullity of a linear transformation, Sylvester's Law, Algebra of Linear Transformations, Sum and scalar multiple of Linear Transformations. 2.2 The Vector space of homomorphism, Product (composition) of Linear Transformations, Linear Operator. 2.3 Linear functional, Invertible and nonsingular Linear Transformation, Eigen space, Characteristic. 2.4 Polynomial of a matrix and remarks on it, similar matrices, Characteristic Polynomial of a linear operator. 2.5 Examples on eigenvalues and eigenvectors.	
UNIT III	**Statistical Modelling and Distributions**	**(15)**
	3.1 Overview of linear correlation and correlation, application and numerical examples on linear correlation and correlation. 3.2 Introduction to Residual Error, Mean Square Error, RMSE, Multilinear correlation ,Regression, Logistic Regression, Simulation using Monte Carlo 3.3 Method, Overview of Discrete and Continuous Probability Distributions, Binomial Distribution, Poisson , Distribution Geometric Distribution, Exponential Distribution, Normal Distributions, Numeric Examples and Random No. Generation Using Python	
UNIT IV	**Hypothesis Tests and Statistical Tests**	**(15)**
	4.1 Typical Analysis procedures, Hypothesis Concept, Errors, p-Value, and Sample Size, Confusion Matrix, ANOVA, Test on 4.2 Sample Mean, Comparison of Two Groups. Comparison of Multiple Groups, Categorical data analysis	

Course Outcomes: Students will be able to...

1. explain the concepts of basis and dimension of a vector space.
2. design eigen values, eigen functions, characteristic polynomial of a matrix.
3. analyze real world engineering problems by applying various statistical modeling techniques.
4. implement Model and solve computing problem using correlation, and resampling using appropriate statistics algorithms.

Reference Books:

1. Khanna V. K. and Bhambri S. K., *"A Course in Abstract Algebra"*, Vikas Publishing House PVT Ltd., New Delhi , 5thEdition 2026.

2. H. Anton & C. Rorres, *"Elementary Linear Algebra (with Supplemental Applications)"*, Wiley India Pvt.Ltd (Wiley Student Edition), New Delhi, 11thEdition 2026.

3. David Lay, Steven Lay, Judi McDonald, *"Linear Algebra and its Applications"*, Pearson Education Asia, Indian Reprint, 5th Edition 2026

4. Thomas Haslwanter, *"An Introduction to Statistics with Python with Applications in the Life Sciences"*, Springer International Publishing Switzerland 2026.

5. S. Friedberg, A. Insel, L. Spence*, "Linear Algebra"*, Prentice Hall of India, 4th Edition, 2024.

MCST 425: Research Project

Credits 4	MCST 425: Research Project	No. of hours- 60

Semester II
MCSP 426- Practical LAB III
(Based on MCST 421,422 courses)

Course Objectives: Student should be able to...

1. Identify, read and write files in Python and use libraries of Python.
2. Understand the basics of images, image transformations, ImageColor Processing.
3. Learn system behavior based on the mathematical model of that system where the model may be expressed in time or frequency domain.
4. Study of the principles of best practice in cloud application design and management

Credits 2	SEMESTER-II Lab-II	No. of hours per unit/ credits (60)
	MCST 421 LAB III	
	1. Introduction to Python Installation of Python on different OS Working with Python as a calculator. 2. Python programs for String, List and dictionary Manipulations 3. Programs on Flow Control Basic programs for understanding of different control flow in Python 4. Python File Operation Reading config files in python Writing log files in python read functions, read(), readline() and readlines() write functions, write() and writelines() 5. Functions Writing Programs using functions Use of Modules Use of packages 6. Python programs for String, List Building blocks of python programs Understanding string in build methods List manipulation using in build methods 7. Demonstration of multithreading and exception handling in python 8. Configuring the mysql connection, designing the python GUI database 9. Python Libraries Matplotlib Scipy 10. Python Framework Tutorial on Django 11. Working and Implementation of Infrastructure as a service. 12. Working and Implementation of Software as a service. 13. Working and Implementation of Platform as a services. 14. Practical Implementation of Storage as a Service. 15. Working of Google drive to make spreadsheet and notes. 16. Working and Implementation of identity management. 17. Write a program for web feed. 18. Execute the step to Demonstrate and implementation of cloud on single sign on. 19. Practical Implementation of cloud security. 20. Installing and Developing Application Using Google App Engine.	

Course Outcomes: Students will be able to...

1. evaluate the fundamental principles of distributed computing.
2. explain modelling of discrete systems in state space.
3. Implement of SAAS ,PASS
4. use Cloud Storage

Reference Books:

1. Greg Michaelson, *"An Introduction to Functional Programming Through Lambda Calculus"*,Dover Publications Inc.,2021.

2. Jan van Eijck,Christina Unger, *"Computational Semantics with Functional Programming"*,Cambridge University Press, 2022.

3. Charles Dierbach, *"Introduction to Computer Science Using Python: A Computational Problem-Solving Focus",* John Wiley & Sons, 2023.

4. Kenneth C. Louden, *"Programming Languages: Principles and Practice"*, Course Technology Inc., 2021.

5. Richard L. Halterman*,"LEARNING TO PROGRAM WITH PYTHON"*, Southern Adventist University,2021

6. Dusty Phillips, *"Python 3 Object-oriented Programming Second Edition"*, Packt Publishing, 2025.

7. Adrian Holovaty and Jacob Kaplan-Moss, *"The Definitive Guide to Web Development Done Right"*,Apress Publishing, 2009.

8. Brian J.S. Chee and Curtis Franklin, *"Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center"*, CRC Press, 2029.

9. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *"Mastering Cloud Computing: Foundations and Applications Programming,* McGraw Hill, 2023.

10. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, *"Distributed and Cloud Computing, From Parallel Processing to the Internet of Things",* Morgan Kaufmann Publishers, 2022.

MCSP 427-

Practical LAB IV

(Based on MCST 423,424 courses)

Course Objectives: Student should be able to...

1. study different types of Vulnerabilities of E-commerce services.
2. learn encryption and decryption techniques.
3. understand the basics of images, image transformations.
4. understand Image Color Processing.

Credits 2	SEMESTER-II Lab-II	No. of hours per unit/ credits (60)
	MCST 423 LAB IV	

	1. Study of the features of firewall in providing network security and to set Firewall Security in windows.
	2. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
	3. Study of different types of vulnerabilities for hacking a websites / Web Applications.
	4. Study of the features of firewall in providing network security and to set Firewall Security in windows.
	5. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
	6. Study of different types of vulnerabilities for hacking a websites / Web Applications.
	7. Analysis the Security Vulnerabilities of E-commerce services.
	8. Analysis the security vulnerabilities of E-Mail Application
	9. Case Study on – Cyber Harassment.
	10. Case Study on – Cyber Law
	11. Case Study on – Patent Law
	12. Image Basics:
	    1.1.W.A.P to read and Display an Image.
	    1.2.W.A.P to read an image & Display its Matrix information.
	13. Image Arithmetic:-
	    2.1 W.A.P to perform image Addition.
	    2.2 W.A.P to perform image Subtraction.
	    2.3 W.A.P to perform image Multiplication.
	    2.4 W.A.P to perform image Division.
	14. Image Transforms using Properties of 2D-DFT. :-
	    3.1 W.A.P to implement 2DFT Convolution Property.
	    3.2 W.A.P to implement 2DFT Rotational Property.
	15. Image Enhancement in Spatial Domain:-
	    4.1. Enhancement Through Point Operation.
	    4.2. Linear Gray Level Transformations:-
	16. Image Enhancement in Frequency Domain:-	

	5.1 Low-Pass Filtering in Frequency Domain.	
	5.2. High-Pass Filtering In Frequency Domain.	
	17. Color Image Processing:-	
	6.1 W.A.P to Read an RGB Image and extract the three Colour Components Red, Green and Blue.	
	6.2 W.A.P to Read a colour image and separate the colour image into Red,Green and Blue Planes.	
	6.3 W.A.P to implement RGB to YCbCr Model Conversion.	
	6.4 W.A.P to implement RGB to HSV Model Conversion	

Course Outcomes: Students will be able to...

1. check security of Emails and E commerce Vulnerabilities.
2. Explain case studies of Cyber Security.
3. do image transformations.
4. do image Processing.

Reference Books:

1.   Jason Andress, Steve Winterfeld, "*Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners2nd Edition* ", Syngress publishing, 2023.

2.   Rafael C. Gonzalez and Richard E. Woods, *"Digital Image Processing"*, Third Edition, - Pearson Education, 2008.

3. S Sridhar, *"Digital Image Processing"*, Oxford University Press, 2026.

4. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, *"Digital Image Processing Using MATLAB"*, Second Edition, - Tata McGraw Hill Publication, 2020.

5. S Jayaraman, S Esakkirajan, T Veerakumar, *"Digital Image Processing"*, Tata McGraw Hill Publication, 2027.