GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Master of Technology in Computer Science& Engineering

(M.TECH CSE-140)

Session: 2017 - 18

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

GURU KASHI UNIVERSITY
PUNJAB - INDIA

TABLE OF CONTENTS

Introduction

This programme aims at equipping the graduates with advanced conceptual knowledge, technical skills and ability to pursue research in the field of Computer Science and Engineering, appropriate to the present ICT scenario. Learners are matured in a specific area of specialization by extending their prior knowledge through meticulous set of advanced courses with a dissertation to showcase their research potential. The focus of thesis is to solve an industry/society centric problem.

Annexure-2

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	140101	Advanced Computer Architecture	T	3	1	0	4	50	50	100
2	140102	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	140106	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	140201	Advanced Programming Languages	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
Elective-II (Select one of the following subject)	
140209	Wireless and Mobile Networks
140210	Advanced Microprocessors and Programming
140211	Data Warehousing & Data Mining

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 Contents

UNIT - I

Parallel Computer Models: Multiprocessors and multi-computers, Multi-vector 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 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

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.

Course Name: Advanced Database Management System

Course Code: 140102

Semester: 1st

Credits- 04 **L T P**

3 1 0

Course Contents

UNIT – I

Distributed DBMS: Transaction Processing, Concurrency & control 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).*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.

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Course Name: Design Principles of Operating System

Course Code: 140103

Semester: 1st

Credits- 04 **L T P**

3 1 0

Course Contents

UNIT - I

Introduction to OS: 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, anode 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, 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.

Inter-process 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.

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UNIT - IV

Real Time Systems and Microkernel's: 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.

Course Name: Multimedia System

Course Code: 140104

Semester: 1st

Credits- 04 **L T P**

3 1 0

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, Color in Image and Video, Color Image and Video Representations, Basics of Video, Types of Color 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*, Pearson Educations.
2. Prabhat K. Andleigh, Kran Thakkar. (2015). *Multimedia System Design*, PHI.
3. Li Drew. (2004). *Multimedia Computing*, Pearson Education.
4. Fred Halsall. (2002). *Multimedia Communications*, Pearson Education.

Course Name: Object Oriented Analysis and Design

Course Code: 140105

Semester: 1st

Credits-04 **L T P**

3 1 0

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 and 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, and Relationships between Use Cases. Classes, Class Diagram, Classes, Objects, Attributes Operations, Methods, Interfaces, Constraints, Generalization, Specialization, Association and 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.

Advanced Database Management System Lab

Course Code: 140106

Semester: 1st

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

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.

Course Name: Advanced Programming Languages

Course Code: 140201

Semester: 2nd

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

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 Program-constructed data objects, sets, file and input/output. Sub program and Program-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, 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.

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*, Addison-Wesley
3. Terrence W. Pratt, Marvin V. Zelkowitz. (2000).*Programming Languages:Design and Implementation*, Pearson

Course Name: Advanced Software Engineering

Course Code: 140202

Semester: 2nd

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

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 Yourdon's 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 - IV

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.

Course Name: Parallel Computing

Course Code: 140203

Semester: 2nd

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

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 environments.

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. New Jersey.
3. T. G. Lewis. (2001).Parallel Programming.*A Machine-Independent Approach*, IEEE Computer Society Press, Los.

Course Name: Advanced Computer Graphics (Elective-I)

Course Code: 140205

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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, and 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 Polygons, Generating Characters, SRGP- copy pixel, Initializing

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 f 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

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.

Course Name: Compiler Design (Elective-I)

Course Code: 140206

Semester: 2nd

Credits- 04 **L T P**
0 0 4

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,* Benjamin Cummings.
4. A. C. Holub. (1997).*Compiler Design in C,* Prentice-Hall Inc.

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

Course Code: 140207

Semester: 2nd

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

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. (1968).*The Art of Programming*, Pearson Education.
4. Nitin Upadhyay. (2004).*The Design & Analysis of Algorithms*, S. K. Kataria publication.

Course Name: Business Information System (Elective-I)

Course Code: 140208

Semester: 2nd

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

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

UNIT - IV

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

Text/References:

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

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

Course Code: 140209

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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 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 802.11 wireless 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.

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

Course Code: 140210

Semester: 2nd

L T P

Credits: 02 **0 0 4**

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*, Penram International publishing India Pvt. Ltd.
2. Douglas. V Hall.*(*2006*).Microprocessors and interfacing,* Tata Mc-Graw Hill publication.

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

Course Code: 140211

Semester: 2nd

Credits- 04 **L T P**

3 1 0

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, and 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. LAP 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.

Course Name: Advanced Software Engineering Lab

Course Code: 140204

Semester: 2nd

Credits- 02

L T P
0 0 4

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

Course Name: Advanced Data Structure

Course Code: 140301

Semester: 3rd

L T P

Credits: 03 **3 0 0**

Course Contents

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, D heaps, 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, B trees. Multimedia Structures Segment trees, k-d trees, Point Quad trees, MX-Quad trees, R-trees, TV trees. 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. E. 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.

Course Name: Digital Image Processing (Elective-III)

Course Code: 143303

Semester: 3rd

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

Course Contents

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, Neighboring of Pixels.

UNIT-II

Image Enhancement and Restoration Enhancement: Spatial Filtering, Introduction to Fourier Transformation. 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.

Course Name: Network Security (Elective-III)

Course Code: 140304

Semester: 3rd

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

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: (For Example, 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, neighbor 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.

Course Name: Minor Project

Course Code: 140302

Semester: 3rd

Credits- 04

L T P
0 0 8

Course Contents

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

Course Name: Seminar

Course Code: 140303

Semester: 3rd

Credits- 02

L T P
0 0 0

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

Course Name: Dissertation

Course Code: 140400

Semester: 4th

Credits- 20 **L T P**
0 0 0

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 the Use 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;

4. An account of the process of obtaining the data required for the dissertation and the Results obtained;

5. 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.

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

Annexure-4

Academic Instructions

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.