PANJAB UNIVERSITY CHANDIGARH- 160014 (INDIA)

(Estted. under the Panjab University Act VII of 1947-enacted by the Govt. of India)

FACULTY OF SCIENCE

SYLLABI

FOR

M. Sc. INFORMATION TECHNOLOGY
(SEMESTER SYSTEM)

EXAMINATIONS 2025 - 2026

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PANJABUNIVERSITY, CHANDIGARH

Outlines of Tests, Syllabi and Courses of Reading for **M.Sc. Information Technology**
(Two Year Degree Program me) for Session2025- 2026

FIRST SEMESTER						
Paper Code	**Paper Name**	**Theory & Practical Lectures**	**Univ. Exam. Marks**	**Int. Exam. Marks**	**Exam. Hours**	**Credits**
MS-66 OR MS-71	**Option-i :** Linux Administration and Programming OR **Option-ii :** Data Analytics-I	6	80	20	3	4
MS-61	Software Engineering	6	80	20	3	4
MS-62	Computer Algorithms	6	80	20	3	4
MS-42	Operating System Concepts	6	80	20	3	4
MS-63 OR MS-72	**Option-i :** Minor Project Based on MS-66 OR **Option-ii :** Minor Project Based on MS-71	8	80	20	3	4
MS-64	Minor Project Based on MS-62	8	80	20	3	4
	Total		**480**	**120**		**24**
SECOND SEMESTER						
MS-45	Advance Java and Network Programming	6	80	20	3	4
MS-65	E- Commerce and Emerging Trends	6	80	20	3	4
MS-60	Advanced Database System and MySQL	6	80	20	3	4
MS-67 OR MS-73	**Option-i :** Artificial Intelligence OR **Option-ii :**Data Analytics-II	6	80	20	3	4
MS-27	SEMINAR	2	-	50		2
MS-56	Minor Project Based on MS-45 & MS-60	8	80	20	3	4
MS-68 OR MS-74	**Option-i :** Minor Project Based on MS-67 OR **Option-ii :** Minor Project Based on MS-73	8	80	20	3	4
	Total		**480**	**170**		**26**

M. Sc. IT - II (SEMESTER 3 & 4) 2025-2026 onwards						
THIRD SEMESTER						
MS-32 OR MS-75	**Option-i :** .NET Framework and C# OR **Option-ii :** Data Analytics-III	6	80	20	3	4
MS-69	Theory of Computation	6	80	20	3	4
MS-39	Computer Graphics	6	80	20	3	4
MS-14	Systems Approach to Management and Optimization Techniques	6	80	20	3	4
MS-18	SEMINAR	2	-	50		
MS-33 OR MS-76	**Option-i :** Minor Project Based on MS-32 OR **Option-ii :** Minor Project Based on MS-75	8	80	20	3	4
MS-59	Minor Project Based on MS- 39	8	80	20	3	4
	Total		**480**	**170**		**24**
FOURTH SEMESTER						
MS-21	**Major Project**		**320**	**80**		**16**

Note: For optional subject: The student will choose one subject from **Option (i)** inseam-I/II/III OR **Option (ii)** in Sem -I/II/III respectively.

The project period will be of 6 months duration.
The project twill involves development of application/system software in industrial/ commercial/scientific environment.

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GUIDELINES FOR SUBMISSION OF PROJECT REPORT (MS-21)

There port should consist of the following:

- Cover page including Project title, Name of the student, Name of the Department and Names of the Project Guides (both External and Internal).
- Acknowledgements.
- Certificates from company and department duly signed by external guide, Principal and internal guide.
- Contents with page numbers.
- Introduction (includes back ground and application or importance of the project)
- Objectives
- **System Analysis** System Feasibility study
- Software requirement specifications
- Design with system flowcharts and input/output design.
- Implementation and Testing

- Hardware and software used
- Listing of well commented programs with result/output or detailed algorithms with input and output.

Furthers cope of the project

- Bibliography
- Appendices(any other information related to project)

Each student should observe the following norms while submitting the synopsis/thesis for the Project :

(a) Use both sides of the paper instead of only single side.

(b) Use one and half inter line spacing in the text(instead of double space)

(c) Stop using a blank sheet before the page, carrying figure or table.

(d) Try to insert figure/table in the text page itself (instead of using a fresh page for it, each time.)

Students must consult/inform the internal guides regarding the progress of their work at least once in 20 days. It is the duty of the student to be in touch with his internal guide. The student must prepare 5 copies of the report including one copy for self. The remaining four are to be submitted before 31st May every year as per the following :

1. Main Library
2. Department Library
3. Internal Guide
4. Company

One softcopy of the work is to be submitted to the concerned head of the department/institution along with the report. The student must present his/ her work in 15 minutes mainly focusing on his/her contribution with the help of slides followed by demonstration of the practical work done. The project Viva will be completed before 15th June every year exact dates will be informed before 31st May every year or as per examination schedule informed by Panjab University.

An external examiner, internal examiner and the internal guide will conduct project viva.

SEMESTERI

Paper Code:MS–66	**Time :**	**3 Hrs.**
(Option-i) Paper Title: Linux Administration and Programming		
Maximum Marks:100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objective: This course enables students to get familiar with Linux system, its commands, files & directories, system, shell programming, PERL programming and system administration.

Course Outcome: After the completion of this course, student will be able to:-

- Work in the Linux environment for Linux server administration
- Write the shell programs, PERL programs and C-program with system calls

Note:

i. The Question Paper will consist of four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT–I

1. **Introduction to Linux:** Functions of an **o**perating system, Linux's History, different flavors of Linux, Minimum System Requirements for installing Linux: Using LILO; Linux's fdisk.

2. **Using Linux:** Starting and Stopping your Linux System, Linux Shutdown Commands, Login, Passwords; Linux Error Messages, Search Paths,Input and Output Redirection, Man pages, Wildcards: * and ?, Environment Variables, process Commands: ps, kill, su command; GREP pattern searching command, vi text-editor.

UNIT-II

3. **Using the File System** : Files Overview, Common types of files, file and directory management commands, Absolute and relative filenames; pwd, cd, rm, cat, mkdir, mv, cp;, ImportantdirectoriesintheLinuxfileSystem:/,/home,/bin,/usr,/usr/bin,/usr/spool,/dev,/usr/bin,/sbin,/etc.

4. **File and Directory Permissions**: File and Directory ownership, User and ownership, Groups, Changing group ownership, File Permissions, UMASK Setting, Changing File Permission, Changing directory permissions; Bourne Again Shell (BASH): Command-line Completion, Wildcards, Command History, Aliases, Pipelines, setting shell prompts, Job control, Customizing bash, bash variables.

UNIT-III

5. **Shell Programming:** Creating and Running Shell Programs, Using variables, Positional Parameters and other built-in Shell Variables; importance of quotation marks, test Command, Conditional Statements: if Statement, case Statement; Iteration Statements: for Statement, while Statement, until Statement, shift Command, select Statement, repeat Statement, Functions.

6. **Linux for System Administrators:** System Administration Basics, The root Account, Starting and Stopping the System; Mounting File Systems: Mounting a Device, Creating a New file System, Un-mounting file Systems, Checking file Systems, Compressing fileswith gzip and compress: Using tar, Backups, Setting the Login Message, Setting of DNS, Ping, WWW, and e-mail.

UNIT-IV

7. **PERL:**CreatingandExecutingPerlPrograms,HandlingDatainPerl:Variables, Numbers,Strings,FileOperators:Arrays,PerlProgrammingConstructs:Statement Blocks, If Statements, unless Statements, for Statements, for each Statements, while Statements, until Statements, Functions: Passing Arguments to Functions, Using Return Values; Perl Operators.

8. **System Calls:** C as System Programming Language, I/O system calls – umask(); create(); open(); read(); write(); lseek(); dup(); link(); access(); chmod(); chown(); Process management system calls; fork(); getpid(); getppid(); exit(); wait(); sleep() ; Signal system calls – kill(); signal().

REFERENCES:

1. Tim Parker: Linux Unleashed, Tech media Publishing House.
2. Norton, P.: Complete guide to LINUX, Tech media.
3. Komarinski, M.: LINUX System Administration Hand book,AW.
4. John Goerzen: Linux Programming Bible, IDG Books, New Delhi.
5. Venkates hmurthy, M.G.: Introduction to Unix& Shell Programming, Pearson Education.
6. Linux Network Administration Guide by Tery Dawson, Gregor N. Purdy, Tony Bautts– Oreilly.
7. Stones, Richard and Mathew Neil: Beginning Linux Programming, 3rd Edition, Wrox.
8. Jones, Tim: GNU/Linux Application Programming, Wiley India Pvt. Ltd.

PaperCode:MS–71	**Time :**	**3 Hrs.**
(Option-ii) Paper Title: Data Analytics-I		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objective: This course enables students to get familiar with Python Programming. Apply Num Py, Pandas for data analysis.

Course Outcome: After the completion of this course, student will be able to:-

- Analyze real life situation specific problems & perceived solution.
- Build explanatory data analysis & visualization.

Note:

i. The Question Paper will consist of FourUnits.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT-I

1. **Fundamentals of Data Science:** Definition, Basic Terminology, Venn diagram, Types of Data: Structured versus Unstructured data, Quantitative versus Qualitative data. The Four Levels of Data, Five steps of Data Science Process Overview, Data science classification, Data Science Algorithms, Components of Data Science, Role of Data Scientist.

2. **Applications of Data Science:** Application areas of Data science, Challenges of Data science, Various Data science tools and programming platforms for developing data science applications, Data science as a growing market, Data science benefit our society.

Unit-II

3. **Data Analytics and Data Cleaning:** Analytics for Data Science, Types, Quality and Quantity of data, Measurement, Exploratory data analysis, Data Analytics Examples, Data Analytics Life Cycle, Data Discovery, Data preparation, Model Planning, Model Building.

4. **Data Cleaning and Transformation:** Data cleaning, Data integration, Data Reduction, Data Transformation and Data Discretization. Feature Generation and Feature Selection, Feature Selection algorithms: Filters, Wrappers, Decision Trees and Random Forests.

Unit-III

5. **Introduction to Python:** Algorithms, building blocks of algorithms (statements, state, control flow, functions); algorithmic problem solving; iteration, recursion. Python Strengths and Weakness, Installing Python, IDLE, Spyder, Jupyter, Mutable and Immutable Data Types, Naming Conventions, String Values; String Operations; String Slices, String Operators, String functions: split, join, chr, ord, Numeric Data Types.

6. **Operators and Control Flow:**Arithmetic Operators and Expressions: Relational Operators; Logical Operators; Bit-wise Operators, Comments in the Program; Understanding Error Messages. List, Tuples, Sets, Dictionaries, Sorting Dictionaries. Control Flow: if statement, while Loop, break and continue statements, for Loop. Functions: Introduction, Defining your own functions, parameters, local and global scope, passing collections to a function, variable number of arguments, passing functions to a function.

Unit-IV

7. **Data Manipulation and NUMPY Basics:** Basics of NumPy, Computation on NumPy, Aggregations, Computation on Arrays Comparisons, Masks and Boolean Arrays, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Array.

8. **Introduction to Pandas:** Introduction to Pandas, Objects, Data indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Aggregation and Grouping, Pivot Tables.

Reference Books:-

1. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, Fundamentals of Data Science, 1 st Edition, 2022
2. Daimi, Kevin, Ed. Hamid R. Arabnia, Principles of Data Science, Springer, 2020
3. Jure Leskovek, AnandRajaraman and Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press, 2014
4. Cielen, Davy, Arno DB Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and more, using Python Tools, Manning Publications Co., 2016
5. Reema, Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press, June 2017
6. Zhang.Y, An Introduction to Python and Computer Programming, Springer Publications, 2016.
7. T.R.Padmanabhan, Programming with Python, Springer Publications, 2016.

PaperCode:MS-61	**Time :**	**3 Hrs.**
Paper Title: Software Engineering		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**0**

Objectives: This course enables students to understand Software Configuration Managements Tools and Techniques.

Course Outcome: After the completion of this paper, student will be able to:-

- Use principles, concepts, methods, and techniques of this of two are engineering approach to produce quality software.
- Apply software engineering principles and practices in the planning and development of an actual software product.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal mark sun les specified.

UNIT–I

1. **Introduction to Software Engineering:** Definition, Software Engineering goals,Characteristics of well-engineered software, Software Process Models: Waterfall Model, Prototyping Model, Spiral Model, RAD, Agile Modelling.

2. **Software Requirement Specification (SRS):** Software Requirements, Definition of SRS, Characteristics of SRS, Components of SRS, Designing of SRS.

3. **System Analysis:** Principles of Structures Analysis, DFDs, E-RDiagrams,DataDictionary.

UNIT – II

4. **Software Design:** Design Objectives, Design Principles, Concepts, Design Process, Design Methodologies: Structured Design, Modular Design, Object Oriented Design, User Interface Design and its elements and its Characteristics.

5. **Software Project Planning & Scheduling:** Objectives, Decomposition techniques, Planning and Scheduling Tools: GANTT Chart, PERT Chart, Critical Path Method andWorkBreakdown Structure; Cost estimation, Cost estimation Models: Single Variable Model, COCOMO Model; Software Risks, Risk Assessment.

UNIT – III

6. **Software Metrics:** Role of Metrics and Measurement, Types of Software Metrics: Product Metrics, Software Size Metrics: LOC and Function Points, Process Metrics, People Metrics**.**

7. **System Maintenance and Reliability:** Maintenance and its types; Factors Affecting Software Reliability, Software Reliability vs. Hardware Reliability, Software Reliability Metrics.

UNIT-IV

8. **Software Testing Techniques:** Introduction to Software Testing Process, Objectives of Software Testing. BBT & its Techniques: Boundary Value Analysis, Equivalence Class Testing, and Cause-Effect Graph, White-Box Testing and its Techniques: Domain and Boundary Testing, Logic Based Testing, Data Flow Testing and Basic Path Testing.

9. **Software Testing Strategies:** Characteristics, Integration Testing, Functional Testing, Object Oriented Testing, Alpha and Beta Testing.

REFERENCES:

1. Pressman: Software Engineering, Tata-Mc Graw Hill Publishing House.
2. Somme rville, I: Software Engineering, Pearson Education.
3. RajibMall:FundamentalsofSoftwareEngineering,PHILearningPvt.Limited
4. Jalota, Pankaj: Anintegrated approachto Software Engineering, Narosa Publishing Company.
5. AliBehforooz:SoftwareEngineeringFundamentals,OxfordUniversityPress.FrederickJ.H
6. William E.Perry,WILEY: Effective methods for Software Testing
7. Gill, Nasib Singh: Software Engineering: Software reliability, Testing and Quality Assurance. Khanna Book Publishing

PaperCode:MS-62	**Time :**	**3 Hrs.**
Paper Title: Computer Algorithm		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objective: The objective of the module is to create skills in students to design and analyze algorithms.

Course Outcome: After studying this subject students will be able to:-

- Understand algorithms and give theoretical estimates for the resources needed by any algorithm.
- Analyze Algorithms.
- Have an empirical approach to gauge the comparative performance of a given set of algorithms.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner wills set total of **NINE** questions comprising **TWO** questions from
iii. Each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iv. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
v. All questions carry equal marks unless specified.

UNIT – I

1. **Introduction to Data Structures**: Definition, Types of Data Structures, Stacks and its operations(Push, Pop), Queue and its operations (Insert, Delete), Tree (Binary Tree, General Tree and its Traversal),Graph(Types and its Traversal).

2. **Algorithms and Analysis:** Definition; Analyzing algorithms; space and time complexity, Asymptotic Notation (O, Ω, θ) practical complexities, Best, average and worst case performance of algorithms, examples, Recursive algorithms, Introduction to recurrence relations.

UNIT – II

3. **Divide and Conquer:** General method, Binary search, Merge sort, Quick sort, Selection problem, Strassen's matrix multiplication and analysis of these problems.

4. **Greedy Method:** General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees (Prim's Algorithm, Kristal's Algorithm), Single source shortest paths and analysis of these problems.

UNIT – III

5. **Dynamic Programming:** General method, Optimal binary search trees, 0/1 Knapsack, the traveling salesperson problem, Single Source Shortest Path Problem (Bellman Ford Algorithm), All pair shortest path problem (Floyd's Algorithm).

6. **Back Tracking:** General method, N queen's problem, Graph coloring, Hamiltonian cycles, Analysis of these problems.

UNIT - IV

7. **Branch-And-Bound:** General Method, 0/1Knapsack, Traveling Sales person problems.

8. **NP-hardandNP-completeproblems:**Basicconcepts,StatementofCook'sTheorem, Satisfiability SAT, Examples of NP-hard graph [Clique Decision Problem, Chromatic Number Decision Problem and NP-scheduling problems [Scheduling Identical Processors, Job Shop Scheduling].

REFERENCES:

1. Lipschutz, Seymour, 1986: Theory &Problems of Data Structures, Schaum Series.
2. Horowitz, Ellis and Sahni, Sartaj: Fundamentals of Computer Algorithms, Galgotia Publications.
3. Aho, A.V.,Hopcroft,J.E., Ullman,J.D.: The Design and Analysis of Computer Algorithms, Addison-Wesley.
4. Goodman, S.E. & Hedetniemi:Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Comp.
5. Knuth, D.E.: Fundamental of Algorithms: The Art of Computer Programming,Vol.-1,NareshPubl.House.
6. Brassad, Gilles and Bartley, Paul: Fundamentals of Algorithms, Prentice HallofIndia.

PaperCode:MS-42	**Time :**	**3 Hrs.**
Paper Title: Operating System Concepts		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**0**

Objectives: This course enables students to understand the concepts of Operating System.

Course Outcome: After the completion of this paper, student will be able to:-

- Manage various processes and use the scheduling algorithms.
- Handle the dead lock conditions.
- Manage the file son the disk with effective outcome.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner wills set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT– I

1. **Introduction to Operating System:** History, Structure of OS, Functions/ Operations of OS, Types: Single User, Multi-user, Simple Batch Processing, Multiprogramming, Multitasking, Parallel systems, Distributed system, Real time system.

2. **Process Management:** Process, Process state, Process Control Block; Process scheduling: Scheduling queues, Schedulers, Context switch; Operation on process: Process creation and termination; interrupt mechanism, threads, Scheduling Algorithms: Pre-emptive and non pre-emptive scheduling, FCFS, SJFS, RRS, priority scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling, Inter process communication: Shared memory systems, Message passing systems.

UNIT– II

3. **Process Synchronization:** Concurrent Processes, Race condition, Shared data; Critical section problem: Mutual exclusion, Progress, Bounded waiting; Software solution: Busy form of waiting, lock and unlock primitives, Peterson's solution; Synchronization: Semaphores, Monitors, ReaderWriterProblem, ProducerConsumerProblem, DinningPhilosopher Problem.

4. **System Deadlock:** System Model; Dead lock Characterization: Necessary conditions, Resource Allocation graph; Deadlock prevention: Mutual Exclusion, Hold and Wait, No Preemption, Circular wait; Deadlock Avoidance: Safe state, unsafe state, Resource Allocation graphs Algorithm, Banker's Algorithm; Dead lock Detection &Recovery from eadlock: Wait-for-graph.

UNIT– III

5. **Memory Management:** Hierarchy of memory types, Cache memory: Types: Associative memory, direct mapped, set associative.

6. **Memory Allocation:** Address binding, Address Space, Memory Protection, Contiguous and Non-Contiguous allocation, Swapping, Fragmentation; Paging: Protection, Shared pages, Techniques for structuring of page table; Segmentation: Segmentation with paging; Virtual Memory: Demand paging; Page replacement Algorithms: FIFO, Optimal, LRU, LFU, MFU, Working set, Thrashing.

UNIT– IV

7. **Storage Management:** File(s): Attributes, Operations, Types, Structure; Access Methods: Sequential, Direct access, Index; Directory Structure: Single level, Two level, Tree Structured, Acyclic Graph; File System mounting; File sharing; Protection: Types of access, access control.

8. **File system** structure, File system implementation, Directory implementation, Allocation methods: Contiguous Allocation, Linked Allocation, Indexed Allocation; Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK; Disk management; Swap space management; RAID.

REFERENCES:

1. GalvinP.B., Silberschatz A., Gagne G.: Operating System Concepts, Wiley Publications.
2. Deitel, H.M.:An Introduction to Operating System, Addision-Wesley Publishing Company.
3. Milenkovic,M.: Operating System-Concepts and Design, McGraw-Hill International Editions.
4. Madnick and Donovan: Operating System, McGraw-Hill Publishing Company.
5. Hansen P.Brineh: Operating System Principles, Prentice-HallIndia.

SEMESTERII

PaperCode:MS-45 **Time : 3 Hrs.**
Paper Title: Advance Java and Network Programming.
Maximum Marks : 100 (External : 80 + Internal : 20) **L P**
Number of Lectures: 90 (45 minutes duration) **6 4**

Objectives: This paper enables student to enhance the programming skills using object oriented programming approaches.

Course Outcome: After the completion of this paper, student will be able to:-

- To create enterprise and standard applications Java.
- To develop web applications with data base support.
- To develop client server based applications.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unitand **ONE compulsory** question of short answer type covering whole syllabi.
iii. Thestudentsarerequiredtoattempt**ONE**questionfromeachUnitandtheCompulsory question.
iv. All questions carry equal marks unless sspecified.

UNIT-I

1. **Review of Java Basics:** Applets, Multi threading, AWT Controls, Event Handling.

2. **Swing:** Features, components, S wingvs AWT,swingcontainers,controls,usingDialogs, sliders, progress bars, tables, creating user interface using swing.

UNIT-II

3. **Java Database Connectivity:** Connectivity model, Java. SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, Using Prepared Statement, creating database applications

4. **Java RMI:** Distributed object technologies, RMI architecture, creating RM Iapplications.

UNIT-III

5. **Java Servest:** Servletsvs CGI, Servlet Life cycle, c reating and running servlets.

6. **Networking:** Networking basics, Client / server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Data grams, create networking applications.

UNIT-IV

7. **Java Beans :** Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK), JAR files, introspection, developing Beans, Using Bound properties, The Java Beans API, Introduction to EJB (Enterprise Java Beans),Types of EJB, Uses of EJB.

8. **Java Server Pages:** Introduction, JSP Architecture, JSP Elements: Implicit Objects, Comments, Directives, Action Elements, Scripting Elements., developing simple Web Applications.

REFERENCES:

1. Schildt, Herbert: The Complete Reference Java2,TMH.
2. Ivan Bayross : Web EnabledCommercialApplicationDevelopmentusingJava2.0,BPB.
3. Cornell,Gary and Horstmann Cay S.:CoreJava,VolI and VolII,Sun MicrosystemsPress.
4. Keogh, James: J2EE:The Complete Reference.
5. Martin Bond, Debbie Law, And y Long shaw,Dan Haywood, Peter Roxburgh: SAMS: Teach Yourself J2EE in 21 days, Pearson.
6. Java6 Programming Black Book, Kogent SolutionInc.,DreamTechPress.

PaperCode:MS–65	**Time :**	**3 Hrs.**
Paper Title: E-Commerce and Emerging Trends		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**0**

Objectives: This course enables students to be familiar with Fundamentals of Electronic Commerce and Emerging Technologies such as Parallel Computing, Cloud Computing, Grid Computing, Mobile Computing, and Concept of Big Data.

Course Outcome: After the completion of this paper, student will be able to:-

- Understand **EDI, Electronic Payment Methods**
- Understand usage of e-commerce in IT and business.

Note:

i. The Question Paper will consist of Four Units.
ii. Examinerwillsettotalof**NINE**questionscomprising**TWO**questionsfromeachUnitand **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT-I

1. ElectronicCommerce: TraditionalCommercevsElectronicCommerce,TypesofE-Commerce, E-Commerce infrastructure: Hardware and Software requirements, **Electronic Data Interchange(EDI):** EDI enabled procurement process and its benefits; Components of EDI system: EDI standards, EDI software, communication networks; **Electronic Payment Methods:** Types of Electronic Payment Systems, Digital Token Based Electronic Payment Systems, Smart cards and Electronic payment Systems, Credit Card-Based Electronic Payment Systems, Risk and Electronic payment Systems.

2. Issues in E-commerce: The legal and policy environment of E-Commerce; Intellectual Property, advertising and consumer protection; Copyright Law; Patent Law; Network Security and Firewalls; Client-Server Network Security Threats; Data and Message Security; Encrypted Documents and E-mail; Digital Signatures.

UNIT-II

4. **Business Intelligence:** Introduction to Business Intelligence, Digital data and its types – structured, semi-structured and unstructured, Introduction to Online Transaction Processing(OLTP), Online Analytical Processing (OLAP), Different OLAP architectures: MOLAP, ROLAP, HOLAP, Comparison of OLTP and OLAP. BI Definitions and need, BI Component Framework, Business Applications of BI.

5. **Case Studies:** Supply Chain management, Banking, Online Reservation Systems, Online Publishing

UNIT-III

6. Parallel Computing: Introduction and use, Flynn's Classical Taxonomy: SISD, SIMD, MISD, MIMD; Parallel Computer Memory Architectures: Shared Memory, Distributed Memory, Hybrid Distributed-Shared Memory; Parallel Programming Models: Shared Memory Model, Threads Model, Distributed Memory/Message Passing Model, Data Parallel Model, Hybrid Model, SPMD and MPMP, Introduction to Parallel Virtual Machine and Message Passing Interface, Supercomputers.

7. Cloud Computing: Introduction and use, Architecture, Service Models: infrastructure as a service, platform as a service, and software as a service;

UNIT-IV

8. Grid computing: Introduction and benefits, virtual organisations, grid Architecture and its relationship to other distributed technologies, grid application areas.

9. Mobile Computing : Definition, Guided Transmission, Unguided Transmission; Mobile computing architecture, Mobile Devices, Mobile System Networks: Cellular, WLAN, Ad hoc networks; Introduction to : GSM,CDMA,GPRS,EDGE; Introduction to Mobile Databases; Mobile Applications; Mobile Application Languages; features of Mobile Operating system: Palm OS , Symbian, Android.

REFERENCES:

1. Ravi KalaKota and Andrew B. Whinston: Frontiers of Electronic Commerce, Addison Wesley 1996
2. Kamlesh K. Bajaj and Debjani Nag: E-Commerce The Cutting Edge of Business, McGraw Hill Education.
3. R.N.PrasadandSeemaAcharya,FundamentalsofBusinessAnalytics,Wiley2011
4. M.Sasikumar, Dinesh Shikhare,P.Ravi Prakash: IntroductiontoParallel Processing,PHI.
5. Barry Wilkinson, Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, Pearson Education.
6. Joshy Joseph, Craig Fellenstein:GridComputing,PearsonEducation.
7. ZarekNabrzyski, Jennifer M. Schopf, Jan Weglarz: Grid Resource Management - State of the Art and Future Trends, Kluwer Academic Publishers.
8. Kamal,Raj,Mobile Computing,Oxford HigherEducation.
9. Perkins, MobileComputing ,PearsonEducation.
10. Jochen Schiller:"Mobile Communications", PHI/PearsonEducation.

PaperCode:MS–60 **Time : 3 Hrs.**
Paper Title: Advanced Database System and MySQL
Maximum Marks : 100 (External : 80 + Internal : 20) **L P**
Number of Lectures: 90 (45 minutes duration) **6 4**

Objectives: The course aims at providing the students through insight on few DBMS principles and practices.

Course Outcome: Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL.

Note:

i) The Question Paper will consist of Four Units.
ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each Unitand **ONE compulsory** question of short answer type covering whole syllabi.
iii) The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv) All questions carry equal marks unless specified.

UNIT– I

1. **Database Management Systems**: Definition, Characteristics, Advantages of Using DBMS Approach, Classification of DBMSs,Data Models, Database Schema and Instance, Three Schema Architecture, Data Independence – Physical and Logical data Independence.

2. **Entity- relationship model**: Entities, Relationships, Representation of entities, attributes, Representation of relationship set, Generalization, aggregation.

3. **Normalization**: Functional Dependency, Full Functional Dependency, Partial Dependency, TransitiveDependency, NormalForms–1NF,2NF,3NF, BCNF, Multi-valued Dependency.

UNIT– II

4. **Relational Algebra and Relational Calculus**: Relational Algebra: Operations- Union, Intersection, Difference, Cartesian product, Projection, Selection, Division and relational algebra queries; Relational Calculus: Tuple oriented and domain oriented relational calculus and its operations.

5. **Transaction and Concurrency control**: Concept of transaction, ACID properties, Serializibility, States of transaction, Concurrency control: Locking techniques, Time stamp based protocols, Granularity of data items, Deadlock.

UNIT– III

6. **MySQL**: Introduction; Why My Sql; Tools provided with My SQL; My SQL Architectural Terminology; Data bases: Creating, Selecting, Dropping and Altering Databases; Tables: Creating, dropping, Altering, Indexing Tables; Adding new rows, Retrieving Information, Deleting or Updating Existing rows; Obtaining My SQL Metadata; Joins; Sub queries; Views; Multiple Tables Deletion and Updation; Foreign Keys and Referential Integrity; My SQL Data Types; Sequences.

UNIT- IV

7. **Data Warehousing**: Introduction; Features; Data modeling for Data Warehousing; Building Data warehouse; Comparison between Data Warehouse and DBMS Metadata; Problems and issues in Data Warehouse.

8. **Data Mining**: Overview; Goals of Data Mining; Techniques: Association rules Market Basket Algorithm, Apriori Algorithm); Classification: Decision Tree, Induction Algorithm; Applications of Data Mining.

REFERENCES:

1. Elmarsi&Navathe, “Fundamentals of Database Systems”4thEdition,2004.
2. Jiawei Hanand Micheline Kamber,"Data Mining:Concepts and Techniques" Elsvier.
3. William H.Inmon,"BuildingtheDataWarehouse",FourthEdition,Willey.
4. C.J.Date“Introductiontodatabasesystem”, 8th Edition,Galgotia Publications,2004.
5. PaulDuBois,"MySQLDeveloper'sLibrary",Fourth Edition,AddisonWesley.
6. BipinC.Desai,AnIntroductiontoDatabaseSystem
7. Silberschatz,Korth, Sudershan“DatabaseSystemConcepts”4thEdition,McGrawHill Education, 2002.
8. Ivan Bayross, “SQL/PLSQL: The Programming Language of Oracle, 3rd Revised Edition, 2006

PaperCode:MS–67	**Time :**	**3 Hrs.**
(Option –i) Paper Title: Artificial Intelligence		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objectives: The paper enables students to understand Artificial Intelligence techniques and the language LISP.

Course Outcome: After the completion of this paper, student will be able to

- Apply standard AI techniques to solve problems.
- Characterize the Knowledge Acquisition
- Differentiate various expert systems
- Write programs o f AI using PROLOG.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner wills set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT– I

1. **Artificial Intelligence (AI)** : Introduction and Applications, History of AI from Alan Turingand developments in AI, application areas; Criteria for success; Problem Characteristics; Problem representation-State space representation, problem reduction representation, production system; Introduction to agents, intelligent software systems, Applications, Intelligent architectures, components of intelligent agent based distributed systems.

2. **Search and Control Strategies:** Data driven and goal driven search; Uninformed search- Breadth - first Search and Depth-First Search methods; Heuristic Search Techniques - Hill Climbing, Best first Search, A*, AO*, Constraint satisfaction and means-ends analysis techniques.

UNIT– II

3. **Knowledge Representation** : Information and Knowledge, Knowledge Acquisition and Manipulation, Issues in Knowledge Representation, Knowledge Representation Methods, Propositional Logic and First Order Predicate Logic, Resolution: Definition, Conversion to Clause Form, Resolution in Propositional and Predicate Logic, Unification and Resolution Principle; Horn's Clauses, Semantic Networks, Partitioned Semantic Nets, Frames, Scripts and Conceptual Dependencies.

4. **Game Playing:** Minimax Search Procedure, Adding Alpha-Beta Cut offs.

UNIT– III

5. **Expert Systems** : Definition and Applications, Characteristics of Expert systems, Architecture of a typical Expert System, Expert System Shells, Building an Expert System, Case studies of Expert Systems like MYCIN, Specific Application of AI. Definition of Neurons, Communication and Learning in Neural Networks, Definition of Fuzzy /Logic set.

6. **Natural Language understanding and Processing**: Complexity of the problem, Syntactic processing: Grammars and Parsers, Augmented Transition Networks; Semantic Analysis: Semantic Grammars, Case Grammars; Discourse and Pragmatic processing: Using Focus in Understanding, Modeling Beliefs; Introduction to Perception: Vision using Low-Level and High-Level Image Features and Action: Navigation and Manipulation.

UNIT– IV

7. **AI Language PROLOG**: Features of Prolog, Elementary Data Types, Compound objects in Prolog, Writing simple program in Prolog, Understanding Default flow control of the Prolog Program, Controlling Program Flow with cut and fail, List Manipulation, String manipulation, Arithmetic Operators and evaluation of Arithmetic expressions, Input /Output statement. Some simple example problems: Tower of Hanoi, Sorted Tree Dictionary, Sorting, Searching Graphs, Searching a Maze.

REFERENCES:

1. RichElaineandKnightKevin: ArtificialIntelligence; Tata-McGrawHillCompany,New Delhi.
2. George F Luger; William A. Stubblefield: Artificial Intelligence; Structures and Strategies for Complex problem solving, Pearson Education.
3. Patter son, Dan W.: Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall of India Pvt. Ltd., New Delhi.
4. W.F.ClofisinandC.S.Mellish,"ProgramminginPROLOG",NarosaPublishingCo.
5. Sanjiva Nath,"Turbo PROLOG",Galgotia Publications Pvt. Ltd.
6. Bharti &Chaitany:Natural Language Processing, PHI.
7. Russel, Sturat & Norviig, Peter: Artificial Intelligence; A modern Approach; Person Education Pvt. Ltd.

Paper Code:MS–73	**Time :**	**3 Hrs.**
(Option – ii) Paper Title: Data Analytics-II		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objectives: The paper enables students to understand Machine Learning, AI, NLP and Big Data concepts.

Course Outcome: After the completion of this paper, student will be able to:-

- Analyze the need and importance of fundamental concepts and principles of Big Data
- Apply internal functioning of Different modules of Big Data and Hadoop.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT– I

1. **Introduction to Machine Learning:** Machine learning in practice, Exploring and understanding state-of-the-art methods, Learning Associations. **Supervised Learning:** Classification and its types, Different Classifier Algorithms, Linear Classifiers Models: Logistic Regression, Support Vector Machines, Non-Linear Classifiers Models: K-Nearest Neighbours, Decision Trees, Naïve Bayes.

2. **Unsupervised machine learning:** Introduction, Clustering: Introduction, K-Means Clustering, Spectral Clustering, Hierarchical Clustering, Density based Clustering. Reinforcement Learning: Introduction, Elements of Reinforcement Learning, Practical Applications of Reinforcement Learning, Probably Approximately Correct Learning (PAC), Noise Learning.

UNIT– II

3. **Artificial Intelligence:** Introduction to AI, the Foundations of AI, AI Techniques, Tic-Tac-Toe. Problem characteristics, Production system characteristics. Production systems: 8-puzzle problem. Searching: Uniformed search strategies, Breadth first search, depth first search. Local Search Algorithms, Generate and Test, Hill climbing, Constraint satisfaction problems, Greedy best first search, A* search, AO* search.

4. **Knowledge Representation:** Knowledge Representation- First order logic. Inference in first order logic, propositional vs first order inference, forward chaining, and backward chaining.

UNIT– III

5. **Natural Language Processing:** Natural Language Processing and its importance, Practical Applications of NLP, Natural Language Processing Workflow, Lexical Analysis, Parsing, Semantic Analysis, Discourse Integration, Pragmatic Analysis,

6. **Components of NLP:** Components of NLP, Natural Language Understanding (analyzing, mapping), Natural Language Generation (Text planning, Sentence planning, Text Realization), Challenge of ambiguity, Role of Language Models. Basic NLP Techniques-Part Of Speech Tagging and Sequence Labeling, Lexical Syntax, Basics of Neural Networks.

UNIT– IV

7. **Big Data Concepts:** Big Data and Cloud technologies, Introduction to HADOOP: Big Data, Apache Hadoop, Map Reduce, Data Serialization, Data Extraction, Stacking Data, Dealing with data.

8. **Big Data Analytics:** Big Data Analytics, Business Intelligence and Data Science, Business intelligence Vs Big data, Big data frameworks, Current landscape of analytics.

REFERENCES:

1. Cielen, Davy, Arno DB Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and more, using Python Tools, Manning Publications Co., 2016
2. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman and Hall, CRC Press, Second Edition, 2014
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager‟s Guide", Second Edition, 2012
4. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley Publishers, 2015
5. SowmyaVajjala, BodhisattwaMajumder, Anuj Gupta, HarshitSurana, Practical Natural Language Processing, 2020
6. S. Russell and P. Norvig, Artificial Intelligence A Modern Approach, 3 rd Edition, Pearson Education, 2019
7. E. Rich and K. Knight, Artificial Intelligence, 3 rd Edition, New york: TMH, 2019

SEMESTERIII

PaperCode:MS–32 **Time : 3 Hrs.**
(Option – i) Paper Title: NETFRAMEWORKANDC#
Maximum Marks : 100 (External : 80 + Internal : 20) **L P**
Number of Lectures: 90 (45 minutes duration) **6 8**

Objectives: This course aims at making a student capable of developing console, windows and web applications using C# on .NET platform.

Course Outcome: After the completion of this paper, student will be able to:-

- Use .Net Framework and concepts of OOPs using C#.
- Create and deploy windows form and ASP.Net applications
- Create Applications using ADO.NET.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT-I

1. **Introduction to .NET environment:** The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio.NET, .NET languages, benefits of the.NET approach.

2. **Introduction to C#** :Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations, difference between C++ and C#, difference between Java and C#.

UNIT-II

3. **Object Oriented Aspects of C#** : Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

4. **I/O and Object Serialization:** I/O: System. I/O, Streams, Text Writer, Text Reader, Binary Writer, Binary Reader, File Stream, File; Serialization: Binary, SOAP,XML and Custom Serialization.

UNIT-III

5. **Writing Windows Forms Applications and Deploying Windows Forms Applications**: WritingWindowsFormsApplications:UnderstandingWindowsForms,Windowform controls,Menus,MDIForms,UsingInheritanceinWindowsForms,UsingCommonDialog Controls,DeployingWindowsFormsApplications:Introductiontodeployment,ClickOnce deployment, Creating an Installation Package for project.

6. **Writing ASP .NET applications and Deploying ASP .NET Applications:** Introduction to ASP.NET, Using Validation Controls, Managing State in ASP.NET Web Applications, Deploying ASP.NET Applications with Windows Installer.

UNIT-IV

7. **Accessing Data with ADO .NET:** ADO .NET Architecture, Components, Database, Data Reader, Data Adapter, Dataset, Viewing data using Data Grid View Control, Creating Applications.

REFERENCES:

1. Jones,BradleyL.:SamsTeachYourself C#in21 Days.
2. Balagurusamy,E.:ProgramminginC#,TataMcGraw-Hill.
3. Liberty,J.:ProgrammingC#,O'Reilly.
4. Schildt,Herbert:TheCompleteReference:C#,TataMcGraw-Hill.
5. Robinson:ProfessionalC#,WroxPress.
6. JasonBeres: SAMSTeachYourselfVisualStudio.Netin21days.
7. Watsel, Nagel, Pedersen,Reid, Skinne,White:Beginning Microsoft VisualC#,Wrox Publications.

PaperCode:MS–75 **Time : 3 Hrs.**
(Option – ii) Paper Title: Data Analytics-III
Maximum Marks : 100 (External : 80 + Internal : 20) **L P**
Number of Lectures: 90 (45 minutes duration) **6 8**

Objectives: This course aims at making a student capable of Data Modeling visualization

Course Outcome: After the completion of this paper, student will be able to:-

- Employ best practices in data visualization to develop charts, maps, tables & other visual representation techniques to communicate findings to diverse audience.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unitand **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT-I

1. **Data Preparation:** Introduction to Data Preparation, Modeling, Applications, Data Preparation using excel, Lookups, Cleaning and Pivoting, Objectives of Data Exploration, Datasets-Multimedia data, Social media data, Biological data, Sensor data, different dataset with different challenges.
2. **Data Visualization:** Introduction to data visualization, Types of Data visualization, The Five Cs of Data Visualization, Filters. Data Visualization Analysis and its categories, Different Data Visualization Techniques: Line Plots, Histograms, Bar Plots, Box Plots, Scatter Plots, Bubble Plots, Tree maps, Heat maps, Dashboard layout techniques.

UNIT-II

3. **Descriptive Statistics:** Raw Data, Graphical Plots and Charts, Frequency Distribution, Histogram and Frequency Polygons, Relative Frequency Distributions, Cumulative Frequency Distributions, Frequency Curves and Their Types.

4. **Measures of Central Tendency:** Mean, Median, Mode, And Trimmed Mean. Measures of Dispersion: Range, Standard Deviation, Quartile Deviation, Mean and Median Absolute Deviation, Measures of Skewness and Kurtosis, Notion of Linear Correlation and Linear Regression, Simple Problems.

UNIT-III

5. **Data Engineering:** Concepts, processes, and tools for data engineering, Role of data engineers. Different properties and behaviors of data and its importance.

6. **Role of Quality Data:** Role of good quality data in machine learning model. Anomalies or outliers. Reasons that outliers may reduce machine learning model performance, two real-world cases studies to show importance of outlier's detection. Missing values, Conditions when to delete missing observation and when to impute it. Concept of dimensionality reduction. On what basis we select feature that needed to be removed. How dimensionality reduction improve accuracy of a machine learning model.

UNIT-IV

7. **Data Science Tools:** Introduction to Data Science Tools, MS-Excel, Tableau, Matplotlib, Tensor Flow, Applications: Problem Solving using these tools. Data Science Ethics, Owners of the data, valuing different aspects of privacy, Future Trends.

8. **R Programming:** Getting started with R, Installing R and R studio, Installing and loading packages, Simple arithmetic calculations, Data structure, Expressions, Conditional statements, Functions, Loops, Introduction to Statistics, Probability and data with R.

REFERENCES:

1. Cielen, Davy, Arno DB Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, and more, using Python Tools, Manning Publications Co., 2016
2. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Chapman and Hall, CRC Press, Second Edition, 2014
3. .Montgomery, D. C., and Runger, G. C. (2018). Applied Statistics and Probability for Engineers, Seventh Edition, John Wiley & Sons, Inc.
4. Bruce, P., Bruce, A., and Gedeck, P. (2020). Practical Statistics for Data Scientists, Second Edition, O'Reilly Media, Inc.
5. Garrett Grolemund, Hands-on Programming with R: Write your own functions and simulations, O'Reilly Publisher, 2014.

PaperCode:MS–69 **Time : 3 Hrs.**

Paper Title: THEORY OF COMPUTATION

Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**0**

Objectives:

The goal of this course is to provide students with an understanding of basic concepts of Theory of Computation.

Course Outcome: After the completion of this paper, student will be able to:-

- Will know about Automata, Transition Systems, Language, Grammar and Deterministic & Non-Deterministic Finite State Machines.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT I

1. **TheoryofAutomata**:Definition,DescriptionofAutomata,TransitionSystems,Language,Grammar, Deterministic & Non-Deterministic Finite State Machines, Equivalence of DFA and NDFA, Finite State Machine with output (Moore Machine and Meally Machine), Conversion of Moore Machine to Meally Machine & vice-versa, Minimization of Finite Automata.

2. **Formal Languages**: Chomsky Classification of Languages, Languages and their Relations, Languages and Automata.

UNIT II

3. **Regular Sets and Regular Grammars**: Regular Expressions, Finite Automata and Regular Expressions, Conversion of NDFA to DFA, Arden's Theorem, Construction of FA equivalent to Regular Expression, Equivalence of two Finite Automata, Equivalence of two Regular Expressions, PumpinglemmaforRegularSetsandapplications,ClosurePropertiesofRegularSets,Constructionof Regular Grammar generating Transition System for a DFA, Construction of Transition System accepting Language for a Regular Grammar , limitations of finite state machine.

UNIT III

4. **Context Free Languages**: Context free grammar, Simplification of Context Free Grammars, Normal Forms for Context Free Grammars: Chomsky Normal Form, Greibach Normal Form, Pumping Lemma,CYK algorithm.

5. **PDA**: Push down stack machine, Design of deterministic and non-deterministic push-down stack, Parser design.

UNIT IV

6. **LR (K) Grammars**: Properties of LR(K)Grammar, Closure properties of Languages.
7. **Turing Machine**: Turing machine definition and design of Turing Machine, Church-Turing Thesis, VariationsofTuringMachines,combiningTuringmachine,UniversalTuringMachine, PostMachine, Chomsky Hierarchy, Halting problem, Post Correspondence problem.

REFERENCES:

1. Mishra, K.L.P and Chandra sekaran, N.: Theory of Computer Science, Automata, Languages and Computation.
2. Lewis,Harry R. and Papa dimitriou, ChristosH.: Theory of Computation, Prentice Hall of India,1996.
3. Hopcroft, John E. and Ullman ,Jefrey D.: Introduction to Automata Theory, Languages and Computation, Addison-Wesley Publishing Company Inc.
4. Brady, J.M.:TheoryofComputer Science, Wiley.
5. A.V.Aho,J.E. Hopcroft and J.D.Ullman,'Introduction to Automata, Languages and Computations, Addison Wesley, 1980.
6. M.DavisandE.J.Weyuker'Computability,Complexity and Languages' Academic Press, 1982.

Paper Code: MS– 39	**Time :**	**3 Hrs.**
Paper Title :Computer Graphics		
Maximum Marks : 100 (External : 80 + Internal : 20)	**L**	**P**
Number of Lectures: 90 (45 minutes duration)	**6**	**8**

Objectives: This paper enables students to understand graphics hardware and various 2D and 3D algorithms.

Course Outcome: After the completion of this paper, student will be able to:

- Implement the principles and commonly used paradigms and techniques of computer graphics.
- Use Open GL proficiently using/C++.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT– I

1. **Introduction to Computer Graphics**: Overview of Graphics Systems, Display Devices, Display Processors, Character Generation; Interactive graphical techniques; Positioning, (Elastic or Rubber Band lines, Inking, zooming, panning)

2. **Raster Scan Graphics**: Line Drawing algorithms-Direct method, DDA and Bresenham's; Circle drawing algorithm- 2-point, 4-point, trigonometric method, 8-point, Bresenham method, Bresenham Midpoint method.

UNIT– II

3. **Two Dimensional Geometric Transformation & Viewing**: homogeneous coordinate system; Basic Transformations- Translation, Rotation, Scaling, Reflection, Shear, composite transformation like- Rotation about an Arbitrary Point, Reflection through an Arbitrary Line; transformation of points and unit square.

4. **Clipping: Point clipping Line clipping algorithms**: Cohen-Sutherland and Liang-Barsky, Polygon Clipping; Window to viewport coordinate transformation.

UNIT– III

5. **Graphics Programming using C/C++**: Basic Graphical functions; Mouse Programming, Graphic Languages: Primitives (Constants, actions, operators, variables), display subroutines, plotting and geometric transformations, Concept of Animation, Saving, Loading and Printing graphics images from/to disk. Animated algorithms for sorting, Towers of Hanoi.
6. **Open G Lusing C/C++**: Geometric Primitive sand Attributes; Viewing; Color; Lighting, Animation**.**

UNIT– IV

7. **Three Dimensional Concepts & Object Representations**: Three Dimensional Display Methods, Parallel Projection, Perspective Projection; Translation, Rotation, Scaling, Composite Transformation; Hidden line and surface elimination-Z-buffer, back face, scan line, depth sorting.
8. **Shading-**Modeling light intensities- flat shading, gouraud shading, phong shading. Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.

REFERENCES:

1. Giloi,W.K.: Interactive Computer Graphics; Prentice-Hall India Ltd.
2. Newman, W.,Sproul, R.F.:Principles of Interactive Computer Graphics, McGraw-Hill.
3. Rogers,D.F.: Procedural Elements for Computer Graphics, McGraw-Hill.
4. Foley, J.D.,Van DamA.:Fundamentals of Interactive Computer Graphics ,Addison-Wesley.
5. Hearn, D.,Baker P.M: Computer Graphics,Prentice-Hall.
6. Roy, Plastock, Theory& Problems of Computer Graphics,SchaumSeries
7. Hearn,D.,BakerP.M:Computer Graphics,Prentice-Hall.
8. Dave Shreiner,Mason W., JackieN., Tom Davis; The Open GL Programming Guide–The Red Book, Addision -Wesley.

Paper Code: MS– 14 **Time : 3 Hrs.**
Paper Title: Systems Approach to Management and Optimization
Maximum Marks : 100 (External : 80 + Internal : 20) **L P**
Number of Lectures: 90 (45 minutes duration) **6 0**

Objective: This course enables students to be familiar with different types of Info systems, basics of DR and its practical problems.

Course Outcome: After the completion of this paper, student will be able to:

- Convert the problem into a mathematical model.
- Understand variety of problems such as assignment, transportation, travelling salesman etc.

Note:

i. The Question Paper will consist of Four Units.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Unit and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Unit and the Compulsory question.
iv. All questions carry equal marks unless specified.

UNIT-I

1. **Concepts of Computer Based Systems**: Data, Information, Information Systems, Model of computer based information system; Introduction to Management Information System, Decision Support System and Knowledge Based Systems.

2. **Accounting Information System**: Characteristics, sample system, subsystems for filling customer order, order replenishment stock, performing general ledger processes; features and use of Accounting Information System Package-Tally.

3. **Marketing Information System**: Basic concepts, model, subsystems including Marketing Research, Marketing Intelligence, Product, Place, Promotion and Pricing sub systems.

UNIT-II

4. **Manufacturing Information System**: Model and sub systems including Accounting information, Industrial Engineering, Inventory, Quality and Cost Subsystems.

5. **Financial Information System**: Model and Subsystems including Forecasting, Funds Management and Control Subsystems.

6. **Human Resources Information Systems**: Model and Sub systems including humanresources research, human resources intelligence, HRIS Database, HRIS output.

UNIT-III

7. **Basics of Operations Research (OR)**: Origin and Development of OR, Characteristics of OR, Models in OR, OR and Decision Making, Role of Computers in OR, Limitations of OR.

8. **Linear Programming**: Mathematical Formulation, Graphical and Simplex method, Duality in Linear programming, Dual Simplex Method, The Revised Simplex Method, Sensitivity Analysis.

UNIT-IV

9. **Special types of Linear Programming problems**: Transportation and Assignment problems.

10. **IntegerProgramming**: Introduction, Branch and Bound Techniques, Binary Linear Programming, Assignment & Traveling salesman problems.

11. **DynamicProgramming**: Deterministic&ProbabilisticDynamicProgramming.

REFERENCES:

1. Basandra, SureshK.: Computer Systems Today, Wheeler Publishing
2. Murdick, R.G.& RossJ.E.& ClaggttJ.R.: Information Systems for Modern Management, Prentice Hall
3. Swarup, Kanti, Gupta, P.K.& Manmohan: Operations Research,Sultan Chand&Sons.
4. Gupta, Prem Kumar & Hira,D.S.: Operations Research.
5. Rao,S. S.: Introduction to Optimization: Theory& Applications, Wiley Eastern.
6. Taha,H.A.: Operations Research–An Introduction, McMillan Publishing Company
7. S.D.Sharma: Operation Research, Sultan Chand& Sons.

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