Program Syllabus Booklet

Master of Technology in Computer Science & Engineering

(M.TECH CSE-140)

Session: 2019 - 20

Guru Gobind Singh College of Engineering & TechnologyGuru Kashi University,Talwandi Sabo

GURU KASHI UNIVERSITY
PUNJAB - INDIA

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Annexure -1

Program Name: M. TECH CSE

Program Code: 140

The Program Outcomes (POs) for the Program Master of Technology in Computer Science and Engineering (M.TECH CSE) are as follows

PO	Statement
PO1	**Fundamental Knowledge:** To apply the knowledge of foundation in engineering areas required to formulate, solve and analyze engineering problems.
PO2	**Problem Solving:** To Identify the independently carry out research /investigation and development work to solve practical problems.
PO3	**Design/Development of Solutions:** To Design advance software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
PO4	**Conduct investigations of complex problems:** To Use research-based advanced knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Software Tools:** To Use advance techniques, skills, and modern engineering tools necessary for engineering practice and commit to professional ethics and responsibilities .
PO6	**The engineer and society:** 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.

PO7	**Environment and Sustainability:** To apply the knowledge gained from advance design methodologies to address issues in a manner i.e., technically sound, economically feasible and socially acceptable. and use the techniques, skills, and modern engineering tools, including simulation and modeling for engineering needs.
PO8	**Ethics and Lifelong Learning:** To Understand ethical attitude, effective communication skills, teamwork in their profession and adapt to current trends by engaging in lifelong learning needed for a successful professional career.
PO9	**Multidisciplinary Environments**. To apply knowledge for functioning effectively, as a member or team leader in software projects.
PO10	**Communication Skills:** To Having a good working knowledge of communicating in English – communication with engineering community and society.
PO11	**Project Management and Finance:** To demonstrate advance knowledge and understanding of the IT and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO12	**Personal and Organizational Growth**: To advance practices on lifelong learning ,adapt new developments and participate in continuing education opportunities.

Program Specific Outcome (PSO): The Program Specific Outcomes (PSOs) for the Program Master of Technology in Computer Science And Engineering (M.TECH CSE) are as follows:

PSO	tatement
PSO1	To advanceSoftware Engineering practices and strategies in real-time software project development using open-source programming environment or commercial environment to deliver quality product for the organization success.
PSO2	To Design and develop computer programs in the areas related to algorithms, networking, web design, cloud computing for efficient solving problems and to understand, analyze and develop computer programs for the efficient design of computer-based systems of varying complexity
PSO3	To Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

Annexure -1

Semester: 1st										
Sr.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	A140101	Advanced Computer Architecture	T	3	1	0	4	50	50	100
2	A140102	Advanced Database Management Systems	T	3	1	0	4	50	50	100
3	140103	Design Principles of Operating Systems	T	3	1	0	4	50	50	100
4	140104	Multimedia Systems	T	3	1	0	4	50	50	100
5	140105	Object Oriented Analysis and Design	T	3	1	0	4	50	50	100
6	A140106	Advanced Database Management System Lab	P	0	0	4	2	60	40	100
Total No. of Credits				22						

Semester: 2nd										
Sr.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	141108	Research Methodology	T	3	1	0	4	50	50	100
2	140202	Advanced Software Engineering	T	3	1	0	4	50	50	100
3	140203	Parallel Computing	T	3	1	0	4	50	50	100
4		Elective-I	T	3	1	0	4	50	50	100
5		Elective-II	T	3	1	0	4	50	50	100
6	140204	Advanced Software Engineering Lab	P	0	0	4	2	60	40	100
Total No. of Credits				22						

Elective-I (Select one of the following subject)	
140205	Advanced Computer Graphics
140206	Compiler Design
140207	Design and Analysis of Advanced Algorithms
140208	Business Information Systems
140201	Advanced Programming Languages

Elective-II (Select one of the following subject)	
140209	Wireless and Mobile Networks
140210	Advanced Microprocessors and Programming
140211	Data Warehousing & Data Mining
140212	Advanced Cloud Computing
140213	Soft Computing

Semester: 3rd										
Sr.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	140301	Advanced Data Structures	T	3	1	0	4	50	50	100
2		Elective-III	T	3	1	0	4	50	50	100
3	140302	Minor Project	P	0	0	8	4	60	40	100
4	140303	Seminar	P	NA	NA	NA	2	100	NA	100
Total No. of Credits							14			

Elective-III (Select one of the following subject)	
143303	Digital Image Processing
140304	Network Security

Semester: 4th										
Sr.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**	**Internal Marks**	**External Marks**	**Total Marks**
				L	**T**	**P**				
1	140400	Dissertation	T/P	NA	NA	NA	20	500	500	1000
Total No. of Credits							20			

Notes:

1. The study scheme is applicable to both Full Time & Part Time M.Tech Courses.
2. Within this study scheme no subject is prerequisite to any other subject.
3. Any subject can be covered in any semester by fulfilling following conditions:
   (a) Per semester credit for Full Time Course = 14 to 25
   (b) Per semester credit for Part Time Course = 10 to 12 (except for 6th semester).
   (c) For both Full Time & Part Time courses Dissertation work will be in final semester.

Annexure -3

Course Name:Advanced Computer Architecture

Course Code: A140101

Semester: 1st

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Discuss memory organization and mapping techniques.
CO2	Demonstrate concepts of parallelism in hardware/software.
CO3	Describe architectural features of advanced processors.
CO4	Interpret performance of different pipelined processors.
CO5	Explain data flow in arithmetic algorithms

Course Contents

UNIT-I

Parallel Computer Models: Multiprocessors and multicomputers, Multivector 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

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

Vector and Symbolic Processors: Inclusion, Coherence and Locality, Backplane Bus SystemBackplane 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

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.

Text / References:

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.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	1	2	2	2	1	2	1
CO2	3	2	2	2	3	1	-	1	2	1	2	3	2	2	3
CO3	3	2	3	3	2	2	-	-	2	2	1	2	2	2	3
CO4	3	2	2	2	2	3	-	-	3	3	3	3	3	1	2
CO5	3	2	2	3	3	2	1	1	2	3	2	2	3	3	3
Average	**2.8**	**2.0**	**1.8**	**2.4**	**2.4**	**1.8**	**1**	**1**	**2.0**	**2.2**	**2.0**	**2.4**	**2.2**	**2.0**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Database Management System

Course Code: 140102

Semester: 1st

Credits- 04 **L T P**
3 1 0

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

CO	Statement
CO1	Acquire knowledge of Query optimization, Parallel and distributed database systems, New database architectures and query operators.
CO2	Develop new methods in databases based on knowledge of existing techniques.
CO3	Apply acquired knowledge for developing holistic solutions based on database systems/database techniques.
CO4	Explain the principles of concurrency control.
CO5	Explain the principles of recovery management.

Course Contents

UNIT– I

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

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 DBMS.Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

UNIT– III

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

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.

Text / References:

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).*ModernDatabaseManagement*,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.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	3	2	3	-	-	2	2	3	3	3	1	3
CO2	1	3	2	3	3	1	-	-	3	2	2	3	2	2	1
CO3	3	1	3	2	3	2	-	1	2	2	2	2	2	2	3
CO4	3	2	2	2	2	3	1	-	3	2	2	2	3	1	2
CO5	3	2	2	2	3	3	-	-	2	2	2	2	3	3	3
Average	**2.4**	**2.2**	**2.0**	**2.4**	**2.6**	**2.4**	**1**	**1**	**2.4**	**2.0**	**2.2**	**2.4**	**2.6**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and indicates there is no correlation.

Course Name: Design Principles of Operating System

Course Code: 140103

Semester: 1st

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Developlow-level operating system code.
CO2	Understand the performance and design trade-offs in complex software systems
CO3	Understandand be capable of developing OS code inside a variety of OS environments, including monolithic, microkernel's, and virtual machines, including device drivers.
CO4	Develop marks and use of profiling tools to evaluate the performance of operating systems and application stacks.
CO5	Understand and of evaluating research published in the field of operating systems at a level commensurate with their experience.

Course Contents

UNIT– I

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

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

Input/ Output Management: Issues in human centric, device centric and computer centric I/O management, input output modes, Programd 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

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.

Text / Reference Books:

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

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	3	-	-	2	2	3	2	3	3	2
CO2	1	1	2	2	2	3	-	1	3	3	2	3	3	2	2
CO3	1	2	3	1	1	3	-	-	2	2	2	2	2	3	3
CO4	2	2	3	1	3	2	1	-	3	2	2	3	3	2	3
CO5	3	1	1	2	1	2	-	-	2	2	2	2	2	3	2
Average	**2.0**	**1.6**	**2.4**	**1.8**	**1.8**	**2.6**	**1**	**1**	**2.4**	**2.2**	**2.2**	**2.4**	**2.6**	**2.6**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and indicates there is no correlation.

Course Name: Multimedia System

CourseCode:140104

Semester: 1st

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Determine the appropriate use of interactive verses standalone Web applications.
CO2	Identify issues and obstacles encountered by Web authors in deploying Web-based. Applications
CO3	Create a well-designed, interactive Web site with respect to current standards and practices.
CO4	Analyze measurement results obtained on the multimedia system and components.
CO5	Demonstrate in-depth knowledge in an industry-standard multimedia development tool and its associated scripting language.

Course Contents

UNIT– I

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

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

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

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.

Text / Reference Books:

1. Ralf Steinmetz ,Klara Nahrstedt.(2002) . *Multimedia Computing Communications and Applications,* By Pearson Educations.
2. Prabhat K. Andleigh, Kran Thakkar. (2015). *Multimedia System Design,*PHI, Latest Edition.
3. Li Drew. (2004). *Multimedia Computing* ,Pearson Education. Latest Edition.
4. Fred Halsall. (2002). *Multimedia Communications,*Pearson Education, Latest Edition.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	1	2	3	3	3	2	3	3	3	1
CO2	1	2	2	2	3	1	1	2	2	2	2	2	1	2	3
CO3	2	3	3	2	2	2	2	3	3	2	1	2	2	3	2
CO4	2	1	2	1	2	2	2	1	1	1	2	1	2	1	3
CO5	2	3	3	2	2	2	2	3	3	2	1	2	2	3	2
Average	**1.8**	**2.4**	**2.6**	**2**	**2.2**	**1.6**	**1.8**	**2.4**	**2.4**	**2**	**1.6**	**2**	**2**	**2.4**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Object Oriented Analysis and Design

Course Code: 140105

Semester: 1st

Credits-04 **L T P**

3 1 0

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

CO	Statement
CO1	Select an appropriate design pattern
CO2	Explain OOAD concepts and various UML diagrams
CO3	Apply knowledge about deliver robust software components.
CO4	Compare and contrast various testing techniques
CO5	Construct projects using UML diagrams

Course Contents

UNIT– I

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

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

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

UML: Basics, Emergence of UML, Types of Diagrams. Use Case. Actors, Use Case Diagram, 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.

Text / References Books:

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.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	3	-	-	2	2	3	2	3	3	2
CO2	1	1	2	2	2	3	-	1	3	3	2	3	3	2	2
CO3	1	2	3	1	1	3	-	-	2	2	2	2	2	3	3
CO4	2	2	3	1	3	2	1	-	3	2	2	3	3	2	3
CO5	3	1	1	2	1	2	-	-	2	2	2	2	2	3	2
Average	**2.0**	**1.6**	**2.4**	**1.8**	**1.8**	**2.6**	**1**	**1**	**2.4**	**2.2**	**2.2**	**2.4**	**2.6**	**2.6**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name :Advanced Database Management System Lab

Course Code:140106

Semester: 1st

Credits- 02 **L T P**
0 0 4

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

CO	**Statement**
CO1	Apply database language commands to create simple database.
CO2	Analyze front end tools to design forms, reports and menus.
CO3	Analyze the database using queries to retrieve records.
CO4	Applying PL/SQL for processing database.
CO5	Perform PL/SQL programming using concept of Cursor Management, Error Handling,Package and Triggers.

Course Contents

The Students are required to implement the applications based on:

1. Expert databases
2. Object-oriented Databases
3. Distributed databases
4. Library management system databases.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	2	-	-	2	2	3	2	2	3	3
CO2	1	2	2	2	1	3	1	-	3	2	3	3	3	2	2
CO3	2	3	3	2	2	2	-	1	2	3	2	2	2	3	3
CO4	2	3	3	2	2	1	-	-	3	2	3	3	3	2	2
CO5	3	1	3	2	3	2	-	-	2	3	2	2	2	2	2
Average	**2.0**	**2.2**	**2.4**	**2.0**	**1.2**	**2.0**	**1**	**1**	**2.4**	**2.4**	**2.6**	**2.4**	**2.4**	**2.4**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Research Methodology

Course Code: 141108

Semester: 2nd

Credits-04 **L T P**

3 1 0

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

CO	**Statement**
CO1	Identify and discuss the role and importance of research in the social sciences.
CO2	Identify and discuss the issues and concepts salient to the research process.
CO3	Choose the appropriate research design and develop appropriate research hypothesis for a research project
CO4	Discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
CO5	Describe the appropriate statistical methods required for a particular research design

Course Contents

UNIT– I

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

UNIT– II

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

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

UNIT– IV

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

Technical Writing and reporting of research: 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.

Text / References:

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 .

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	2	-	-	2	2	3	2	2	3	3
CO2	1	2	2	2	1	3	1	-	3	2	3	3	3	2	2
CO3	2	3	3	2	2	2	-	1	2	3	2	2	2	3	3
CO4	2	3	3	2	2	1	-	-	3	2	3	3	3	2	2
CO5	3	1	3	2	3	2	-	-	2	3	2	2	2	2	2
Average	**2.0**	**2.2**	**2.4**	**2.0**	**1.2**	**2.0**	**1**	**1**	**2.4**	**2.4**	**2.6**	**2.4**	**2.4**	**2.4**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Software Engineering

Course Code: 140202

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO2	Describe software measurement and software risks.
CO3	Discuss software evolution and related issues such as version management.
CO4	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects.
CO5	Discuss data models, object models, context models and behavioral models.

Course Contents

UNIT- I

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 standards.

UNIT- II

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

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- I V

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 / References:

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 .

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	1	2	-	-	2	2	3	2	2	3	2
CO2	2	3	2	2	2	3	1	-	2	2	3	3	2	3	3
CO3	1	2	2	3	2	2	-	1	1	1	2	2	2	3	3
CO4	3	2	3	1	2	3	-	-	2	2	3	3	1	2	3
CO5	2	2	2	2	3	2	1	-	2	1	2	2	2	2	2
Average	**1.8**	**2**	**2.2**	**2**	**2**	**2.4**	**1**	**1**	**1.8**	**1.6**	**2.6**	**2.4**	**1.8**	**2.6**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Parallel Computing

Course Code: 140203

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Explain the organization of basic computer, its design and the design of control unit.
CO2	Provide communicate effectively with a range of audiences
CO3	Elaborate advanced concepts of computer architecture, Parallel Processing, interprocessor communication and synchronization.
CO4	Describe the operations and language f the register transfer, micro operations and input- output organization
CO5	Apply new knowledge as needed, using appropriate learning strategies.

Course Contents

UNIT- I

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

UNIT- II

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

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 simulations.

UNIT– IV

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 environment.

Text Books/References:

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.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	1	1	-	1	-	-	2	2	2	2
CO2	3	1	2	3	2	1	1	-	2	1	2	3	3	2	2
CO3	3	3	2	3	3	2	1	1	3	2	1	2	2	3	3
CO4	3	3	3	3	3	2	1	1	3	1	3	3	3	2	2
CO5	3	3	3	3	3	3	2	1	3	2	2	3	2	1	2
Average	**3**	**2.2**	**2.2**	**2.6**	**2.4**	**1.8**	**1.2**	**1**	**2.4**	**1.2**	**1.6**	**2.6**	**2.4**	**2**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Computer Graphics(Elective-I)

Course Code: 140205

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Learn mathematical operations to develop Computer programs.
CO2	Understand scientific and strategic approach to solve complex problems in the domain of Computer Graphics.
CO3	Define the concepts related to Computer Vision and Virtual reality.
CO4	Apply the logic to develop animation and gaming programs.
CO5	Implement Flood Fill Algorithm.

Course Contents

UNIT- I

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

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

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- I V

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.

Text / Reference Books:

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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	2	1	1	2	1	3	2	3	2	2
CO2	1	3	2	2	1	1	-	2	3	2	3	3	1	3	2
CO3	2	2	2	3	1	2	1	1	2	1	2	2	2	2	3
CO4	2	1	2	1	3	1	-	2	3	2	3	3	3	2	3
CO5	3	1	3	1	2	2	1	1	2	3	2	2	2	2	2
Average	**2**	**1.6**	**2**	**1.6**	**2**	**1.6**	**1**	**1.4**	**2.4**	**1.8**	**2.6**	**2.4**	**2.2**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Compiler Design (Elective-I)

Course Code: 140206

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Specify and analyze the lexical, syntactic and semantic structures of advanced language features Apply the knowledge of mathematics, science, engineering Fundamentals and an engineering specialization to the solution of complex engineering problems.
CO2	Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
CO3	Explain the concepts and different phases of compilation with compile time error handling
CO4	Design a compiler for a simple programming language
CO5	Describe techniques for intermediate code and machine code optimization

Course Contents

UNIT– I

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

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

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

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.

Text Books / References:

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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	3	-	0	2	2	3	2	1	2	1
CO2	2	2	2	2	3	1	-	-	3	2	3	3	2	2	3
CO3	3	2	3	3	3	2	1	-	2	2	2	2	2	2	3
CO4	3	2	2	2	2	3	-	1	3	2	3	3	3	2	2
CO5	3	2	2	3	3	2	-	-	2	1	2	2	3	3	3
Average	**2.6**	**2.2**	**2.0**	**2.4**	**2.6**	**2.2**	**1**	**1**	**2.4**	**1.8**	**2.6**	**2.4**	**2.2**	**2.4**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name:Design and analysis of advanced algorithms(Elective-I)

Course Code: 140207

Semester: 2nd

Credits - 04 **L T P**

3 1 0

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

CO	Statement
CO1	Define the basic concepts of algorithms and analyze the performance of algorithms.
CO2	Discuss various algorithm design techniques for developing algorithms.
CO3	Apply the algorithms and design techniques to solve problems, and mathematically evaluate the quality of the solutions, typically using the following algorithms.
CO4	Discuss various searching, sorting and graph traversal algorithms.
CO5	Discuss various advanced topics on algorithms.

Course Contents

UNIT– I

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

UNIT– II

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

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

UNIT– IV

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

Text/Reference Books:

1. Aho. (2002). *Design & Analysis of Computer Algorithms*, Pearson Education.
2. Horowitz, S. Sahni. (1984).*Fundamentals of Computer Algorithms,*Galgotia Publishers.
3. Knuth. (2010).*The Art of Programming*, Pearson Education.
4. Nitin Upadhyay. (2004).*The Design & Analysis of Algorithms*, S. K. Kataria publication.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	1	2	-	-	2	2	3	2	3	2	2
CO2	2	2	2	1	2	2	-	-	3	2	3	3	2	3	2
CO3	2	2	3	3	1	2	1	-	2	3	2	2	3	3	3
CO4	1	3	1	2	2	3	-	-	3	2	3	3	2	2	1
CO5	2	2	3	3	2	3	-	1	2	3	2	2	2	3	3
Average	**2.0**	**2.2**	**2.0**	**2.4**	**1.6**	**2.4**	**1**	**1**	**2.4**	**2.4**	**2.6**	**2.4**	**2.4**	**2.6**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Business Information System(Elective-I)

Course Code: 140208

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Relate the basic concepts and technologies used in the field of management information systems;
CO2	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
CO3	Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.
CO4	Compare the processes of developing and implementing information systems.
CO5	Describe the role of information technology and decision support systems in business and record the current issues

Course Contents

UNIT– I

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

UNIT– II

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

UNIT– III

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

UNIT– IV

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

Text/Reference :

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

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	3	-	1	2	2	3	2	2	3	3
CO2	2	1	2	1	3	2	-	-	3	2	3	3	3	2	3
CO3	2	2	1	2	1	2	-	-	2	3	2	2	3	1	2
CO4	1	2	2	3	1	1	1	-	3	2	3	3	2	2	1
CO5	2	1	3	3	1	2	-	1	2	2	2	2	1	1	2
Average	**2.0**	**1.6**	**2.2**	**2.2**	**1.4**	**2.0**	**1**	**1**	**2.4**	**2.2**	**2.6**	**2.4**	**2.2**	**1.8**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Programming Languages(Elective-I)

Course Code: 140201

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Determine the order of priorities in the mathematical operations.
CO2	Exploration of contemporary multi-paradigm languages .
CO3	Explain logic operations with their commands and symbols.
CO4	Determine the order of priorities in the mathematical operations.
CO5	Demonstration of knowledge of programming language design.

Course Contents

UNIT– I

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

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 Programr-constructed data objects, sets, file and input/output.subprogram and programr-defined data types. evolution of the data type concept, abstraction, encapsulation, and information hiding, subprogram, type definitions, abstract data types .

UNIT– III

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

Storage Management: Major Runtime elements requiring storage, Programr 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 Environmen. Batch processing environment, interactive environments, embedded system environments, programming environments. Theoretical Models.Problem in syntax and translation, problem in semantics.

Text / References:

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.*
3. Terrence W. Pratt , Marvin V. Zelkowitz.(2000).*Programming Languages: Design and Implementation,*United States Edition Paperback.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	3	2	3	-	-	2	2	3	3	3	1	3
CO2	1	3	2	3	3	1	-	-	3	2	2	3	2	2	1
CO3	3	1	3	2	3	2	-	1	2	2	2	2	2	2	3
CO4	3	2	2	2	2	3	1	-	3	2	2	2	3	1	2
CO5	3	2	2	2	3	3	-	-	2	2	2	2	3	3	3
Average	**2.4**	**2.2**	**2.0**	**2.4**	**2.6**	**2.4**	**1**	**1**	**2.4**	**2.0**	**2.2**	**2.4**	**2.6**	**1.8**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Wireless and Mobile Networks(Elective-II)

Course Code: 140209

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Compare different multiple access techniques in mobile communication.
CO2	Demonstrate knowledge hand-off and interface and apply the concept to calculate link budget using path loss model.
CO3	Demonstrate knowledge oncellular concepts like frequency reuse, fading, equalization, GSM ,CDMA.
CO4	Demonstrate knowledge equalization and different diversity techniques.
CO5	Apply the concept of GSM in real time applications.

Course Contents

UNIT– I

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

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

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

UNIT– IV

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.

Text/ Reference Books:

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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	1	2	-	-	2	2	3	2	3	2	3
CO2	2	1	3	2	2	1	-	-	3	2	3	3	3	2	3
CO3	1	2	2	3	2	3	1	1	2	1	2	2	1	3	2
CO4	3	2	3	1	1	2	-	-	3	2	3	3	2	3	2
CO5	1	2	2	1	3	2	-	-	2	3	2	2	2	3	3
Average	**1.6**	**1.8**	**2.4**	**1.8**	**1.8**	**2**	**1**	**1**	**2.4**	**2**	**2.4**	**2.4**	**2.2**	**2.6**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Microprocessor and Programming(Elective-II)

Course Code: 140210

Semester: 2nd

L T P

Credits: 02 **0 0 4**

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

CO	Statement
CO1	Examine basic binary math operations using the instructions of microprocessor 8085.
CO2	Design, code and debugs Assembly Language programs to implement simple programs.
CO3	Execute a machine code program on the training boards.
CO4	Explain the architecture of generic advanced microprocessor and features of advanced microprocessors.
CO5	Analyze the addressing modes and understand the functions of 8086 instructions.

Course Contents

UNIT– I

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

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

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

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.

Text / Reference:

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

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	1	2	-	-	2	2	3	2	2	3	3
CO2	3	2	3	2	1	2	-	-	3	2	3	3	3	2	3
CO3	3	2	2	3	1	1	1	-	2	2	2	2	2	2	2
CO4	3	2	2	2	3	3	-	1	3	3	3	3	3	1	3
CO5	2	3	3	2	2	1	-	-	2	2	2	2	2	2	3
Average	**2.8**	**2**	**2.2**	**2.4**	**1.6**	**1.8**	**1**	**1**	**2.4**	**2.2**	**2.6**	**2.4**	**2.4**	**2**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Warehousing & Data mining(Elective-II)

Course Code: 140211

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Design and deploy appropriate classification techniques
CO2	Cluster the high dimensional data for better organization of the data
CO3	Discover the knowledge imbibed in the high dimensional system
CO4	Evolve Multidimensional Intelligent model from typical system
CO5	Evaluate various mining techniques on complex data objects

Course Contents

UNIT– I

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 Block. 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

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

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

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

Text/Reference Books:

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.

The mapping of POs/PSOs/COs attainments is as follows

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	2	-	-	2	2	3	2	2	3	3
CO2	1	2	2	2	1	3	1	-	3	2	3	3	3	2	2
CO3	2	3	3	2	2	2	-	1	2	3	2	2	2	3	3
CO4	2	3	3	2	2	1	-	-	3	2	3	3	3	2	2
CO5	3	1	3	2	3	2	-	-	2	3	2	2	2	2	2
Average	**2.0**	**2.2**	**2.4**	**2.0**	**1.2**	**2.0**	**1**	**1**	**2.4**	**2.4**	**2.6**	**2.4**	**2.4**	**2.4**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Advanced Cloud Computing(Elective-II)

Course Code :140212

Semester-2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Design Vision, Reference Model, Benefits, Limitations, Open Challenges, Grid and Utility Computing.
CO2	Demonstrate Service Models, Deployment Models, Cloud Entities, Cloud Clients, Cloud Programming Models.
CO3	Describe Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud
CO4	Resource Provisioning, Bill Management, Multitenancy and Isolation, Service Level Agreement (SLA) and Quality of Service (QoS)
CO5	Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

Course Contents

UNIT– I

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

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

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

UNIT-IV

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. Sunilkumar Manvi (2018). *Cloud Computing: Concepts and Technologies* ,CRC Press
2. Judith Hurwitz.(2020) *Cloud Computing for Dummies*, Wiley
3. Miller .(2008). *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*,Pearson

The mapping of POs/PSOs/COs attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	3	3	2	-	-	2	2	3	2	3	2	2
CO2	1	2	2	2	3	2	-	-	3	1	3	3	2	3	3
CO3	2	2	3	3	2	3	-	-	2	2	2	2	3	1	3
CO4	3	1	3	1	3	2	1	-	3	1	3	3	3	2	3
CO5	1	2	1	3	1	2	-	1	2	3	2	2	3	3	2
Average	**1.8**	**1.6**	**2**	**2.4**	**2.4**	**2.2**	**1**	**1**	**2.4**	**1.8**	**2.6**	**2.4**	**2.8**	**2.2**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Soft Computing (Elective-II)
Course Code: (140213)
Semester-2nd

Credits- 04 **L T P**

3 1 0

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

CO	Statement
CO1	Determine Working of a simple Genetic Algorithm and the related definitions: Representation/Encoding Schemes, initializing a GA population
CO2	Explain evaluation function, genetic operators, study of parameters of genetic algorithms and its performance, sampling and selection mechanisms
CO3	Genetic Algorithm variations: Scaling fitness, Niching and speciation, Crowding Technique for Multimodal Problems
CO4	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 Perceptron
CO5	Explain Fuzzy sets: Basic terminology and definitions, Operations on Fuzzy sets, MF formulations and parameterization

Course Contents

UNIT– I

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

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

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

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*, Physica.
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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	3	2	1	-	2	2	3	2	2	3	2
CO2	2	1	2	1	3	2	-	1	3	1	3	3	1	2	3
CO3	1	2	2	3	3	3	-	-	2	2	2	2	2	1	3
CO4	2	2	2	1	2	2	-	1	3	1	3	3	2	3	2
CO5	3	1	2	1	1	1	1	-	2	2	2	2	3	2	3
Average	**2**	**1.8**	**2.2**	**1.4**	**2.4**	**2**	**1**	**1**	**2.4**	**1.6**	**2.6**	**2.4**	**2**	**2.2**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Software Engineering Lab

Course Code: 140204

Semester: 2nd

Credits- 02 **L T P**

0 0 4

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

CO	Statement
CO1	identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
CO2	demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
CO3	demonstrate the implementation of various operations on stack and queue.
CO4	Apply various white box and black box testing techniques
CO5	Apply new knowledge as needed, using appropriate learning strategies.

Course Contents

1. Crop management system
2. On-line sharing of computer systems
3. Highway systems
4. Hospital management system
5. Hotel management system
6. University management system

7. Inventory control
8. Railway management system
9. Any other similar database system

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	1	2	-	-	2	2	3	2	2	3	2
CO2	2	3	2	2	2	3	1	-	2	2	3	3	2	3	3
CO3	1	2	2	3	2	2	-	1	1	1	2	2	2	3	3
CO4	3	2	3	1	2	3	-	-	2	2	3	3	1	2	3
CO5	2	2	2	2	3	2	1	-	2	1	2	2	2	2	2
Average	**1.8**	**2**	**2.2**	**2**	**2**	**2.4**	**1**	**1**	**1.8**	**1.6**	**2.6**	**2.4**	**1.8**	**2.6**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Data Structure

Course Code: 140301

Semester: 3rd

L T P

Credits: 03 **3 0 0**

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

CO	Statement
CO1	Design and implement an appropriate hashing function for an application
CO2	Demonstrate different methods for traversing trees
CO3	Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
CO4	Compare and contrast the benefits of dynamic and static data structures implementations
CO5	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Content

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

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

Search Structures: Binary search trees, AVL trees, 2-3 trees, 2-3-4 trees, Red-black trees, Btrees. 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

Applications: Huffman coding, Garbage collection and compaction, Topological sort, Mincut maxflow algorithm, Activity networks, Set representation, Set union and find operations, Counting binary trees.

Text / Reference Books:

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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	2	-	1	2	2	3	2	3	2	3
CO2	1	1	1	1	2	2	-	-	3	2	3	3	3	2	3
CO3	2	3	1	2	2	2	-	1	2	3	2	2	3	2	3
CO4	1	2	2	3	2	1	1	-	3	2	3	3	3	2	3
CO5	2	1	3	1	3	3	-	-	2	2	2	2	3	2	3
Average	**1.8**	**1.8**	**2.0**	**1.8**	**2.4**	**2.0**	**1**	**1**	**2.4**	**2.2**	**2.6**	**2.4**	**3**	**2**	**3**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Digital Image Processing(Elective-III)

Course Code: 143303

Semester: 3rd

Credits- 04 **L T P**

3 1 0

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

CO	**Statement**
CO1	Review the fundamental concepts of a digital image processing system.
CO2	Analyze images in the frequency domain using various transforms.
CO3	Evaluate the techniques for image enhancement and image restoration
CO4	Categorize various compression techniques.
CO5	Interpret Image compression standards

Course Content

UNIT– I

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, Neighbouring of Pixels.

UNIT– II

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

UNIT– III

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

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

Text / References:

1. Rafael C. Gonzalez.(2001). *Digital Image Processing*:*United States,*Pearson .
2. Richard E. Woods .(2018). *Digital Image Processing,*Pearson.
3. Ikvinderpal Singh.(2015)**.***Digital Image Processing,*Khanna Publishing House

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	1	2	-	-	2	2	3	2	2	3	3
CO2	3	2	3	2	1	2	-	-	3	2	3	3	3	2	3
CO3	3	2	2	3	1	1	1	-	2	2	2	2	2	2	2
CO4	3	2	2	2	3	3	-	1	3	3	3	3	3	1	3
CO5	2	3	3	2	2	1	-	-	2	2	2	2	2	2	3
Average	**2.8**	**2**	**2.2**	**2.4**	**1.6**	**1.8**	**1**	**1**	**2.4**	**2.2**	**2.6**	**2.4**	**2.4**	**2**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Network Security (Elective-III)

Course Code: 140304

Semester: 3rd

Credits- 04 **L T P**

3 1 0

Course Outcomes: On successful completion of thiscourse, the students will be able to :

CO	Statement
CO1	Identify the different types of network devices and their functions within a network
CO2	Describe network architectures and classifications.
CO3	Summarize the intrusion detection and its solutions to overcome the attacks.
CO4	Describe various network applications, and network security considerations.
CO5	Identify the different types of network topologies and protocols

Course Contents

UNIT- I

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

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

UNIT– III

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

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, key distribution protocols, Digital signatures, digital certificates.

Text/References:

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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	1	2	-	-	2	2	3	2	3	2	3
CO2	2	1	3	2	2	1	-	-	3	2	3	3	3	2	3
CO3	1	2	2	3	2	3	1	1	2	1	2	2	1	3	2
CO4	3	2	3	1	1	2	-	-	3	2	3	3	2	3	2
CO5	1	2	2	1	3	2	-	-	2	3	2	2	2	3	3
Average	**1.6**	**1.8**	**2.4**	**1.8**	**1.8**	**2**	**1**	**1**	**2.4**	**2**	**2.4**	**2.4**	**2.2**	**2.6**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Minor Project

Course Code: 140302

Semester: 3rd

Credits- 04 **L T P**

0 0 8

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

CO	**Statement**
CO1	Engage in independent study to research literature in the identified domain
CO2	Consolidate the literature search to identify and formulate the engineering problem
CO3	Identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment
CO4	Demonstrate compliance to the prescribed standards/ safety norms through implementation of the identified engineering problem
CO5	Prepare the Gantt Chart for scheduling the project work and designate responsibility of every member in the team

Course Contents

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

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	1	2	-	-	2	2	3	2	2	3	2
CO2	2	3	2	2	2	3	1	-	2	2	3	3	2	3	3
CO3	1	2	2	3	2	2	-	1	1	1	2	2	2	3	3
CO4	3	2	3	1	2	3	-	-	2	2	3	3	1	2	3
CO5	2	2	2	2	3	2	1	-	2	1	2	2	2	2	2
Average	**1.8**	**2**	**2.2**	**2**	**2**	**2.4**	**1**	**1**	**1.8**	**1.6**	**2.6**	**2.4**	**1.8**	**2.6**	**2.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Seminar

Course Code: 140303

Semester: 3rd

Credits- 02 **L T P**

0 0 0

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

CO	Statement
CO1	Locate different sources of information.
CO2	Filter and select relevant information.
CO3	Prepare the power point presentation of the specific topic.
CO4	Deliver the seminar on a specific topic.
CO5	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

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1	2	2	2	3	2	3	3	2	3
CO2	3	1	3	1	3	2	2	3	3	3	2	2	2	3	2
CO3	3	2	3	1	3	2	3	3	3	3	2	3	3	3	3
CO4	3	1	3	1	1	3	3	3	3	3	2	2	3	2	2
CO5	3	1	1	1	1	1	1	3	2	3	2	3	2	2	2
Average	3	1.2	2.4	1	2.2	1.8	2.2	2.6	2.6	3	2	2.6	2.6	2.4	2.4

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Dissertation

Course Code: 140400

Semester: 4th

Credits- 20 **L T P**

0 0 0

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

CO	Statement
CO1	Create, analyze and critically evaluate different technical/architectural solutions.
CO2	Analyse the consciousness of the ethical aspects of research and development work.
CO3	Create, analyze and critically evaluate different technical/architectural solutions.
CO4	Explain the capability of critically and systematically integrate knowledge.
CO5	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 newEnvironments, 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.

The mapping of POs/PSOs/COs attainments is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1	2	2	2	3	2	3	3	2	3
CO2	3	1	3	1	3	2	2	3	3	3	2	2	2	3	2
CO3	2	2	2	2	3	3	3	2	2	2	2	3	3	3	3
CO4	3	2	3	1	1	3	3	3	3	3	2	2	3	2	2
CO5	2	1	1	1	1	2	1	3	2	3	2	3	2	2	2
Average	2.6	1.4	2.2	1.2	2.5	2.2	2.2	2.6	2.4	2.8	2	2.6	2.6	2.4	2.4

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Total Number of Course	17
Number of Theory Course	13
Number of Practical Course	04
Total Number of Credits	**78**

Annexure-4

ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (50)						**External (50)**	**Total**
Components	**Attendance**	**Assignment**			**MST1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	10	10	10	10	30	30	50	
Average Weightage	10	10			30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.