FAREASTINTERNATIONAL UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

MASTER OF SCIENCE IN COMPUTER SCIENCE & ENGINEERING (M.Sc. in CSE)

MASTER OF SCIENCE IN COMPUTER SCIENCE & ENGINEERING

Computer Science is the body of knowledge concerned with computer and computation. It has theoretical, experimental, and design components and include:

a) Theories of understanding computing devices, programs and systems;
b) Experimentation for the development and testing of concepts;
c) Design methodology, algorithms, and tools for practical realization; and
d) Methods of analysis for verifying that these realizations meet requirements.

In general, the M.Sc. degree in Computer Science& Engineering is intended as a terminal professional degree and does not lead to the Ph.D. degree. Most students planning to obtain the Ph.D. degree should apply directly for admission to the Ph.D. program. Some students, however, may wish to complete the master's program before deciding whether to pursue the Ph.D. To give such students a greater opportunity to become familiar with research, the department has instituted a program leading to master's degree with distinction in research. This degree is described is more detail in a subsequent section.

The program is tailored to serve both computing professional working in business/industry sites who seek an advanced degree to improve their job skill, and the computer teachers/lab managers in the secondary schools, colleges and technical schools.

Courses in the program will be offered during evening and on weekends. This provides an educational opportunity for students who are unable to attend day time classes. Currently, there is no evening program applied computing in our country BUET or one/two more university.

6.1.1. STRUCTURE OF THE PROGRAM

The Master of Computer Science& Engineering is a 66-credit two-year (6-semester) full time program, which includes a research project. These credits include Prerequisite Courses (30 credits), and by doing course work (30 credit), or, by doing thesis (36 credits).

6.1.2. PROGRAM REQUIREMENTS

A. Admission Requirements

Applicants must satisfy any one of the following criteria:

1. 4-years B.Sc. (or 3-years Honors + 1-year M.Sc.) in CS/CSE/IT/EEE/ECE/ETE or equivalent.
2. B.Sc. (Engineering) in any discipline with at least 1-year PGD in CSE/IT or equivalent.
3. 4-years B.Sc. (or 3-years Honors + 1-year M.Sc.) in Physics/Mathematics/ Statistics/Geological Science/Chemistry/Environmental Science.

The applicant's undergraduate grade point average (GPA), GRE score and work experience will be considered in the admission process. Applicants must also be able to demonstrative computer literacy and have received undergraduate credit for pre-calculus. A personal interview will be encouraged and may be required. Upon acceptance, students will receive a copy of their planned academic program. Students are encouraged to meet periodically with the program director to discuss academic progress, career placement and special needs.

B. Degree Requirements

A total of 66 credit hours of graduate course work are required for the M.Sc. degree with a minimum GPA of 3.0. Depending on undergraduate preparation, students can reduce credit hours by as many as 30 credits and waivers for which a students may be eligible, a minimum of 36 credits hours must be taken at Fareast International University.

The M.Sc. curriculum for students with a four-year computer undergraduate degree will generally consist of 36 credit hours or less of 500-level courses. Students who have weak under graduates grades or have not taken undergraduate computer courses in computer programming, database concepts, algorithm, system analysis logic, computer organization, assemble language and mathematics, system analysis, digital logic, computer organization, assembly language and mathematics will be required to take the equivalent. Students may be required to take one or more English courses. Prerequisite courses are at the 500 levels.

6.1.3. FACULTY

The breadth of faculty expertise is evident from the many courses offered on varied topics: programming languages, operating systems, simulation and modeling, systems analysis, computer architecture, windows technology, software engineering, computer networks, artificial intelligence, computer graphics, database management, compiler theory, display systems, computer performance measurement, object-oriented methodologies, data communication and distributed systems.

6.1.4. LIST OF THE COURSES

A. Prerequisite courses

Course Code	Title of the courses	Credits	Contact Hours/week
CSE 501	Structured Programming Language	3.0	3-0
CSE 502	Structured Programming Language (Lab)	1.5	0-3
CSE 571	Data Structure and Algorithms	3.0	3-0
CSE 572	Data Structure and Algorithms (Lab)	1.5	0-3
CSE 521	Database Concepts	3.0	3-0
CSE 522	Database Concepts (Lab)	1.5	0-3

CSE 592	System Analysis and Design	3.0	3-0
CSE 511	Digital Logic Design	3.0	3-0
CSE 513	Computer Organization and Assembly Programming	3.0	3-0
CSE 514	Computer Organization and Assembly Programming (Lab)	1.5	0-3
CSE 593	Discrete Mathematics	3.0	3-0
CSE 595	Numerical Methods	3.0	3-0

B. Required Courses (Any six for thesis group/Any ten for non-thesis group)

Course Code	Title of the Course	Credits	Contact Hours/week
CSE 601	Objective Oriented Programming Language	3.0	3-0
CSE 621	Distributed Database Query Optimization	3.0	3-0
CSE 661	Operating System	3.0	3-0
CSE 641	Advanced Artificial Intelligence	3.0	3-0
CSE 651	Software Engineering and Project management	3.0	3-0
CSE 631	Computer Network	3.0	3-0
CSE 611	Computer Architecture	3.0	3-0
CSE 691	Computer Graphics and Animation	3.0	3-0
CSE 642	DATA Mining and warehousing	3.0	3-0
CSE 647	Image Processing	3.0	3-0
CSE 671	Parallel Algorithms	3.0	3-0
CSE 652	Software Quality Assurance	3.0	3-0
CSE 672	Graph Theory	3.0	3-0
CSE 602	Visual and Internet Programming	3.0	3-0
CSE 692	Simulation and Modeling	3.0	3-0
CSE 622	Distributed System	3.0	3-0
CSE 649	Machine Learning	3.0	3-0
CSE 681	Multimedia System Design	3.0	3-0
CSE 613	Computer Interfacing	3.0	3-0
CSE 612	Microprocessor	3.0	3-0
CSE 643	Neural Network	3.0	3-0
CSE 644	Fuzzy System	3.0	3-0
CSE 645	Speech Recognition	3.0	3-0
CSE 646	Syntactic Pattern Recognition	3.0	3-0
CSE 615	Digital Signal Processing	3.0	3-0
CSE 616	Optical Fiber communication	3.0	3-0
CSE 614	VLSI Design	3.0	3-0
CSE 648	Mathematical Programming	3.0	3-0
CSE 673	Computational Geometry	3.0	3-0

C. M.Sc. 600 Thesis (18 credit hours for M.Sc. thesis group)/M.Sc. 690 project (6 credit hours for M.Sc. non-thesis group)

6.1.5. SUMMARY OF COURSE CURRICULUM

SL.	Group	Theory	Lab	Project and thesis	Total
1.	Prerequisite courses	24.00	6.00	-	30.00
2.	M.Sc. by Thesis	18.00	-	18.00	36.00
3.	M.Sc. by Course Work	30.00	-	6.00	36.00

6.1.6. SIGGESTED 2-YEAR IN 6- SEMISTER COURSES SEQUENCE (For M.Sc. Thesis Group)

FIRST YEAR		
Semester – 01		
CourseCode	**Title of the courses**	**Credits**
CSE 501	Structured Programming Language	3.0
CSE 502	Structured Programming Language (Lab)	1.5
CSE 521	Database Concepts	3.0
CSE 521	Database Concepts (Lab)	1.5
	Required Course	3.0
		12.0
Semester – 02		
CSE 571	Data Structure and Algorithms	3.0
CSE 571	Data Structured and Algorithms (Lab)	1.5
CSE 513	Computer Organization and Assembly Programming	3.0
CSE 513	Computer Organization and Assembly (Lab)	1.5
	Required Course	3.0
		12.0
Semester – 03		
CSE 592	System Analysis And Design	3.0
CSE 511	Digital Logic Design	3.0
	Required Course	3.0
		9.0
SECOND YEAR		
Semester - 04		
CSE593	Discrete Mathematics	3.0
CSE595	Numerical Methods	3.0

	Required Course	6.0
		12.0
Semester – 05 Semester - 06		
	Required Course	3.0
CSE600	Thesis	18.0
		21.0
		66.0

6.1.7. SUGGESTED 2- YEAR IN 6- SEMISTER COURSE SEQUENCE (For M.Sc. Non-thesisgroup)

FIRST YEAR		
1st Semester		
CourseCode	**Title of the courses**	**Credits**
CSE501	Structured Programming Language	3.0
CSE502	Structured Programming Language (Lab)	1.5
CSE521	Database Concepts	3.0
CSE521	Database Concepts (Lab)	1.5
	Required Course	3.0
		12.0
2nd Semester		
CSE571	Data Structure and Algorithms	3.0
CSE571	Data Structured and Algorithms (Lab)	1.5
CSE513	Computer Organization and Assembly Programming	3.0
CSE513	Computer Organization and Assembly (Lab)	1.5
	Required Course (any two)	6.0
		15.0
3rd Semester		
CSE592	System Analysis And Design	3.0
CSE511	Digital Logic Design	3.0
	Required Course (any two)	6.0
		12.0
SECOND YEAR		
4th semester		
CSE593	Discrete Mathematics	3.0
	Required Course (Any Two)	6.0
		9.0
5th Semester		
CSE595	Numerical Methods	3.0
	Required Course (Any two)	6.0

		9.0
6th Semester		
	Required course (Any one)	3.0
CSE690	Project	6.0
		9.0
Total		**66.0**

6.1.8 WAIVER POLICY

A. Prerequisite Courses

To apply for prerequisite undergraduate credit equivalents, a students must have an average grade of C or better and courses must have been taken within the past 5 years.

CSE 501 and CSE 502: 4.5 credit hours in Structured Programming Language-the equivalent of CSIT 121 and CSIT 122 at FIU.

CSE 571 and CSE 572: 9 credit hours in Data structure and Algorithms the equivalent of CSIT 217, CSIT 218. CSIT 122 and CSIT 228 at FIU.

CSE 521 and CSE 522: 4.5 credit hours in Database the equivalent of CSIT 311 and CSIT 312 at FIU.

CSE 592: 4.5 credit hours in system analysis and design the equivalent of CSIT 311 and CSIT 312 at FIU.

CSE 511: 4.5 credit hours in Digital Logic Design – the equivalent of CSE 213 and CSE 214 at FIU.

CSE 513 and CSE 514: 4.5 credit hours in Computer Organization and Assembly Programming- the equivalent of CSE 233 and CSE 234 at FIU.

CSE 593: 3 credit hours in Discrete Mathematics- the equivalent of MATH 135 at FIU.

CSE 593: 3 credit hours in Numerical Methods – the equivalent of MATH 415 FIU.

B. Required Courses

No waiver will be given for these course.

Syllabus for M.Sc. in Computer Science & Engineering

Prerequisite Courses:

CSE 501 STRUCTURED PROGRAMMING LANGUAGE

Over view, Structure of program, Data Types and data Type Qualifier, I/O Functions-Character I/O, Formatted I/O, Character Set, Identifiers, Keywords and Contents, Variables, Expressions Statement and Symbolic Constant, Arithmetic operators, Relational Operators and Logical operators, Assignment Operators, Increment/Decrement Operators, Unary Operator and Conditional Operator, Bit-wise Operators, Comma Operators, Precedence and Associatively, Branching: The IF statement (break and continue), SWITCH statement, GOTO statement and operator, Looping: For statement (break and continue), Looping: WHILE and Do WHILE statement, Storage Class: Automatic, Static, Register and Extern, Functions: Access, Prototype, Argument Passing and Value Receiving, Functions: Pass by value, Pass – by-reference and Value Receiving, Functions: Command Line Parameter and Library Functions, Arrays: Initialization, Access, Passing and Receiving, Arrays: 2D handling, Arrays: Sorting and Searching, String, Handling, Structure: Initialization, Access, Passing and Receiving, Structure: Embedded Structure, Union and Bit – fields, File: Types of File, Text File handling, File: Binary File Allocation and Release, Pointer: List or Tree Management by Self-Referential Structure, Pointer and Multi-Dimensional Arrays, Enumeration, Macros, Pre-Processor and Compiler, Directives, Library, Compiler and Linker, Segment and Memory Model, Video Adapter, Modes and Graphics Initialization, Graphics Functions, Introduction to C++, OOP, Polymorphism and necessary features of C++.

Textbook:

1. Structured Programming in Assembly Language for the IBM PC and PS/2, William C. Runnion
2. Programming in C (3rd Edition) by Stephen G. Kochan

CSE 502 STRUCTURED PROGRAMMING LANGUAGE (LAB)

Laboratory work based on CSE 501

CSE 571 DATA STRUCTURE AND ALGORITHMS

Concepts and example, elementary data objects, elementary data structures, arrays, lists, stacks, queues, graphs, trees, Memory management, Sorting and searching, hash techniques, Techniques for analysis of algorithms, Methods for the design of efficient algorithms: Divide and conquer, greedy method, dynamic programming, back tracking, branch and bound, Basis search and traversal techniques, graph algorithms, Algebraic simplification and transformations, lower bound theory, NP – hard and NP – complete problems.

Textbook:

1. Data Structures and Algorithms by Alfred V. Aho and Jeffrey D. Ullman
2. Algorithms and Data Structures by Niklaus Wirth

CSE 572 DATA STRUCTURE AND ALGORITHMS (LAB)

Laboratory work based on CSE 571

CSE 521 DATABASE CONCEPTS

Concepts and methods in database system, File organization and retrieval, Data manipulation, Query formulation and language, Database models, Data description language, database integrity and security, Data dictionary/ directory systems, database administration, Database design, Survey of some existing database management systems, Some applications commercial language.

Textbook:

1. Database Concepts (6th Edition)by David M. Kroenke and David Auer
2. Concepts of Database Management by Philip J. Pratt and Joseph J. Adamski

CSE 522 DATABASE CONCEPTS (LAB)

Laboratory work based on CSE 521

CSE 592 SYSTEM ANALYSIS & DESIGN

Information, general concepts of formal information systems, analysis of information requirements for modern data processing technology and its application, information systems structures, designing information outputs, classifying and coding data, physical storage media considerations, logical data organization, systems analysis, general systems, design, detail system design, project management and documentation, Group development of an information system project: includes all phases of software life cycles form requirement analysis to the completion of a full implemented system.

Textbook:

1. Systems Analysis and Design by Alan Dennis and Barbara Haley Wixom
2. Systems Analysis and Design (9th Edition) by Kenneth E. Kendall and Julie E. Kendall

CSE 511 DIGITAL LOGIC DESIGN

Number systems and codes, Digital logic, Boolean algebra, De-Morgaan's law, logic gages and their truth tables, canonical forms, Combinational logic circuits, minimization techniques, Arithmetic and data handling logic circuits, decoders and encoders, Multiplexers and demultiplexers, Combinational Circuit design, Flip-flops, race around problems, Counters: asynchronous counters, synchronous counters and their application, TTL, MOS, CMOS, IIL logic gates and their circuits, PLA design, Synchronous and asynchronous logic design: state diagram, Mealy and more

machines, State minimization's and assignments, Pulse mode logic, Fundamental mode design.

Textbook:

1. Digital Design and Computer Architecture, Second Edition by David Harris and Sarah Harris
2. Digital Design: A Systems Approach by William J. Dally and R. Curtis Harting
3. Fundamentals of Logic Design by Jr. Charles H. Roth and Larry L Kinney

CSE 513 COMPUTER ORGANIZATION AND ASSEMBLY PROGRAMMING

Computer Organization: Fundamentals of computer design, Performance and cost. Instruction set design and examples, Measurements, Basic processor implementation techniques: hardwired and micro-programmed control; Caches and multiprocessor caches, Design of I/O system, I/O performances, Micro programmed control, Multiprocessors with examples.

Assembly language: machine and Assembly instruction types and their formats, Character representation instructions, instruction execution, Machine Language programming, instruction sets and their implementations, The assembly process, Addressing methods, Subroutines, macros and files, I/O programming, interrupts and concurrent processes.

Textbook:

1. Principles of Computer Organization and Assembly Language by Patrick Juola
2. Computer Organization Assembly Language (2nd Edition) by Thorne

CSE 514 COMPUTER ORGANIZATIN & ASSEMBLY PROGRAMMING (LAB)

Laboratory work based on CSE 512

CSE 593 DISCRETE MATHEMATICS

Set theory, Elementary number theory, Graph theory, Paths and trees, Generating functions, Algebraic structures, Semi graph, permutation groups, Binary relation, Mathematical logic, prepositional calculus and predicate calculus.

Textbook:

1. Alan D Cur: *Introduction to Discrete Mathematics.*
2. O. Nicodemi: *Discrete Mathematics.*
3. J.P. Trermbly& R. Monohor: *Discrete Mathematics Structures with Computer Applications.*

CSE 595 NUMERICAL METHODS

Computational methods for solving problems in linear algebra, linear programming, nonlinear equations, approximations, iterations, methods of least squares, interpolation, approximation of functions and integral, numerical solution of ordinary

differential equations; discusses various applications in science and engineering; includes some programming as well as the use of high quality mathematical library routines.

Textbook:
1. Numerical Methods for Engineers by Steven Chapra and Raymond Canale
2. Numerical Methods for Engineers and Scientists by Amos Gilat

Required courses:

CSE 601 OBJECT ORIENTED PROGRAMMING LANGUAGE

Introduction to programming using C++ for its object-oriented will include structures. File input/output, data abstraction, classes (constructors, destructors, data members, member function) operator overloading, inheritance, virtual functions, polymorphism and templates, Java Application, Java applets, Methods, Arrays, String & Graphics & java 2D, Basic graphical user interface components, multithreading, Multimedia, Files & streams, JDBC, Servlets, RMI, Networking, Java beans.
Laboratory work must be provided based on the course description

Textbook:
1. H. Schildet: CIC++ The Complete Reference
2. L. Balagurshamy:Programming in C++
3. H. Schildet: Teach yourself C++

CSE 621 DISTRIBUTED DATABASE QUERY OPTIMIZATION

Review to Database and computer network, Levels of distribution Transparency, distributed database design, Translation of global queries to fragment queries, Optimization of access strategies, the management of distrusted transaction, Concurrency Control, Distributed Database Administration, Homogeneous and heterogeneous distributed Database Administration, Homogeneous and Heterogeneous distributed Database.
Laboratory work must be provided based on the course description

Textbook: Database Systems: Design, Implementation, & Management by Carlos Coronel and Steven Morris

CSE 661 OPERATING SYSTEM

Operating system for time-shared multiprocessor computer systems, preprocessor, management state modeling, job scheduling, process scheduling, process synchronization, time slicing and time sharing operating systems and sub systems. Memory management in paged and segmented virtual memory systems, Performance evaluation of computer network software, introduction to computer as a utility, introduction to security and large database system.
Laboratory work must be provided based on the course description.

Textbooks:

1. A.S. Tanenbaum: *Operating Systems*
2. Peterson and Silberchatz: *Operating systems concepts*
3. P.B. Houses: *Operating systems Principles*
4. Silberchatz Galvin: *Operating Systems*
5. Dietel&Dietel: *Operating System*

CSE 641 ADVANCED ARTIFICIAL INTELLIGENCE

Introduction, advanced search techniques in Al, knowledge based system design, advanced plan generating systems, Bayesian network and probabilistic reasoning, Learning in neural belief networks, Practical natural language processing, Computer vision, Introduction to Robotics.

Laboratory work must be provided based on the course description.

Textbooks:

1. Advanced Artificial Intelligence (Series on Intelligence Science)by Zhongzhi Shi
2. Artificial Intelligence for Advanced Problem Solving Techniques by DimitrisVrakas and Ioannis Pl Vlahavas

CSE 611 COMPUTER ARCHITECTURE

Integer arithmetic, Floating point arithmetic, Single precision and double precision; Interrupt handling high speed adders; Standard and recorded multipliers, Booths multiplier, Canonical and multi bit scanning multipliers, Array multipliers; High radix non-restoring division, SKT division, Robertson division, Convergence division and cellular array dividers; Floating point processors; binary squares and square roots, Evaluation of trigonometric functions and polynomials, Chen convergence computation, CORDIC computations, Logarithmic number system (LNS) processor.

Laboratory work must be provided based on the course description.

Textbooks:

1. V.C. Hamacher, Z.G. Zaky: *Computer Organization.*
2. J.P. Hays: *Computer Organization and Architecture*
3. Raman: *Parallel Processing*

CSE 631 COMPUTER NETWORKS

Network Architectures-layered & ISO Reference model. Physical layer; Transmission Media, Data Link Layer: Error Detection, Error Correction, Data Link Protocols & Examples, Medium Access Sub-layer: Channel Allocation procedure, Multiple Access Protocol, IEEE 802 Standard, Bridges, High Speed LANs Satellites Networks, Network Layer: Design Issues, Routine Algorithm, Congestion Central, Internet Working Layer in Internet, Trans Port Layer, Transport Service & Protocols, Internet Transport Protocols, Application Layer: Network Security, Domain System, SNMP, E-mail, WWW & Multi Media.

Laboratory work must be provided based on the course description.

Textbooks:

1. A. S. Tanenbaum and Addison Wesley: *Computer Networks*
2. G.E.Keiser: *Local area network*
3. Comer: *Computer Networks and Internets*

CSE 651 SOFTWARE ENGINEERING & PROJECT MANAGEMENT

Advanced concepts in software engineering. Topics may include new lifecycle paradigms, code reusability issues, formal specifications, new methodologies, and others.

Planning, scheduling, cost management of projects, measuring progress, predicting success, and controlling failure, Management tools and their use. Effectiveness and efficiency of software and personnel. Distributed software development. Quality control standards and practices.

Laboratory work must be provided based on the course description.

Textbook: Software Project Management by Bob Hughes and Mike Cotterell

CSE 691 COMPUTER GRAPHICS AND ANIMATION

Advanced Graphic Techniques: Graphics basics, Three dimensional drawings, Geometric forms and models, Hidden surfaces, Fractals, Advanced rendering Techniques: Shadow generation techniques, Texture and environment mapping techniques, Procedural texture mapping and modeling, Ray tracing, Radiosity Methods, Global illumination models, Volume rendering techniques; Advanced Animation: Animation articulated structures, Soft object animation, Procedural animation.

Laboratory work must be provided based on the course description.

Textbook:

1. The Complete Guide to Blender Graphics, Second Edition: Computer Modeling and Animation by John M. Blain
2. An Introduction to 3D Computer Graphics, Stereoscopic Image, and Animation in OpenGL and C/C++ by Fore June

CSE 642 DATA MINING AND WAREHOUSING

Concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, application of data warehousing and data mining. Data warehousing and OLAP Technology for data mining. Data preprocessing, Descriptive data mining: Characterization and comparison, Association analysis, Classification and prediction, Cluster analysis, mining complex types of data, Applications and trends in data mining.

Laboratory work must be provided based on the course description.

Textbook:

1. Data Mining: Concepts and Techniques, Third Edition (The Morgan Kaufmann Series in Data Management Systems) by Jiawei Han and MichelineKamber
2. Data Warehousing Fundamentals for IT Professionals by PaulrajPonniah

CSE 647 IMAGE PROCESSING

This course covers the advanced research topics of image processing which include image digitization, description, enhancement, segmentation, image transforms, filtering, restoration, coding and retrieval. Students are encouraged to collect and evaluate recently published articles in the above-mentioned topics.

Laboratory work must be provided based on the course description.

Textbook: Image Processing, Analysis, and Machine Vision by Milan Sonka and Vaclav Hlavac

CSE 671 PARALLEL ALGORITHMS

Introduction, Parallel processing, Parallel models, Performance of Parallel Algorithms, The work time presentation framework, Basic techniques: Pointer jumping, Balanced Trees, Divided and Conquer, Pipelining, Partitioning and symmetry breaking, List ranking, Euler-Tour technique, Tree contraction; Parallel searching, margin, sorting and selection, Connected components, Minimum spanning trees, Bi-connected Components, Directed graph, Plane sweeping, Visibility problems, Simulation between PRAM models, Lower bunds for EREW, CREW and CRCW PRAMs.

Laboratory work must be provided based on the course description.

Textbook: Algorithms Sequential & Parallel: A Unified Approach by Russ Miller and Laurence Boxer

CSE 652 SOFTWARE QUALITY ASSURANCE

Verification and validation: Testing processes, Test planning and strategies, Defect testing, Testing techniques-Unit testing, Integration testing, Validation testing, System testing, Debugging, software Cost Estimation: Cost estimation methods, Understanding of and Planning for Quality: Defining quality, Quality and competitiveness, SEI-CMM, Managing processes, Quality Management: Quality review, Software standards, Documentation standards, Software metrics, Product quality metrics, Software Maintenance: Maintenance process, Program evolution dynamics, maintenance costs, Software Configuration Management: Version control, change control, Configuration audit, Status reporting, Design for Quality: Innovation, design and improvement, Design Control and management, Specification and standards, Process analysis and modeling, Improved Strategies, Problem-solving methods. Process measurement, System documentation. Implementation and assessment: Why documented system, Quality system design, Quality design, Quality system requirement, and ISO 9000 series of standards, organization for Quality and leadership: People and the organization structure, Employee involvement, Responsibility and performance management, Councils, committees and teams, Quality culture, Stages of team development, Team roles and personality types, Quality management approaches, Commitment and Policy, Communication of Quality, Training for Quality, Tools and the Improvement Cycles: Measurement of quality, Cost of Quality, Tools and techniques for quality improvement.

Customer Satisfaction: Who is customer, Feedback,customer complaints, translating needs into requirements, Service quality, Benchmarking: Reason for benchmarking, deciding what to benchmark, and Planning?
Laboratory work must be provided based on the course description.

Textbook: Software Quality Assurance: From Theory to Implementation by Daniel Galin

CSE 672 GRAPH THEORY

Introduction, Fundamental concepts, Trees, Spanning trees in graphs, Distance in graphs, Eulerian graphs, Digraphs, matching and factors, Cuts and connectivity, k-connected graphs, Network flow problems, Graph coloring: Vertex coloring and edge coloring, Line graphs, Hamiltonian cycles, Planar graphs, perfect graphs.
Laboratory work must be provided based on the course description.

Textbook: Graph Theory and Complex Networks: An Introduction by Maarten van Steen

CSE 602 VISUAL & INTERNET PROGRAMMING

Concepts of Visual Programming Environment, Multiple Documents Interface. Active X controls and Active X components, API OLE Automation, Database programming and Active Data Objects. Introduction to the Web, Scripting objects.
Laboratory work must be provided based on the course description.

CSE 692 SIMULATION AND MODELING

Introduction to the basic concepts and methods for using computers to models various real world systems; model building, random number generator, statistical analysis of results, validation and verification techniques, Digital simulation of continuous system, Simulation and analytical methods for analysis of computer systems and practical problems in business and practice, introduction to simulation packages. Probability distribution and expectations, stochastic processes, discrete Markov chain and continuous time Markov chain, Birth death processing queuing. Queuing models; M/M/1, M/M/C, M/G/1, M/D/1. Solution of network of queues-closed queuing models and approximate models.
Laboratory work must be provided based on the course description.

Textbook: Simulation Modeling and Analysis with Expertfit Software (McGraw-Hill Series in Industrial Engineering and Management) by Averill Law

CSE 622 DISTRIBUTED SYSTEMS

Fundamental characteristics of distributed System. Architectural models for distributed system, Examples of servers such as file servers and name servers, Remote Procedure Calls (RPC). The features of UNIX and other operating systems

that are geared towards distributed working, including sockets and NFS. Multicast communication and other algorithms for agreement between distributed sites. Securities in distributed system. Concurrency control and transactions in sharing of distributed data.

Laboratory work must be provided based on the course description.

Textbook: Distributed Systems: Concepts and Design (5th Edition)by George Coulouris and Jean Dollimore

CSE 649 MACHINE LEARNING

Introduction, Supervised and Unsupervised learning in prepositional logic, Induction of decision trees, Noise and over-fitting issues, Minimum description length principle, Conceptual clustering, version space, Nearest neither classifier, Genetic algorithm, Computational learning theory.

Learning in first order logic, Top-down and Bottom-up approach for inducing first order theory, handling noise, first order theory revision, predicate invention, Application of Inductive logic Programming, Multiple predicate learning, Different types of language bias, PAC Learn ability knowledge discovery in database and data mining, Text and image retrieval.

Laboratory work must be provided based on the course description.

Textbooks:

1.Understanding Machine Learning: From Theory to Algorithmsby ShaiShalev-Shwartz and Shai Ben-David

2. Machine Learning (McGraw-Hill International Editions Computer Science Series) by Tom M. Mitchell

CSE 681 MULTIMEDIA SYSTEM DESIGN

Introduction to multimedia, interface and characteristics of voice and video processing equipment, multimedia document architecture, multimedia storage, media encoding/compression schemes, multimedia networking and protocols, operating system support for multimedia, real time scheduling of time multimedia documents, multimedia editors, current communication standards and software.

Laboratory work must be provided based on the course description.

Textbook: Multimedia: Making It Work, Ninth Edition by Tay Vaughan

CSE 613 COMPUTER INTERFACING

Practical knowledge of how to diagnose and solve the problems of input devices, processors, cache, RAM, ROM, motherboard, different types of cards, storage media, display unit, printer and other computer related equipment such as scanner OMR, barcode reader, UPS, stabilizer etc. Interface components and their characteristics. Optical displays and sensors. High power interface devices, transducer, and stepper motor and peripheral devices.

Laboratory work must be provided based on the course description.

Textbooks:
1. Brain-Computer Interfacing: An Introduction by Rajesh P. N. Rao
2. Computer Interfacing by George Smith

CSE 612 MICROPROCESSOR

Review of different microprocessor 80486, 68040. V70G, microprocessors, Comparing the architectures: RISC and CISC; Instruction set of machines: SPARC, INTEL and MIPS; Study of microprocessor: Pentium Series, Alpha 21064, MIS 6400, PA-RISC; Math coprocessors and microprocessors.
Laboratory must be provided based on the course description.
Textbook: B.B. Bray: The Intel Microprocessors

CSE 643 NEURAL NETWORKS

Fundamentals of neural Networks, Back propagation and related training algorithms; Hebbian learning; Cohen-Grossberg learning; The BAM and Hopfield memory; simulated Annealing; Different types of neural networks; Counter propagation probabilistic, radial basic function, generalized regression etc. Adaptive Resonance Theory; Dynamic systems and neural control; the Boltzman machine; Self organizing maps; spatiotemporal pattern classification, the Neo-cognition, practical aspects of neural networks.
Laboratory must be provided based on the course description.

Textbook: Neural Network Design (2nd Edition) by Howard B Demuth and Mark H Beale

CSE 644 FUZZY SYSTEM

Basic concepts of Fuzzy set theory, Fuzzy numbers, Aggregation operation on fuzzy sets. The theory of approximate reasoning. Introduction to fuzzy logic control, Fuzzy system model and developments, Fuzzy logic controllers, Defuzzification methods, Linguistic descriptions and their analytical forms, the flexible structure of Fuzzy systems.
Laboratory must be provided based on the course description.

Textbook: Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systemsby Guanrong Chen and Trung Tat Pham

CSE 645 SPEECH RECOGNITION

Introduction, Speech signal: production, perception and characterization; signal processing and analysis; Pattern comparison techniques: distortion measures, spectral-distortion measures, time alignment and normalization; Recognition system design and implementation: Source-coding, template training, performance, analysis, Connected word models: two level DP, Level building algorithm, one-pass algorithm; Continuous speech recognition: sub-word units, Statistical modeling, context-dependent units, Task oriented models.
Laboratory must be provided based on the course description.

Textbook: Automatic Speech Recognition: A Deep Learning Approach (Signals and Communication Technology) by Dong Yu and Li Deng

CSE 646 SYNTACTIC PATTERN RECOGNITION

Introduction to formal language, String language for pattern description, Higher dimensional pattern grammars, Syntax analysis as a recognition procedure, Stochastic languages, Error-correcting parsing for string languages, Error-correcting tree automata, Cluster analysis for syntactic patterns, Grammatical inference for syntactic pattern recognition, Application shape analysis of wave forms and contours, Syntactic approach to texture analysis.

Laboratory must be provided based on the course description.

Textbook: Pattern Recognition, Fourth Edition by SergiosTheodoridis and KonstantinosKoutroumbas

CSE 615 DIGITAL SIGNAL PROCESSING

Main features and application of digital signal processing. Introduction to speech, image and data processing. Discrete time signals, sequences. Linear systems. Linear constant co-efficient difference equations. Sampling of continuous time signals, DFT, FFT. Two dimensional sequences and systems; Non parametric methods-discrete random processes, auto correlation sequence, period gram; parametric method-auto regressive modeling. Forward/backward linear production, Lavinson-Durbin algorithm, minimum variance method and Eigen Structure method-I and II.

Laboratory must be provided based on the course description.

Textbook:

1.Digital Signal Processing (4th Edition) by John G. Proakis and Dimitris K Manolakis
2. Understanding Digital Signal Processing (3rd Edition)by Richard G. Lyons

CSE 616 OPTICAL FIBER COMMUNICATION

Introduction, light propagation through Optical Fiber: Ray Optics theory and mode theory: Optical Fiber: Types and characteristics, Transmission characteristics, fiber joints and fiber couplers. Light sources: light emitting diodes and laser diodes Detectors: PIN photo detector and avalanche photo detector. Receiver analysis: Direct detection and coherent detection, noise and limitation. Transmission limitation: chromatic dispersion, non linear refraction, four wave mixing and laser face noises. Optical amplifier: laser and fiber amplifiers, applications and limitations. Multi channel optical system: frequency division multiplexing, wavelength division multiplexing and co-channel interference.

Laboratory must be provided based on the course description.

Textbook: Optical Fiber Communications by Gerd Keiser

CSE 614 VLSI DESIGN

Overview of the design methodology: top-down design approach technology trends and design styles. Brief review of MOS transistor theory. MOS transistor as a switch: pass transistor. And transmission gates. NMOS inverter characteristics, CMOS inverter characteristics: influence of n/p ratio of transfer characteristics and noise margin. CMOS processing technologies, CMOS circuit characteristics and performance estimation: resection: resistance and capacitance, raise and fall times, delay, gate resistor sizing, power consumption, CMOS logic design. Structured

design methods: design styles, automated synthesis, circuit extraction, simulation and design rule checking (DRC). Design examples. CMOS subsystem design: adders and related functions, multipliers, memory systems, data paths, programmable logic arrays (PLAs), Field programming Gate Array (FPGAs). VLSI testing structured DFT, self-test and built-in text.
Laboratory must be provided based on the course description.

CSE 648 MATHEMATICAL PROGRAMMING

Basic concept of Mathematical Programming, Concepts of linear and quadratic programming, Convexity, Convex sets and convex functions, Concepts of integer programming, Some example of integer programming problems, Linear programming techniques, Graphical solution of linear programming problems, Simplex method, Dual simplex method, Different integer programming techniques, Revised simple method.
Laboratory must be provided based on the course description.
Textbook: Model Building in Mathematical Programming by H. Paul Williams

CSE 673 COMPUTATIONAL GEOMETRY

Searching and Geometric Data Structures: Balanced binary search trees, Priority-search trees Range searching, Interval trees, Segment trees, Algorithms and complexity of fundamental geometric objects: Polygon triangulation and art gallery theorem, Polygon partitioning, Conex-hulls in 2 - and 3- dimension, Dynamic convex-hulls; Geometric intersection: line segment intersection and the plane-sweep algorithm, Intersection of polygons; Proximity: Voronoi diagrams, Delunay triangulations closest and furthest pair; Visualization: Hidden surface removal and binary space partition (BSP) trees; Graph Drawings: Drawings of rooted trees (layering, Radial drawings, HV-Drawing, Recursive winding), Drawings of planar graph (Straight-line drawings, Orthogonal drawings, Visibility drawings); survey of recent developments in computational geometry.
Laboratory must be provided based on the course description.
Textbook: Computational Geometry: Algorithms and Applications by Mark de Berg and Otfried Cheong

CSE 600 THESIS (18 credit hours for M.Sc. group)

Students are required to undertake supervised study and research culmination in a Thesis in their field of specialization. Thesis group should have contribution in the field of specification and their thesis should be at least of 100 pages.

CSE 690 PROJECT (6Credit hours for M.Sc. non-thesis group)

Students are required to undertake supervised study and research culmination in a projection their field of specialization. Students of non-thesis group have to learn the method of research.