GURU KASHI UNIVERSITY

M.Tech Computer Science & Engineering

Session : 2022-23

Department of Computer Science & Engineering

PROGRAMME LEARNING OUTCOMES

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the Engineering community and with society at large, such as, being able to Comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

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Programme Structure

Semester: 1st						
Course Code	**Course**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS101	Advanced Computer Architecture	T	3	0	0	3
MCS102	Advanced Database Management Systems	T	3	0	0	3
MCS103	Design Principles of Operating Systems	T	3	0	0	3
Audit Course-I(Any one of the following)						
MCS104	English for Research Paper Writing	T	3	0	0	3
MCS105	Disaster Management					
MCS106	Value Education					
Elective-I (Any one of the following)						
MCS107	Multimedia Systems	T	3	0	0	3
MCS108	Object Oriented Analysis And Design					
Elective-II (Any one of the following)						
MCS109	Business Information Systems	T	3	0	0	3
MCS110	Distributed System					
Total			18	0	0	18
Semester: 2nd						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS201	Research Methodology	T	4	0	0	4
MCS202	Advanced Software Engineering	T	3	0	0	3

MCS203	Mini Project*	P	0	0	4	2
Audit Course-II(Any one of the following)						
MCS204	Constitution of India	**T**	3	0	0	3
MCS205	Pedagogy Studies					
MCS206	Stress Management by Yoga					
MCS207	Personality Development through Life Enlightenment Skills					
Elective-III (Any one of the following)						
MCS208	Advanced Computer Graphics	**T**	3	0	0	3
MCS209	Compiler Design					
MCS210	Design and Analysis of Advanced Algorithms					
MTI211	Advanced Programming Languages					
Elective-IV(Any one of the following)						
MCS212	Wireless and Mobile Networks	**T**	3	0	0	3
MCS213	Advanced Microprocessors and Programming					
MCS214	Data Warehousing & Data Mining					
MTI215	Advanced Cloud Computing					
Total			**16**	**0**	**4**	**20**

Semester: 3rd

Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS301	Dissertation Phase -I*	P	0	0	0	10
MCS302	Seminar	P	0	0	4	2
Elective-V (Any one of the following)						

MCS303	Soft Computing	T	3	0	0	3
MCS304	Parallel Computing					
MCS305	Advanced Data Structures					
Elective-VI(Any one of the following)						
MCS306	Digital Image Processing	T	3	0	0	3
MCS307	Network Security					
MCS308	Mobile Applications & Services					
Total			**6**	**0**	**4**	**18**

***Dissertation Phase – I**:-The work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem formulation with objectives and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.

Semester: 4th

Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
MCS401	Dissertation Phase-II	P	NA	NA	NA	20
MCS402	Organisational Ethical Values	T	2	0	0	2
Total						**22**

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Dissertation Phase – II:-It is a continuation of research work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed research report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out

the conclusions of the work and future scope for the study. . The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

= Max. hours for teacher

^= Independent study hours

SEMESTER-I

Course Title: Advanced Computer Architecture

L	T	P	Cr
3	0	0	3

Course Code: MCS101

Total hours-45

Course Outcome: On successful completion of this course, students will be able to**:**

1. Discuss memory organization and mapping techniques.
2. Demonstrate concepts of parallelism in hardware/software.
3. Describe architectural features of advanced processors.
4. Interpret performance of different pipelined processors.
5. Explain data flow in arithmetic algorithms

Course Contents

UNIT-I **15 Hours**

Parallel Computer Models: Multiprocessors and multicomputer, Multifactor and SIMD computers, Architectural development tracks Program and network properties ,Conditions of parallelism, Data and resource dependencies, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

UNIT-II **10 Hours**

Processors and Memory Hierarchy: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW

Architectures. Hierarchical memory technology, Memory capacity planning, Virtual Memory Technology, Cache addressing models, Direct mapping and associative caches.

UNIT-III **10 Hours**

Vector and Symbolic Processors: Inclusion, Coherence and Locality, Backplane Bus System Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt,

Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques.

UNIT-IV **10 Hours**

Vector Processing Principles: Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing. SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement. Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines

Suggetsed Readings

1. Mano M.M.(1990). *Computer System Architecture,* PHI.
2. Hayes J.P.(1998). *Computer Organization and Architecture*, TMH.
3. William Stallings. (1990).*Computer System Architecture,* PHI.
4. Hwang and Briggs. (1986). *Computer Architecture and Parallel Processing, MGH.*

SEMESTER-I

Course Title: Advanced Database Management System

L	T	P	Cr
3	0	0	3

Course Code: MCS102

Total hours-45

Course Outcome: On successful completion of this course, students will be able to:

1. Acquire knowledge of Query optimization, Parallel and distributed database systems, New database architectures and query operators.
2. Develop new methods in databases based on knowledge of existing techniques.
3. Apply acquired knowledge for developing holistic solutions based on database systems/database techniques.
4. Explain the principles of concurrency control.
5. Explain the principles of recovery management.

Course Content

UNIT-1 **15 Hours**

Distributed DBMS: Transaction Processing, Concurrency & Recovery Management in Centralized DBMS. Concept of Transaction and its properties, Scheduling of transactions, Conflict operations, Two Phase Locking protocol, Recovery management in Centralized DBMS.

Concepts And Design: Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in DDBMS, Date's Twelve rules for a DDBMS. Advanced Concepts. Distributed transaction management, distributed concurrency control,

distributed deadlock management, distributed database recovery, Replication servers, and Distributed query optimization, Mobile databases.

UNIT-II **10 Hours**

Object-Oriented DBMS: Introduction, advanced database applications, weakness of RDBMS, storing objects in a relational database, next-generation database systems. Concepts and Design. OODBMS perspectives, persistence, issues in OODBMS, advantages and disadvantages of OODBMS, Object-oriented database design. Object Relational DBM. Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

UNIT-III **10 Hours**

Web Technology and DBMS: Web as a database Application Platform, Requirements for web-DBMS integration, web-DBMS architecture, advantages and disadvantages of web-DBMS approach, approaches to integrating the web and DBMS, Oracle Internet Application Server (IAS).

UNIT-IV **10 Hours**

Data Warehousing Concepts, OLAP and Data mining: Evolution of data warehousing, data warehousing concepts, benefits and problems of data warehousing, comparison of OLTP systems and data warehousing, On-Line Analytical Processing, Introduction to data mining.

Suggetsed Readings

1. Thomas Connolly, Carolyn Begg. *(*1996). *Database Systems*, Dorling Kingsley.
2. H. F. Korth , A. Silverschatz. (1997). *Database Concepts,* Tat Hill.
3. Hoofer, Prescott, McFadden.*(2007*).*Modern Database Management,* Pearson education.
4. C.S.R. Prabhu. *(*2005). *Object-oriented Database Systems,* Eastern Economy Edition.
5. C. J. Date. (2004). *An Introduction to Database Systems,* Pearson education.

SEMESTER-I

Course Title: Design Principles of Operating System

Course Code: MCS103

L	T	P	Cr
3	0	0	3

Total Hours:-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Develop low-level operating system code.
2. Understand the performance and design trade-offs in complex software systems
3. Understand and be capable of developing OS code inside a variety of OS environments, including monolithic, microkernel's, and virtual machines, including device drivers.
4. Develop marks and use of profiling tools to evaluate the performance of operating systems and application stacks.
5. Understand and of evaluating research published in the field of operating systems at a level commensurate with their experience.

Course Contents

UNIT-I **15 Hours**

Introduction to OS: Operating system, Application scenarios, kind of resource support needed by applications, what is an "Operating System" and what support is provided to run an application, hardware and software layers, organization of a computer system, operational view of a computing system with resources like processor, memory, input and output, issues in resource management, a bare-bone operating system, introduction to the issues in communication with devices, kernel and shell of an operating system, processes and file.

File Systems and Management: File systems. What is a file, user view of files, file types and file operations, file types in Unix and Microsoft, file operation commands, file access rights, file storage management, Inode or FAT structure, file control blocks, root file system, directory and file paths, blocks, impact of block size selection, contiguous allocation, chained and indexed allocations, Impact of allocation policy on fragmentation, mapping file blocks on the disk platter, cylinder, disk access control and scheduling.

UNIT-II **10 Hours**

Process Management: Processor resource management, Explanation of processor as a resource, definition of a process, processor utilization, multi-processing and time sharing, response time, process state, process state transitions, process scheduling, short-term and long term schedules, non-pre-emptive and pre-emptive scheduling policies, time slice, policies like FCFS, SJF etc. Gantt charts and parameters to compare policy performance, context switching of process state information. Kernel architecture, User and kernel mode of operation, System calls, process states, kernel operations, design of a scheduler.

Memory Management: Motivation for memory management, when and where primary and secondary memory management is needed, compiled code and memory relocation, linking and loading, processes and primary memory management, memory allocation policies, critique of various policies like first fit, best fit, internal and external fragmentation, secondary memory management, fixed and variable partitions, virtual memory concept, paging and page replacement policies, page faults, thrashing, hardware support for paging, segmentation, segmentation with paging.

UNIT-III **10 Hours**

Input/ Output Management: Issues in human centric, device centric and computer centric I/O management, input output modes, Programmed I/O, polling, interrupt mode of IO, various types of interrupts, interrupt servicing, priority interrupts, interrupt vectors, direct memory access (DMA) mode of transfer, setting up DMAs, device drivers, interrupt handling using device drivers, buffer management, device scheduling, disk scheduling algorithms and policies.

Resource Sharing and Management: Shared resources, resource allocation and scheduling, resource graph models, deadlocks, deadlock detection, deadlock avoidance, deadlock prevention algorithms, mutual exclusion, semaphores, wait and signal procedures.

Interprocess Communication: Spawning a new process, parent and child processes, assigning a task to child processes, need for communication between processes, modes of communication, pipes, shared files, shared memory, message based IPC, signals as IPC, the distribute computing environment.

UNIT-IV **10 Hours**

Real Time Systems and Microkernels: Characteristics of real-time operating systems, classification of real-time systems, architectures of real-time systems, micro-kernels, scheduling in RTOS, rate monotonic scheduling, priority inversion, RTOS for hand-held devices.

OS and Security: Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access, policy and access control, OS design considerations for security, access control lists and OS support, internet and general network security.

Suggested Readings:

1. Silberschatz, Galvin. *(*1998*).Operating System Concepts*, Addison-Wesley publishing.
2. A S. Tanenbaum. *(*2008*). Modern Operating System,* Pearson Education.
3. H.M. Dietel.(1990*).An Introduction to Operating System* ,Pearson Education.
4. William Stallings. *(*2008). *Operating* Education *Systems*, Pearson.

SEMESTER-I

Course Title: ENGLISH FOR RESEARCH PAPER WRITING

Course Code: MCS104

L	T	P	Cr
3	0	0	3

Total Hours:-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Understand professional writing by studying management communication contexts and genres, researching contemporary business topics, analyzing quantifiable.

2. Examine the formal elements of specific genres of organizational communication: white papers, recommendation and analytical reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents.

3. Understand how to critically analyze data from research; incorporate it into assigned writing clearly, concisely, and logically; and attribute the source with proper citation.

4. Comprehend the ethical, international, social, and professional constraints of audience, style, and content for writing situations

Course Content

UNIT-I **10 Hours**

Planning and Preparation:Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Plagiarism : Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-II **10 Hours**

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

UNIT-III **10 Hours**

key skills: key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-IV **15 Hours**

writing the Methods : Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

Implementation Process: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Suggested Readings :

1. Goldbort R. (2006) .*Writing for Science*, Yale University Press. (available on Google Books)

2. Day R. (2006) .*How to Write and Publish a Scientific Paper*, Cambridge University Press.

3. Highman N .(1998). *Handbook of Writing for the Mathematical Sciences*, SIAM. Highman'sbook.

SEMESTER-I

Course Title: DISASTER MANAGEMENT

Course Code: MCS105

L	T	P	Cr
3	0	0	3

Total Hours:-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Understand the foundations of hazards, disasters and associated natural/social phenomena
2. Predict the management theory (cycle, phases).
3. Examine about existing global frameworks and existing agreements (e.g. Sendai)
4. Analysis on conducting independent DM study including data search, analysis and presentation of disaster case study

Course Contents

UNIT-I **10 Hours**

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Repercussions of Disasters and Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters, Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster, Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT-II **15 Hours**

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemic.

Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk, Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports, Governmental And Community Preparedness.

UNIT-III **10 Hours**

Risk Assessment: Disaster Risk, Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-1V **10 Hours**

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

Suggested Readings:

1. Nishith, R., & Singh, A. K. (2004). *Disaster Management in India: Perspectives,* issues and strategies. New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.), *Disaster Mitigation Experiences and Reflections*, Prentice Hall of India, New Delhi.
3. Goel, S. L. (2009). *Disaster Administration And Management Text And Case Studies*, Deep & Deep Publication Pvt. Ltd., New Delhi.

SEMESTER-I

Course Title: Value Education

L	T	P	Cr
3	0	0	3

Course code: MCS106

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Understand value of education and self- development
2. Predict the good values in students
3. Examine about the importance of character
4. Comprehend the essential steps to become good leaders

Course Content

UNIT-I **10 Hours**

Values And Self-Development: Social Values And Individual Attitudes. Work Ethics, Indian Vision Of Humanism. Moral and Non- Moral Valuation. Standards And Principles. Value Judgements

UNIT-II **10 Hours**

Importance of Cultivation of Values: Sense of Duty. Devotion, Self-Reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of Faith, National Unity. Patriotism, Love For Nature, Discipline

UNIT-III **15 Hours**

Personality And Behavior Development: Soul And Scientific Attitude. Doing Best For Saving Nature Association And Cooperation. Aware Of Self-Destructive Habits. Happiness Vs Suffering, Love For Truth. True Friendship. Universal Brotherhood And Religious Tolerance. Free From Anger, Dignity Of Labour. Avoid Fault Thinking. Punctuality, Love And Kindness. Positive Thinking. Integrity and Discipline.

UNIT-IV **10 Hours**

Character And Competence: Holy Books Vs. Blind Faith. Honesty, Studying Effectively. Mind Your Mind, Self-Control. All Religions And Same Message. Equality, Nonviolence, Humility, Role Of Women. Science Of Reincarnation. Self-Management And Good Health.

Suggested Readings:

1. Chakroborty, S.K. (2000). *Values and Ethics for organizations Theory and practice*, Oxford University Press, New Delhi
2. Chatterjee, S. R. (1997). Values and Ethics for Organizations: Theory and Practice. *The Asia Pacific*

SEMESTER-I

Course Title: Multimedia Systems

Course Code: MCS107

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Determine the appropriate use of interactive verses standalone Web applications.
2. Identify issues and obstacles encountered by Web authors in deploying Web-based. Applications
3. Create a well-designed, interactive Web site with respect to current standards and practices.
4. Analyze measurement results obtained on the multimedia system and components.
5. Demonstrate in-depth knowledge in an industry-standard multimedia development tool and its associated scripting language.

Course Content

UNIT-I **10 Hours**

Introduction: Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia, Multimedia Software for different media, Multimedia Technology ,Multimedia Systems Technology , Multimedia Hardware devices, Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, SGML, ODA, Multimedia Standards for Document interchange, MHEG.

UNIT-II **10 Hours**

Storage Media: Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Server Image, Graphics and Video ,Graphic/Image File Formats, Graphic/Image Data, Colour in Image and Video, Colour Image and Video Representations, Basics of Video ,Types of Colour Video Signals, Analog Video, Digital Video, TV standards

UNIT-III **10 Hours**

Video and Audio Compression: Classifying Compression Algorithms, Lossless Compression Algorithms, Entropy Encoding, Run-length Encoding, Pattern Substitution, Basics of Information theory, Huffman Coding, Huffman Coding of Images, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques , Transform Coding, Frequency Domain Methods, Differential Encoding, Vector Quantization, JPEG Compression, Video Compression, H. 261 Compression, Intra Frame Coding, Inter-frame (P-frame) Coding,

UNIT-IV **10 Hours**

Multimedia Communication: Building Communication network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia System, Design issues, Design considerations, Design steps, Feasibility analysis and Performance Evaluations, Different ways to analyze performance, Multimedia System architecture and different components, MPEG Compression, MPEG Video, PEG Video Bit stream, Decoding MPEG Video in Software, Audio Compression, Simple Audio Compression Methods, Psychoacoustics, MPEG Audio Compression.

Suggested Readings:

1.Ralf Steinmetz ,Klara Nahrstedt.(2002) . *Multimedia Computing Communications and Applications,* By Pearson Educations.

2. Prabhat K. Andleigh, Kran Thakkar. (2015). *Multimedia System Design* ,PHILatest Edition.

3. Li Drew. (2004). *Multimedia Computing* ,Pearson Education.

4. Fred Halsall. (2002). *Multimedia Communications,* Pearson Education.

SEMESTER-I

Course Title: Object Oriented Analysis and Design

L	T	P	Cr
3	0	0	3

Course Code: MCS108

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Select an appropriate design pattern
2. Explain OOAD concepts and various UML diagrams
3. Apply knowledge about deliver robust software components.
4. Compare and contrast various testing techniques
5. Construct projects using UML diagrams

Course Content

UNIT-I **10 Hours**

Introduction to Object: Object Orientation, Development, Modeling, Object Modeling technique. Object modeling, Objects and classes, Links and Association, Generalization and inheritance, Grouping constructs, Aggregation, Abstract Classes, Generalization as extension and restriction, Multiple inheritance, Meta data, Candidate keys, Constraints. Dynamic modeling: Events and states, Nesting, Concurrency, Advanced Dynamic Modeling concepts.

UNIT-II **10 Hours**

Functional Modeling: Functional Models, Data flow diagrams, Specifying operations, Constraints, Relation of Functional model to Object and Dynamic Models. Design Methodology, Analysis, Object modeling, Dynamic modeling, Functional modeling, Adding operations, Iterating Analysis. System design,Subsystems Concurrency, Allocation to processor and tasks, Management of data stores, Handling Global Resources, Handling boundary Conditions, Setting Trade-off priorities.

UNIT-III **15 Hours**

Object Design: Overview-Combining the three models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, and Document Design Decision. Comparison of methodologies, Structured Analysis/Structured Design, Jackson Structured Development. Implementation, Using Programming Language, Database System, outside Computer. Programming Style, Object Oriented Style, Reusability, Extensibility, Robustness, and Programming-in-the-large.

UNIT-IV **10 Hours**

UML: Basics, Emergence of UML, Types of Diagrams. Use Case, Actors, Use Case Diagram, and Relationships between Use Cases. Classes**,** Class Diagram, Classes, Objects, Attributes Operations, Methods, Interfaces, Constraints, Generalization, Specialization, Association, Aggregation. Behavioral Diagrams, Activity Diagram, Collaboration Diagram, Sequence Diagram, State chart Diagram. Implementation Diagrams, Component Diagram, Deployment Diagram.

Suggested Readings

1. Ram bough (2007).*Object Oriented Modeling and Design,* Pearson Education.
2. Bernd Ostrich. *(*2007).*Developing Software with UML,* Pearson Education.
3. BOOCH, *(*1994).*Object Oriented Analysis and Design,* Addison Wesley.
4. Pierre-Alain Muller. (2000).*Instant UML,* Shroff Publisher.

Course Title: Business Information Systems

Course code: MCS109

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Relate the basic concepts and technologies used in the field of management information systems;
2. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
3. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.
4. Compare the processes of developing and implementing information systems.
5. Describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.

Course Content

UNIT-I **10 Hours**

Basic concepts- understanding information and information systems, Hardware, Software, Networks, telecommunications and the Internet.

UNIT-II **10 Hours**

E-Business: E-Business applications, Acquiring and developing BIS, Initiating systems development, BIS project management.

UNIT-III **10 Hours**

Systems analysis: Systems analysis, Systems design, System builds, implementation and maintenance, BIS strategy, Managing E-Business.

UNIT-IV **15 Hours**

Business information security: Managing information security, End-user computing - providing end-user services Ethical, legal and moral constraints on information systems.

Suggested Readings

1. Paul Bocij, Dave Chaffey, Andrew Greasley. *(*2015*). Business Information Systems: Business Information Systems Technology,* Pearson.
2. Paul Bocij ,Andrew Greasley. *(*2014). *Business Information Systems. Technology, Development and Management for the E-Business*, Pearson
3. David T. Bourgeois (2014).*Information Systems for Business and Beyond*, Textbook

SEMESTER-I

Course Title: Distributed System

Course code: MCS110

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Understand the hardware and software issues in modern distributed systems
2. Get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
3. Analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
4. Get knowledge about Shared Memory Techniques.
5. Have knowledge of Synchronization and Deadlock.

Course Content

UNIT-I **15 Hours**

Introduction: Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts Distributed Database Management System Architecture Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.

UNIT-II **15 Hours**

Distributed Database: Design Alternative design strategies; Distributed design issues; Fragmentation; Data allocation. Basics of semantic data control, query processing issues Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.

UNIT-III **15 Hours**

Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Transaction Management The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models .Concurrency Control Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.

UNIT-IV **15 Hours**

Reliability: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols. Parallel Database Systems, Parallel architectures; parallel query processing and optimization; load balancing. Advanced Topics, Mobile Databases, Multi-databases.

Suggested Reading

1. George Coulouris, Jean Dollimore, Tim Kindberg(1996). Distributed Systems*: Concepts and Design,* Addison-Wesley.
2**.** pradeep k. sinha **(**1998). Distributed Operating Systems*:* Concepts and Design, PHI
Learning Pvt. Ltd.

SEMESTR-II

Course Title: Research Methodology

Course code: MCS201

L	T	P	Cr
4	0	0	4

Total hours-60

Course learning outcomes: On successful completion of this course, students will be able to:

1. Identify and discuss the role and importance of research in the social sciences.
2. Identify and discuss the issues and concepts salient to the research process.
3. Choose the appropriate research design and develop appropriate research hypothesis for a research project
4. Discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
5. Describe the appropriate statistical methods required for a particular research design

Course Content

UNIT-I **15 Hours**

Research: Objectives of Research, Research Types, Research Methodology, Research Process – Flow chart, description of various steps, Selection of research problem**.**

UNIT-II **15 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs, completely randomized, randomized block, Latin Square, Factorial Experimental Design.

UNIT-III **15 Hours**

Data Collection Methods: Data Collection Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research.

UNIT-IV **15 Hours**

Sampling Methods: Different methods of Sampling, Probability Sampling methods , Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non Probability Sampling methods, Sample size.

Technical Writing and reporting of research: Types of research report: Dissertation and Thesis, Report Format – Cover page, introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation. Research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism.

Suggested Reading

1 .C. R. Kothari, Gaurav Garg.(2004). *Research Methodology Methods and Techniques* ,New Age International publishers.

2. Ranjit Kumar.(2005). *Research Methodology: A Step-by-Step Guide for Beginners*,Sage.

3. Donald Cooper, Pamela Schindler.*(* 2006 *).Business Research Methods* ,McGraw-Hill.

4. Creswell, John W. (2013).*Research design: Qualitative, quantitative, and mixed methods approaches,*Sage .

SEMESTR-II

Course Title: Advanced Software Engineering

L	T	P	Cr
3	0	0	3

Course Code: MCS202

Total hours-45

Course learning outcomes: On successful completion of this course, students will be able to:

1. Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
2. Describe software measurement and software risks.
3. Discuss software evolution and related issues such as version management.
4. Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects.
5. Discuss data models, object models, context models and behavioral models.

Course Content

UNIT-I **15 Hours**

Principles and Motivations: History, Definitions; Engineering approaches to software development, Software development process models from the points of view of technical development and project management, waterfall, rapid prototyping, incremental development, spiral models, Agile Software Development, Emphasis on computer-assisted environments. Selection of appropriate development process.

Software Development Methods: Formal, semi-formal and informal methods; Requirements elicitation, requirements specification; Data, function, and event-based modeling; Some of the popular methodologies such as Yourdons SAD, SSADM etc; CASE tools-classification, features, strengths and weaknesses; ICASE; CASE standard

UNIT-II **10Hours**

Software Project Management: Principles of software projects management; Organizational and team structure; Project planning; Project initiation and Project termination, Technical, quality, and management plans; Project control; Cost estimation methods, Function points and COCOMO

UNIT-III **10 Hours**

Software Quality Management: Quality control, quality assurance and quality standards with emphasis on ISO 9000; Functions of software QA organization in a project; interactions with developers; Quality plans, quality assurance towards quality improvement; Role of independent verification & validation; Total quality management; SEI maturity model; Software metrics.

UNIT-IV **10 Hours**

Configuration Management: Need for configuration management; Configuration management functions and activities; Configuration management techniques; Examples and case studies. Software Testing Fundamentals**,** Basic Terminology, Testing Techniques and strategies. Brief introduction to various standards related to Software Engineering.

Text/ Reference Books:

1. Pressman, Roger.(2021) *Software Engineering - A Practitioners Approach*,McGraw Hill.
2. Sommerville, Ian. *(*2011*).Software Engineering,* Addison-Wesley Publishing Company.
3. Peter, James F.(2005).*Software Engineering. An Engineering Approach*, John Wiley.
4. Jalote, Pankaj.(2005).*An integrated Approach to Software Engineering,*Narosa .

SEMESTER-I

Course Title: Mini Project*

Course code: MCS203

L	T	P	Cr
3	0	0	3

Total hours-30

Course learning outcomes: On successful completion of this course, students will be able to:

1. Engage in independent study to research literature in the identified domain
2. Consolidate the literature search to identify and formulate the engineering problem
3. Identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment
4. Demonstrate compliance to the prescribed standards/ safety norms through implementation of the identified engineering problem
5. Prepare the Gantt Chart for scheduling the project work and designate responsibility of every member in the team

Course Content

To achieve a desired outcome at a specific end date employing a specific amount of resources.

SEMESTER-II

L	T	P	Cr

3	0	0	3

Course Title: Constitution of India

Course Code: MCS204

Total Hours- 45.

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Understand the meaning and importance of Constitution
2. Examine about making of Indian Constitution - contribution of Constituent assembly onit.
3. Comprehend the salient features of Indian Constitution
4. Predict the importance of Preamble of the Indian Constitution and its significance.

Course Content

UNIT-I **10 Hours**

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features.

UNIT-II **10 Hours**

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties

Pachayati raj. Introduction, PRI.Zila Panchayat. Elected officials and their roles, CEO Zila Pachayat,Position and role. Block level. Organizational Hierarchy (Different departments), Village level,Role of Elected and Appointed officials

UNIT-III **15 Hours**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Local Administration: District's Administration head: Role and Importance, Municipalities, Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

UNIT-IV

Election Commission: Election Commission, Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission, Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

SEMESTER-II

Course Title: Pedagogy Studies

Course Code: MCS205

L	T	P	Cr
3	0	0	3

Total Hours- 45.

Course learning Outcomes: On successful completion of this course, students will be able to

1. Understand nature of education and pedagogic processes through enriched experiences.
2. Comprehend content analysis in subject areas and use it for facilitating learning in the classroom.
3. Examine various educational issues in the context of diverse socio cultural & Multilingual Indian Society .
4. Predict the difference between theory and practice by dovetailing both appropriately.

Course Content

UNIT-I **10 Hours**

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework andterminology Theories of learning, Curriculum, Teacher education. Overview of methodology and Searching Conceptual framework, Research questions.

UNIT-II **10 Hours**

Thematic overview: Pedagogical practices are being used by teachers in formal and informal Curriculum, Teacher education. Classrooms in developing countries.

UNIT-III **15 Hours**

Evidence on the effectiveness of pedagogical practices: How can teacher education (curriculum and practicum) and the school curriculum. Methodology for the in depth stage: quality assessment of included studies. Teachers' attitudes and beliefs and Pedagogic strategies. Pedagogic theory and pedagogical approaches. Strength and nature of the body of evidence for effective pedagogical practices. Theory of change and guidance materials best support effective pedagogy.

UNIT-IV **10 Hours**

Professional development: alignment with classroom practices and follow- up. Peer support. Support from the head teacher and the community. Barriers to learning,limited resources and large class sizes.Curriculum and assessment.Research gaps and future directions Research design, Contexts, Pedagogy, Teacher education, Dissemination and research impact. Curriculum and assessment.

Suggested Readings:

. Ackers, J., & Hardman, F. (2001). *Classroom interaction in Kenyan primary chools,*Compare: a journal of comparative and international education,

.Agrawal, M. (2004). *Curricular reform in schools: the importance of evaluation,*Journal f curriculum studies.

. Akyeampong, K. (2003). *Teacher Training in Ghana-Does it Count? Multi-Site Teacher ducation Research Project (MUSTER),* Country Report One.

SEMESTER-II

Course Title: Stress Management by Yoga

Course Code: MCS206

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Understand the best relaxation techniques for educators and students.
2. Comprehend about emotional intelligence to better deal with stress;
3. Predict the integrate emotional intelligence skills into the curricula
4. Analysis the foster resilience and cope with stressful situations at the workplace toincrease their well-being.

Course Contents

Course Content

UNIT-I III **5 Hours**

Definitions of Eight parts of yog. (Ashtanga)

UNIT-II III **15 Hours**

Yam and Niyam. Do`s and Don't's in life.

I. Ahinsa, satya, astheya, bramhacharya and aparigraha

II. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

UNIT-III III **10 Hours**

Asan and Pranayam

1.Various yog poses and their benefits for mind & body

UNIT-IV III **15 Hours**

Regularization of breathing techniques and its effects-Types of pranayam

Suggested Readings:

1. Acharya Yatendra .(2019). *Yoga & Stress Management* , Fingerprint! Publishing.

2. K.N. Udupa.(2000). Stress and its Management by Yoga, Motilal Banarsidass Publishers Pvt. Ltd.

SEMESTER-II

Course Title: Personality Development through Life Enlightenment Skills

Course Code: MCS207

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Understand the interpersonal skills and be an effective goal-oriented team player.
2. Comprehend the professionals with idealistic, practical and moral values.
3. Predict the communication and problem-solving skills.
4. Analysis the re-engineer attitude and understand its influence on behavior.

Course Contents

UNIT-I

Neetisatakam: Holistic development of personality. Verses- 29, 31, 32 (pride Verses- 19,20,21,22 (wisdom) & Verses- 71,73,75,78 (do's). Verses- 52, 53, 59 (dont's) .Verses- 26,28,63,65 (virtue) heroism)

UNIT-II

Approach to day to day work and duties: Chapter 18-Verses 45, 46, 48. Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5, 13, 17, 23, 35, Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48,

UNIT-III

Statements of basic knowledge: Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16, 17, 18.

UNIT-IV

Chapter 4-Verses 18, 38, 39. Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36, 37, 42,

Suggested Readings:

1. Heller, Robert.(2002).*Effective leadership. Essential Manager series*, Dk Publishing.
2. Hindle, Tim. (2003). *Reducing Stress. Essential Manager series*, Dk Publishing.
3. Mile, D.J .(2004). *Power of positive thinking*,Delhi. Rohan Book Company.

SEMESTER-II

Course Title: Advanced Computer Graphics

Course Code: MCS208

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Learn mathematical operations to develop Computer programs.
2. Understand scientific and strategic approach to solve complex problems in the domain of Computer Graphics.
3. Define the concepts related to Computer Vision and Virtual reality.
4. Apply the logic to develop animation and gaming programs.
5. Implement Flood Fill Algorithm.

Course Contents

UNIT-I **15 Hours**

Introduction: Fundamentals of Computer Graphics, Applications of computer graphics. Programming in the Simple raster Graphics Package, Drawing with SRGP, Basic Interaction Handling, Raster Graphics Features, Limitation of SRGP Basic Raster Graphics, Algorithms for Drawing 2D Primitives, Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses, Filling Rectangles, Filling Polygons, Filling Ellipse Arcs, Pattern Filling, Thick Primitives, Line Style and Pen Style, Clipping in a Raster World, Clipping lines, Clipping Circles and Ellipses, Clipping Polygens, Generating Characters, SRGP- copy pixel, Antialising.

UNIT-II **10 Hours**

Graphics Hardware: Hard copy Technologies, Display Technologies, Raster Scan Display Systems, Video Controller, Random Scan Display Processor, Input Devices for Operator Interaction, Image Scanner Geometrical transformations, 2-D transformations, homogenous co-ordinates & Matrix Representation of 2-D transformations, Window-to-view port transformation, Efficiency, matrix representation of 3-D transformations, composition of 3-D transformations, Transformations as a change in co-ordinate system.

UNIT-III **10 Hours**

Viewing in 3-D: Projections, Specifying an arbitrary 3-D view, Examples of 3-D viewing, Mathematics planar geometric projections, implementing planar geometric projections, co-ordinate systems Visible surface determination, Visible Surface Detection Back-Face detection, Depth-Buffer method, The Z-Buffer algorithm, The Painter's Algorithm, Scan line algorithms, Area-subdivision algorithms. Illumination and Surface-Rendering Methods Basic Illumination models, Halftone patterns and Dithering Techniques, Polygon-Rendering methods, adding surface details.

UNIT-IV **10 Hours**

Advance Raster Display System: Simple Raster Display System, Display Processor System, Standard Graphics Pipeline, Introduction to Multiprocessing, Pipeline Front End Architectures, Parallel Front End Architecture, Multiprocessor Rasterization Architecture, Image Parallel Rasterization, Object Parallel Rasterization, Hybrid Parallel Rasterization, Enhanced Display Capabilities

Suggested Readings:

1. Hern and Baker. (2000).*Computer Graphics***,** PHI, New Delhi.
2. William Newman.(2001) . *Principles of Computer Graphics,* McGraw Hill Education.
3. Schaum's.(2000). *Outline Series Computer Graphics,* MGH Publications.

SEMESTER-II

Course Title: Compiler Design

Course Code: MCS209

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Specify and analyze the lexical, syntactic and semantic structures of advanced language features
2. Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3. Explain the concepts and different phases of compilation with compile time error handling
4. Design a compiler for a simple programming language
5. Describe techniques for intermediate code and machine code optimization

Course Contents

UNIT-I **15 Hours**

Compiler Structure: Analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction. Lexical analysis, interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting, Implementation, Regular definition, Transition diagrams, LEX.

UNIT-II **10 Hours**

Syntax Analysis: CFG, ambiguity, associatively, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC. Syntax directed definitions, inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

UNIT-III **10 Hours**

Type Checking: Type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions. Run time system, storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

UNIT-IV **10 Hours**

Intermediate Code Generation: Intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues. code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.

Suggested Readings:

1. V. Aho, R. Sethi, and J. D. Ullman. (2003).*Compilers: Principles, Techniques and Tools,*Addison-Wesley.
2. C. Fischer and R. LeBlanc. (1993).*Crafting a Compiler,* Benjamin Cummings.
3. C. Fischer and R. LeBlanc. (2001).*Crafting a Compiler in C,* BenjaminCummings.

4. A. C. Holub. (1997).*Compiler Design in C,* Prentice-HallInc.

SEMESTER-II

Course Title: Design and analysis of advanced algorithms

Course Code: MCS210

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Define the basic concepts of algorithms and analyze the performance of algorithms.
2. Discuss various algorithm design techniques for developing algorithms.
3. Apply the algorithms and design techniques to solve problems, and mathematically evaluate the quality of the solutions, typically using the following algorithms.
4. Discuss various searching, sorting and graph traversal algorithms.
5. Discuss various advanced topics on algorithms.

Course Contents

UNIT-I **10 Hours**

Analysis of algorithms: Notation for Algorithms, Complexity of Algorithm, Growth of functions, Models of computation, Algorithm control structures, Performance analysis

UNIT-II **10 Hours**

Elementary Data Structures: Stacks and Queues, Lists, Trees, Dictionaries, Set and graphs. Basic design methodologies, Incremental & Divide and conquer Approach, Dynamic Programming, Backtracking, Greedy algorithms, Branch and Bound.

UNIT-III **10 Hours**

Particular Algorithms: Disjoint set manipulation, Matrix multiplication, Pattern matching, Sorting and Searching algorithms, combinatorial algorithms, String processing algorithms, Algebraic algorithms.

UNIT-IV **10 Hours**

Graph Algorithms: Problem classes, NP-completeness, Deterministic and Nondeterministic, polynomial time algorithms, theory of lower bounds, Approximation algorithms.

Suggested Reading

1. Aho. (2002). *Design & Analysis of Computer Algorithms*, Pearson Education.
2. Horowitz, S. Sahni. (1984).*Fundamentals of Computer Algorithms*, Galgotia Publishers.
3. Knuth. (1968).*The Art of Programming*, Pearson Education.
4. Nitin Upadhyay. (2004).*The Design & Analysis of Algorithms*,S. K. Kataria publication.

SEMESTER-I

Course Title: Advanced Programming Languages

Course Code: MCS211

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Determine the order of priorities in the mathematical operations.
2. Exploration of contemporary multi-paradigm languages.
3. Explain logic operations with their commands and symbols.
4. Determine the order of priorities in the mathematical operations.
5. Demonstration of knowledge of programming language design.

Course Contents

UNIT-I **15 Hours**

Introduction: Brief history of Programming Language, Characteristics of programming language. Programming Language Processors, The structure and operation of a computer, Hardware and firmware computers, Translator and simulator computers, Syntax, semantics and virtual computers, hierarchies of computers, binding and binding time.

Elementary Data Types: Data object, variable and constants, data types, specification of elementary data types, declarations, type checking and type conversion, assignment and initialization, numeric data types, enumerations, Boolean, characters.

UNIT-II **10 Hours**

Structured Data Types: Structured data object and data types, specification of data structure types, implementation of data structure types, declarations and type checking for data structures, vector and arrays, record, character strings, variable sized data structures, pointers and Program-constructed data objects, sets, file and input/output. Subprogram and programmer-defined data types evolution of the data type concept, abstraction, encapsulation, and information hiding, subprogram, type definitions, abstract data types.

UNIT-III **10 Hours**

Sequence Control: Implicit and explicit sequence control, sequence control within expression, sequence control between statements, subprogram sequence control, recursive subprogram, exceptions and exception handlers, Co-routines, scheduled subprograms, tasks and concurrent execution, data structures and sequence control. Data Control names and referencing environments, static and dynamic scope, block structure, local data and local referencing environments, shared data, and its tasks.

UNIT-IV **10 Hours**

Storage Management: Major Runtime elements requiring storage, Program and system controlled storage management, storage management phases, static storage management, stack based storage management, heap storage management elements of Syntax and Semantics.

Translation: General syntactic criteria, syntactic elements of language, stages in translation, formal definition of syntax. Operating and Programming Environment. Batch processing environment, interactive environments, embedded system environments, programming environments. Theoretical Models: Problem in syntax and translation, problem in semantics.

Suggested Reading

1. Terrence W. Pratt .(2002). *Programming Languages, design and implementation.* Prentice Hall of India pvt.ltd,New Delhi.
2. Raphael Finkel. (1995).*Advanced Programming Language Design,* Addison-Wesley
3. .Terrence W. Pratt , Marvin V. Zelkowitz.(2000).*Programming Languages: Design and Implemen*

SEMESTER-II

Course Title: Wireless and Mobile Networks

Course Code: MCS212

L	T	P	Cr
3	0	0	3

Total hours-45

Course learning Outcomes: On successful completion of this course, students will be able to:

1. Compare different multiple access techniques in mobile communication.
2. Demonstrate knowledge hand-off and interface and apply the concept to calculate link
3. budget using path loss model.
4. Demonstrate knowledge on : cellular concepts like frequency reuse, fading, equalization,
5. GSM ,CDMA.
6. Demonstrate knowledge equalization and different diversity techniques.
7. Apply the concept of GSM in real time applications.

Course Contents

UNIT-I **15 Hours**

Wireless Transmission: Introduction, Frequencies for radio transmission, Overview of signals and antennas, signal propagation, Multiplexing techniques, TDM, FDM, CDM & SDM, Analog and Digital Modulation techniques, Spread spectrum, Direct sequence, Frequency Hopping. Introduction to Mobile Communication, Cellular concept, Frequency reuse.

UNIT-II **10 Hours**

Digital Cellular Mobile Systems: Introduction, GSM digital cellular standard, GSM services, GSM architecture, GSM Radio aspects, Security aspects, Handover, Call flow sequence in GSM, Evolutionary directions.

UNIT-III **10 Hours**

CDMA Digital Cellular Standard: Services, Radio aspects, Security aspects, Traffic channels, Key features of IS-95 CDMA system, Evolutionary directions.

UNIT-IV **10 Hours**

Mobile Data Communications: Overview of circuit switched and packet switched data services on cellular networks, Wireless local area networks, Introduction, IEEE 802.11wireless LAN, and Support of mobility on the internet, Mobile IP.

Suggested Readings:

1. Jochen Schiller.(2003).*Mobile Communications*, Pearson Education.
2. Raj Pandya. (1999).*Mobile and Personal Communication-System and Services*, PHI.
3. W. Stallings.(2014).*Wireless Communications and Network*, Pearson Education.

SEMESTER-II

Course Title: Advanced Microprocessor and Programming

Course Code: MCS213

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to :

1. Examine basic binary math operations using the instructions of microprocessor 8085.
2. Design, code and debugs Assembly Language programs to implement simple programs.
3. Execute a machine code program on the training boards.
4. Explain the architecture of generic advanced microprocessor and features of advanced microprocessors.
5. Analyze the addressing modes and understand the functions of 8086 instructions.

Course Contents

UNIT-I **10 Hours**

8085 Microprocessor: Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals, address, data and control buses, clock signals, instruction cycles, machine cycles, and timing states, instruction timing diagrams.

UNIT-II **10 Hours**

Programming of 8085 Microprocessor: Basic instruction set, writing assembly language programs, looping, counting and indexing operations, stacks and subroutines, conditional call and return instructions, debugging programs.

UNIT-III **15 Hours**

8085 Interfacing and Interrupts: Bus interfacing concepts, timing for the execution of input and output(I/O) instructions, I/O address decoding, memory and I/O interfacing memory mapped I/O interfacing of matrix input keyboard and output display, Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SOD and SID lines, interrupt structure of 8085, RST(restart) instructions, vectored interrupt, interrupt process and timing diagram of interrupt instruction execution, 8259 A interrupt controller, principles block transfer (Direct memory access) techniques.

UNIT-IV **10 Hours**

Programmable Interface and Peripheral Devices: Programming and applications of 8455/8156 programmable I/O ports and timer, 8255A programmable peripheral interface, 8253/8254 programmable interval timer, 8257 direct memory access controller, 8279 programmable keyboard/display interface.

Suggested Reading:

1. *Ramesh s. Gaonkar. (2013)Microprocessor Architecture, Programming and Application with 8085*, PenramInternational publishing India Pvt. Ltd.
2. *Douglas.* V Hall.*(2006).Microprocessors and interfacing,*Tata Mc-Graw Hill publication.

SEMESTER-II

Course Title: Data Warehousing & Data mining

Course Code: MCS214

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to:

1. Design and deploy appropriate classification techniques
2. Cluster the high dimensional data for better organization of the data
3. Discover the knowledge imbibed in the high dimensional system
4. Evolve Multidimensional Intelligent model from typical system
5. Evaluate various mining techniques on complex data objects

Course Contents

UNIT-I **10 Hours**

The Compelling Need for data warehousing: Escalating Need for strategic information, Failures of past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined. data warehouse – the building blocks .defining Features, data warehouses and data marts, overview of the components, and metadata in the data Warehouse. Defining the business requirements. dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition, scope and content.

UNIT-II **10 Hours**

Principles of dimensional modeling: Objectives, From Requirements to data design, the STAR schema, STAR Schema Keys, Advantages of the STAR Schema, Dimensional Modeling, Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables, families of STARS.

UNIT-III **15 Hours**

OLAP in the Data Warehouse: Demand for Online analytical processing, need for multidimensional analysis, fast access and powerful calculations, limitations of other analysis methods, OLAP is the answer, OLAP, definitions and rules, OLAP characteristics, major features and functions, general features, dimensional analysis, what are hyper cubes?, Drill-down and roll-up, slice-and-dice or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, ROLAP versus MOLAP, OLAP implementation considerations

UNIT-IV **10 Hours**

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining, applications in retail industry, applications in telecommunications industry, applications in banking and finance

Suggested Reading

1. Kamber, Han. (2000). *Data Mining Concepts and Techniques*, Hartcourt India P.Ltd.
2. Laura L. Reeves. (2001). *A Manager's Guide to Data Warehousing*, Kindle Edition
3. Pieter Adiaans , Dolf zantinge. (2008). *Data Mining*, Pearson Education.

SEMESTER-I

Course Title: Advanced Cloud Computing

Course Code: MCS215

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to :

Course

1. Design Vision, Reference Model, Benefits, Limitations, Open Challenges, Grid and Utility Computing.
2. Demonstrate Service Models, Deployment Models, Cloud Entities, Cloud Clients, Cloud Programming Models.
3. Describe Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud
4. Resource Provisioning, Bill Management, Multitenancy and Isolation, Service Level Agreement (SLA) and Quality of Service (QoS)
5. Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

Contents

UNIT-I **10 Hours**

Introduction: Definition, Vision, Reference Model, Benefits, Limitations, Open Challenges, Grid and Utility Computing.

Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance.

UNIT-II **15 Hours**

Cloud Computing Architecture: Service Models, Deployment Models, Cloud Entities, Cloud Clients, Cloud Programming Models.

Cloud Terminology: Resource Provisioning, Bill Management, Multitenancy and Isolation, Service Level Agreement (SLA) and Quality of Service (QoS), Mobile Cloud Computing.

UNIT-III **10 Hours**

Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

UNIT-IV **10 Hours**

Big-Data and Internet of Things (IoT): Definition of Big-Data, Structured and Unstructured Data, V's of Big-Data, Hadoop, Definition of IoT, Characteristics of IoT, Combining Big-Data, IoT and Cloud Computing.

Text/Reference Books:

1. Sunil kumar Manvi (2018). *Cloud Computing: Concepts and Technologies* ,CRC Press
2. Judith Hurwitz.(2020) *Cloud Computing for Dummies,* Wiley

SEMESTER-III

Course Title: Dissertation Phase -I*

Course Code: MCS301

L	T	P	Cr
0	0	0	10

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to:

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyse the consciousness of the ethical aspects of research and development work.
3. Create, analyze and critically evaluate different technical/architectural solutions.
4. Explain the capability of critically and systematically integrate knowledge.
5. Use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues.

Course Contents

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and creative elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and theUse of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critical review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.

SEMESTER-III

Course Title: Seminar

Course Code: MCS302

L	T	P	Cr
0	0	2	2

Total hours-30

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1. Locate different sources of information.
2. Filter and select relevant information.
3. Prepare the power point presentation of the specific topic.
4. Deliver the seminar on a specific topic.
5. Write a detailed report on a specific topic.

Course Contents

To showcase cutting edge research on education and culture from outstanding academic researchers from the UK and internationally

To bring together seminar SECTION occupants from different disciplines such as Sociology, Philosophy, Psychology, Human Geography, Media Studies as well as Education and Cultural Studies

To use the seminars to develop links between academics and stakeholders in the arts, library, media, community and educational sectors

SEMESTER-III

Course Title: Soft Computing

Course Code: MCS303

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will be able to:

1. Determine Working of a simple Genetic Algorithm and the related definitions: Representation/Encoding Schemes, initializing a GA population
2. Explain evaluation function, genetic operators, study of parameters of genetic algorithms and its performance, sampling and selection mechanisms
3. Genetic Algorithm variations: Scaling fitness, Niching and speciation, Crowding Technique for Multimodal Problems
4. Determine Neural networks: Basic terminology and definitions, Model of an artificial neuron, Sigmoid function, Neural Network Architectures, Characteristics of neural networks, Learning methods, Rosenblatt's Perception
5. Explain Fuzzy sets: Basic terminology and definitions, Operations on Fuzzy sets, MF formulations and parameterization

Course Contents

UNIT – I **10 Hours**

Working of a simple Genetic Algorithm and the related definitions: Representation/Encoding Schemes, initializing a GA population, evaluation function, genetic operators, study of parameters of genetic algorithms and its performance, sampling and

selection mechanisms, mathematical foundations of genetic algorithms, schemata theorem and building block hypothesis, Optimizing numerical functions using GA.

UNIT – II **10 Hours**

Genetic Algorithm Variations: Scaling fitness, Niching and speciation, Crowding Technique for Multimodal Problems, Multi-Objective Genetic Algorithms, Master Slave and Distributed Genetic Algorithms, Designing GAs for numerical optimization, knapsack problem, travelling salesperson and other similar problems.

UNIT – III **15 Hours**

Neural Networks: Basic terminology and definitions, Model of an artificial neuron, Sigmoid function, Neural Network Architectures, Characteristics of neural networks, Learning methods, Rosenblatt's Perceptron, Fixed increment perceptron learning algorithm for a classification problem, Examples of learning of AND/OR gate by perceptron, XOR problem. Back Propagation Neural Networks Architecture of a backpropagation network, Model for multi-layer perceptron, Back propagation learning, Delta or gradient descent learning rule and effect of learning rate, Back propagation learning algorithm.

UNIT – IV **10 Hours**

Fuzzy Sets: Basic terminology and definitions, Operations on Fuzzy sets, MF formulations and parameterisation, Derivatives of parameterised MFs, Fuzzy numbers, Extension principal and fuzzy relations, Linguistic variables, Fuzzy If-Then Rules, Fuzzy reasoning and compositional rule of inference.

Software and Tools to be learnt: MATLAB tool boxes on global optimization, neural networks and fuzzy logic, R Programming, GALIB 247 and KEEL

Text and Reference Books:

1. Margarita-Arimatea Díaz-Cortés .(2018). *Engineering Applications of Soft Computing*,Springer.
2. Andrea Bonarini Soft (2003).*soft Computing Applications*, Physical.
3. S. N. Sivanandam , S. N. Deepa.(2007). *Principles of Soft Computing,* Wiley – India
4. S. N. Sivanandam , S. N. Deepa.(2007). *Principles of Soft Computing,* Wiley – India.

SEMESTER-III

Course Title: Parallel Computing

Course Code: MCS304

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to:

1. Explain the organization of basic computer, its design and the design of control unit.
2. Provide communicate effectively with a range of audiences
3. Elaborate advanced concepts of computer architecture, Parallel Processing, interprocessor communication and synchronization.
4. Describe the operations and language f the register transfer, micro operations and input- output organization
5. Apply new knowledge as needed, using appropriate learning strategies.

Course Contents

UNIT-I **10 Hours**

Introduction: Paradigms of parallel computing, Synchronous - vector/array, SIMD, Systolic; Asynchronous - MIMD, reduction paradigm

UNIT-II **10 Hours**

Hardware Taxonomy: Flynn's classifications, Handler's classifications. Software taxonomy, Kung's taxonomy, SPMD. Abstract parallel computational models, Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism.

UNIT-III **15 Hours**

Performance Metrics: Laws governing performance measurement .Metrics- speedups, efficiency, utilization, communication overheads, single/multiple program performances, bench marks. Theoretical Models, Taxonomy and topology - shared memory multiprocessors, distributed memory networks. Processor organization - Static and dynamic interconnections. Embeddings and s imulations.

UNIT-IV **10 Hours**

Parallel Programming: Shared memory programming, Distributed memory programming, Object oriented programming, Data parallel programming, functional and dataflow programming. Scheduling and Parallelization, Scheduling parallel programs. Loop scheduling. Parallelization of sequential programs, Parallel programming support environments.

Suggested Reading

1. M. J. Quinn. (1994) .*Parallel Computing: Theory and Practice*,McGraw Hill. NewYork.
2. T. G. Lewis and H. El-Rewini . (2004).*introduction to Parallel Computing*, Prentice Hall. NewJersey.
3. T. G. Lewis. (2001). *Parallel Programming. A Machine-Independent Approach*,IEEE Computer Society Press,Los.

SEMESTER-III

Course Title: Advanced Data Structure

Course Code: MCS305

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will be able to :

1. Design and implement an appropriate hashing function for an application
2. Demonstrate different methods for traversing trees
3. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
4. Compare and contrast the benefits of dynamic and static data structures implementations
5. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Contents

10 Hours

UNIT-I

Complexity Analysis: Asymptotic notations , Properties of big oh notation , asymptotic notation with several parameters , conditional asymptotic notation , amortized analysis , NP completeness, NP-hard , recurrence equations , solving recurrence equations.

UNIT-II **10 Hours**

Elementary Data Structures& Basics Applications: Arrays, linked lists, trees and sparse matrices. Heap Structures Min-max heaps , Dheaps , Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps, Lazy-binomial heaps.

UNIT-III **15 Hours**

Search Structures: Binary search trees, AVL trees, 2-3 trees, 2-3-4 trees, Red-black trees, B trees. Multimedia Structures Segment trees, k-d trees, Point Quad trees , MX-Quad trees, R-trees, TVtrees. Graph Algorithms, Topological sort, minimum Spanning tree, single-source shortest paths, all-pairs shortest paths, bi-connected components, strongly connected components, cycles, articulation points, bridges.

UNIT-IV **10 Hours**

Applications: Huffman coding, Garbage collection and compaction, Topological sort, Min cut max flow algorithm, Activity networks, Set representation, Set union and find operations, Counting binary trees.

Suggested Reading:

1. Horowitz, S.Sahni and Dinesh Mehta. (2008).*Fundamentals of Data structures in C++,* universities
2. Adam Drozdex .(1993).*Data Structures and algorithms in C++.Thomson learning* ,Vikas publishing house.

3. Lipschutz Seymour. (2014).*Theory and Problems of Data Structures,* Schaum's series.

4. Baluja G.S.(2016). *Data structures through C++,* PHI.

SEMESTER-III

Course Title: Digital Image Processing

Course Code: MCS306

L	T	P	Cr
3	0	0	3

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration
4. Categorize various compression techniques.
5. Interpret Image compression standards

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to:

Course Content

UNIT-I **10 Hours**

Fundamental of image processing: Introduction, Origin, Areas of Image Processing, steps in Digital Image Processing, Components of Image Processing System, Image Sensing, Sampling and Quantization, Neighboring of Pixel **.**

UNIT-II **10 Hours**

Image Enhancement and Restoration: Enhancement, Spatial Filtering, Introduction to Fourier Transformational model of the Image Degradation/ Restoration Process. Color Image Processing, Color fundamentals, models, transformation and segmentation, Noise in color Images.

UNIT-III **15 Hours**

Wavelets: Wavelet functions, Wavelet transformations in one and two dimensions, fast wavelet transform. Image Compression, Image compression models, Error free compression, Lossy compression. Image segmentation, Line detection, edge detection, Edge linking and boundary detection, region based Segmentation.

UNIT-IV **10 Hours**

Representation and Description: Representation, Boundary and Regional Descriptors, Relational Descriptors. Object Recognition, Pattern and pattern classes, recognition based on Decision Theoretic Methods, Structural Methods.

Suggested Reading:

1.Rafael C. Gonzalez.(2001). *Digital Image Processing*: *United States,* Pearson .

2. Richard E. Woods .(2018). *Digital Image Processing,* Pearson.

3. Ik vinderpal Singh.(2015).*Digital Image Processing,* Khanna Publishing House.

SEMESTER-III

Course Title: Network Security

Course Code: MCS307

L	T	P	Cr
3	0	0	3

Total hours-45

1. Identify the different types of network devices and their functions

Course within a network **Learning**

2. Describe network architectures and classifications.
3. Summarize the intrusion detection and its solutions to overcome the attacks.
4. Describe various network applications, and network security considerations.
5. Identify the different types of network topologies and protocols

Outcomes: On successful completion of this course, the students will be able to :

Course Contents

UNIT-I **10 Hours**

Introduction: Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc.MAC protocols for high-speed LANS, MANS and wireless LANs. (For Example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)

UNIT-II **10 Hours**

Fast Access Technologies :(For Example, ADSL, Cable Modem, etc. IP Multicasting, Multicast routing protocols, address assignments, session discovery, etc

UNIT-III **10 Hours**

Ipv6: Basic Protocol, extensions and options, support for QoS, security, etc, neighbour discovery, auto configuration, routing. Changes to other protocols. Application Programming Interface for IPV6.Mobility in networks. Mobile IP, Security related issues

UNIT-IV **10 Hours**

TCP/IP protocol: TCP Extension for high-speed networks, transaction-oriented applications. Other new options in TCP. Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, distribution protocols, Digital signatures, digital certificates

Suggested Readings:

1. William Stallings (2010). *Network Security Essentials: Applications and Standards,* Prentice Hall.
2. Michael T. Goodrich and Roberto Tamassia (2011). *Introduction to Computer Security,* Addison Wesley.
3. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone. (2001) .*Handbook of Applied Cryptography*, CRC Press.

SEMESTER-III

Course Title: Mobile Applications & Services

Course Code: MCS308

L	T	P	Cr
3	0	0	3

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to**:**

1. Compare different multiple access techniques in mobile communication.
2. Familiarize with concepts of Wireless Adhoc Networks
3. Analyze WPAN, WMAN and WWAN technologies
4. Demonstrate knowledge equalization and different diversity techniques.
5. Compare 3G and 4G technologies of communications

Course Contents

UNIT-I **10 Hours**

Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User.

UNIT-II **10 Hours**

More on UIS: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

UNIT-III **10 Hours**

Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony. Notifications and Alarms, Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics.

UNIT-IV **10 Hours**

Putting It All Together: Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android. Multimedia, Mobile Agents and Peer-to-Peer Architecture, Android Multimedia.

Platforms and Additional Issues: Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking, Active Transactions, More on Security, Hacking Android.

Recent trends in Communication protocols for IOT nodes, mobile computing techniques in IOT, agents based communications in IOT.

Suggested Readings:

1.Asoke K Talukder,Hasan Ahmed .(2017).*Mobile Computing: Technology, Applications and Service Creation,* McGraw Hill Education.

2. Bhosale Damayanti A, Patil Mohini M.(2019). *Mobile Application And Development*, Tech-Neo Publications.

3.Jeff McWherter and Scott Gowell (2012). *Professional Mobile Application Development*, Kindle Edition

SEMESTER-IV

Course Title: Dissertation Phase -II*

Course Code: MCS401

L	T	P	Cr
0	0	0	10

Total hours-45

Course Learning Outcomes: On successful completion of this course, the students will able to:

Course

1. Create, analyze and critically evaluate different technical/architectural solutions.
2. Analyse the consciousness of the ethical aspects of research and development work.
3. Create, analyze and critically evaluate different technical/architectural solutions.
4. Explain the capability of critically and systematically integrate knowledge.
5. Use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues.

Contents

The dissertation will normally contain:

1.A clear indication, at appropriate stages, of original and creative elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re-working of existing materials, and theUse of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critical review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications;

7. The relationship of the findings to existing professional understanding and, where Appropriate, potential implementation difficulties. It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.