COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

B.Tech. COMPUTER SCIENCE & ENGINEERING

Course of Study & Scheme of Examination
2016-17

Maulana Azad National Institute of Technology
Bhopal

SCHEME

III Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE211	Discrete Structure	3	1	-	3
CSE212	Data Structure	3	1	-	3
CSE 213	Digital Electronics	3	1	-	3
CSE 214	Digital Communication	3	1	-	3
CSE 215	Computer Graphics	3	1	-	3
CSE 216	Linear Algebra & Numerical Methods	3	1	-	3
CSE 217	DS Lab	-	-	2	1
CSE 218	Digital Electronics Lab			2	1
CSE 219	CG Lab	-	-	2	1
CSE 220	Lab-I (Python/VHDL)			2	1
					Total Credit 22

IV Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE 221	Probability and Queuing Theory	3	1	-	3
CSE 222	Computer Architecture	3	1	-	3
CSE 223	Theory of Computation	3	1	-	3
CSE 224	Database Management System	3	1	-	3
CSE 225	Analysis and Design of Algorithm	3	1	-	3
CSE 226	Software Engineering	3	1	-	3
CSE 227	DBMS Lab	-	-	2	1
CSE 228	ADA Lab	-	-	2	1
CSE 229	SE Lab	-	-	2	1
CSE 230	Lab-II (JAVA/PHP)	-	-	2	1
					Total Credit 22

V Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE 311	Compiler Design	3	1	-	3
CSE 312	Operating System	3	1	-	3
CSE 313	Microprocessor	3	1	-	3
	Departmental Elective 1	3	1	-	3
	Departmental Elective 2	3	1	-	3
	Open Elective 1	3	1	-	3
CSE 315	CD Lab	-	-	2	1
CSE 316	MP Lab-	-	-	2	1
CSE317	OS Lab	-	-	2	1
CSE 318	Lab-III (Android/MATLAB)			2	1
CSE 319	Minor Project				1
					Total Credit 23

VI Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE 321	Computer networks	3	1	-	3
CSE 322	Data ware housing and mining	3	1	-	3
CSE 323	Artificial intelligence	3	1	-	3
	Departmental Elective 3	3	1	-	3
	Departmental Elective 4	3	1	-	3
	Open Elective 2	3	1	-	3
CSE 325	Network Lab	-	-	2	1
CSE 326	Data ware housing and mining Lab	-	-	2	1
CSE 328	Lab-IV (Hadoop/CUDA)			2	1
CSE329	Minor Project	-	-	-	2
					Total Credit 23

List of V and VI Semester Departmental Electives

CSE 331	Advance Computer Architecture
CSE 332	Software Reusability
CSE 333	CAD of Digital Systems
CSE 334	Parallel and Distributed Algorithm
CSE 335	Distributed database
CSE 336	Embedded System
CSE 337	Cryptography
CSE 338	Heterogeneous computing
CSE 339	Digital Image Processing
CSE 341	E-commerce & E-Governance
CSE 342	Advanced Data Structure
CSE 343	Principles of Programming Languages
HUM xxx	Professional Communication

List of V and VI Semester Open Electives

CSE 351	Multimedia
CSE 352	Object-Oriented Design and Modeling
CSE 353	Simulation & Modeling
CSE 354	UNIX internals & shell programming
CSE 355	Information Theory and Coding
CSE 356	Statistical Methods

VII Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE 411	TCP/IP & Web Technology	3	1	-	3
	Departmental Elective 5	3	1	-	3
	Departmental Elective 6	3	1	-	3
	Open Elective 3	3	1	-	3
	Open Elective 4	3	1	-	3
CSE 412	Lab TCP/IP & Web Technology	-	-	2	1
CSE 413	Major Project	-	-	-	2
CSE 414	Internship/Industrial Training.	-	-	-	1
CSE 415	Seminar			2	1
					Total Credit 20

VIII Semester

Course Number	Subject	Scheme of Studies Periods per week			Credits
		L	T	P	
CSE421	Network Security	3	1	-	3
	Departmental Elective – 7	3	1	-	3
	Departmental Elective – 8	3	1	-	3
	Open Elective 5	3	1	-	3
	Open Elective 6	3	1	-	3
CSE 422	Major project	-	-	-	2
CSE 423	General Proficiency	-	-	-	2
CSE 424	Seminar			2	1
					Total Credit 20

List of VII and VIII Semester Departmental Electives

CSE 431	**Software Testing**
CSE 432	**Cloud Computing**
CSE 433	**Distributed Computing**
CSE 434	**Pattern Recognition**
CSE 435	**Computer Vision**
CSE 436	**Randomized Algorithm**
CSE 437	**Natural Language Processing**
CSE 438	**Mobile computing**
CSE 439	**Quantum computing**
CSE 441	**Sensor Network**
CSE 442	**Web search and Mining**
CSE 443	**Big Data Analytics**

List of VII and VIII Semester Open Electives

CSE 451	**Graph Theory**
CSE 452	**Optimization Techniques**
CSE 453	**Cyber crime and information warfare**
CSE 454	**Wireless Networks**
CSE 455	**Neural Networks**
CSE 456	**Ethical hacking**
CSE 457	**Biometrics**
CSE 458	**Machine Learning**

SYLLABUS

I & II SEMESTER

CS 115-COMPUTER PROGRAMMING

Concepts, definitions, taxonomy and history of computer programming, operating systems and program execution, Unix system, Input/output devices, Storage devices, Flow chart and algorithm development, Computer program. C programming, Statements, Arrays and functions

References:

1. Programming with C Gottfried
2. C programming Ritchie & Kernighan
3. UNIX programming Kernighan & Pike

III SEMESTER

CSE-211 DISCRETE STRUCTURES

Set Theory, Principle of inclusion and exclusion, Proposition and first order logic, Mathematical Induction, Relations, partial ordering and total ordering. Posets, Lattices , Algebraic system and group theory, Hass Diagrams, Functions, Logic, Graph Theory, Discrete Probability, Boolean algebra, Group Theory, Discrete Numeric functions, Generating functions, Recurrence Relations, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions, total solution, Propositional Calculus, predicate logic, Introduction, formal language , grammars and finite state machine.

References:

1. Element of Discrete Mathematics By C. L. Liu
2. Discrete Mathematical Structures: Theory and Application By D.S. MALIK and M.K. Sen,
   Thomson Publications
3. Discrete Mathematical Structures with applications to computer science, by Trembly J. P.&Manohar .P
4. Discrete Mathematics for Computer Scientists and Mathematicians by Mott J. L. Kandel A. and Baker T. P
5. Graph Theory Frank Harary

CSE-212 DATA STRUCTURE

Introduction to Data Structures, Algorithm Evaluation, Arrays, Multi-dimensional Arrays, Sparse Matrices, Structure, Pointers, Stacks: representation of stacks and basic operations, applications of Stacks, Prefix, Postfix and Infix notations and conversion, Recursion, Tail Recursion, Towers of Hanoi. Queues: Types of Queue and its application. Linked lists: Types of Linked list, implementation of Stack and Queue using Linked list, Polynomial representation and Arithmetic. Trees: binary tree, n-ary Tree, Tree Traversal, AVL Trees, Threaded trees, Binary Search trees, Graphs: Representation, Traversing. Sets: Representation of sets and operations of sets. Searching: Sequential Search, Binary Search, and Hashing. Sorting: External and Internal Sort, Selection Sort, Bubble Sort, Insertion Sort, Radix Sort, and Bucket Sort.

References:

1. Data Structure Using C Tanenbaum
2. Fundamentals of Data Structures Horowitz and Sahni
3. Data Structures, Schaum's Seri
4. Classic Data Structures Samantha

CSE-213 DIGITAL ELECTRONICS

Number system, radix conversion, Binary codes, Boolean algebra, Logic gates, simplification of Boolean expressions, minimization techniques. Combinational circuit: Full and half adder, Full and half subtractor, Parallel adder and subtractor, BCD adder, Excess 3 adder, Magnitude comparator, Look-ahead carry generator, Multiplexer and De-multiplexer, Encoder and Decoder. Flip-Flop: RS, clocked RS, T, D, JK, race-around problem, master – slave JK, Sequential circuits: State diagrams, Designing of sequential circuit, Minimization of sequential circuit, Synchronous and Asynchronous system, Synchronous Counter Designing, Asynchronous counter, Registers, Shift registers, Serial and parallel registers, Johnson and rings counter.

References:

1. Digital Electronics Morris Mano
2. Digital Circuits & Design Arivazhagan S Salivahanan

CSE-214 DIGITAL COMMUNICATION

Characterization of communication signals: Bit rate Baud rate, Sampling, Nyquist bit rate, Shannon Theorem, Bandwidth, Throughput. PCM, Delta Modulation, Serial & parallel transmission, Amplitude modulation, frequency modulation and phase modulation, ASK, BPSK, QPSK, FSK, QAM, Modems. Multiplexing, Spread spectrum modulation: Pseudo noise sequences, DS & FH spread spectrum. Synchronous and asynchronous transmission, Line coding scheme, Error detection and correction.

References:

1. Data Communication and Networking B A Forouzan
2. Digital Communications Simon Haykin,
3. Principles of Communication Systems Herbert Taub& D L Schilling
4. Data & Computer Communication William Stallings

CSE-215 COMPUTER GRAPHICS

Introduction to raster & random graphics fundamentals, Display devices & comparison Point plotting, line drawing & circle drawing & their algorithm like DDA & Bressenhams, Video Basics- Graphics input/ output devices techniques, Mouse, tablets, stylus, light pen, valuators, digitizers, and plotter Devices independent graphics systems, positioning constraints, rubber band technique, dragging, inking& Painting, Data Structure of Computer Graphics, 2-D Transformation, Clipping, Windowing, View port, 3-D transformation, clipping, viewing transformations, projection, curve generation methods. Graphics packages, segmented files,

Geometric models, Picture Structure. Raster graphics, Character Displaying, Natural images Solid Area. Scan Conversion, Raster display hardware, Filling areas, aliasing & anti-aliasing Hidden surface elimination, Shading, Application to Simple Engineering Problem.

References:

1. Principles of Interactive Computer Graphics William M. Newman
2. Computer Graphics D. Hern and M.P. Baker.
3. Computer Graphics Multimedia and Animation Malay k Pakhira. PHI

CSE-216 NUMERICAL METHODS AND LINEAR ALGEBRA

Numerical solutions of non-linear algebraic equations by Bisection, Regula-falsi, Secant, Newton-Raphson Methods and Newton-Raphson Method with Multiple Roots.

Numerical solutions of systems of simultaneous linear algebraic equations by Gauss elimination method, Gauss Jorden method, Crout's triangularization method, Jacobi's iterative method and Gauss Seidel iterative method.

Finite difference and interpolation, Numerical differentiation, Numerical integration: trapezoidal rule, Simpson’s rules 1/3 & 3/8 and Weddle's rule.

Numerical solution of differential equation: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge's Method and Runge-Kutta's Method.

Matrix: Algebra of matrices, Elementary Row and Column operations, determinants, Rank and nullity, systems (Homogeneous and Non-homogeneous) of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem.

Vector Space: Vector spaces, Subspaces, Linear combinations and subspaces spanned by a set of vectors, Linear dependence and Linear independence.

Reference:

1. Higher Engineering Mathematics by Dr. B. S. Grewal.

Subject Name	Out comes
Discrete Structures	(i) Learn about computer mathematics.
Data Structures	(i) Concept and importance of data structures (ii) Learn to implement various types of data structure. (iii) Learn how To determine algorithm correctness and its efficiency
Digital Electronics	(i) Learn about digital logics and their implementation.
Digital Communication	(i) Learn about the basic concepts of how digital data is transferred across various types of data communication links.
Computer Graphics	(i) Learn about the development of computer graphics technologies (ii) Learn about the various operations which can be applied on computer graphics.

IV SEMESTER SYLLABUS

CSE-221 PROBABILITY AND QUEUEING THEORY

Permutations, combinations, counting, summation, generating function, recurrence relations, asymptotic. Sample space and events- Probability- The axioms of probability- Some Elementary theorems- Conditional probability- Baye's theorem- Random variable- Discrete and continuous- Distribution- Distribution function, Distribution, Binomial and poison distribution Normal distribution- related properties.

Queuing theory- Classification, stationary process, markov process, Binomial process, Poisson process, Birth and death process, Markov chain.

References:

1. Probability and Statistics with reliability, Queuing and Computer Science Trivedi K.S.
2. Reliability Engineering Balagurusamy .E

3. Fundamental of Queuing Theory Gross D,and Harris C.M.
4. Probability Statistics and Queuing Theory Allen, A.O.

CSE-222 COMPUTER ARCHITECTURE

Central processor organizations: basic building blocks, bus organized computer memory, address structure, register transfer languages, instruction formats, expanding op-codes and addressing modes. Control unit organization: hardwired control & micro-programmed control organization, control memory, address sequencing micro-instruction formats, micro-program sequencer, micro-programming. Arithmetic processor design: addition and subtraction algorithm, multiplication algorithm, division algorithm, processor configuration, and floating point arithmetic. Input-Output organization: Asynchronous Data Transfer, Asynchronous Communication Interface, Modes of Transfer: Interrupt-Initiated, Direct Memory Access (DMA). Memory Organization: Main Memory, Auxiliary Memory, Associative Memory: Hardware Organization, Cache Memory: Mapping Schemes, Virtual Memory: Address Space and Memory Space, Address Mapping. Structure of multiprocessors, Introduction to parallel processing, Flynn's classification, pipeline processing, pipeline hazards.

References:

1. Computer Organization and architecture William Stallings
2. Computer Architecture Morris Mano,
3. Computer Organisation & Architecture T.K. Ghosh,

CSE-223 THEORY OF COMPUTATION

Finite State Systems, Basic Definitions Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with E-moves, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa, Myhill-Nerode Theorem and minimization of finite Automata. Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines, Properties of Regular Sets: The Pumping Lemma for Regular Sets, Closure properties of regular sets. Context free grammar and ambiguity, reduced forms, Removal of useless symbols and unit production, Chomsky Normal Form (CNF), Griebach Normal Form (GNF). Introduction to Pushdown Machines, Application of Pushdown Machines, context free grammar to PDA and vice versa, Closure properties of CFL. Deterministic and Non-Deterministic Turing Machines, Design of T.M, Halting problem of T.M., PCP Problem. Chomsky hierarchies of grammars, Context sensitive grammar, unrestricted grammars, Context sensitive languages, Relation between languages of classes. Computability: Basic concepts, Primitive Recursive Functions.

References:

1. Introduction to automata theory, language & computations Hopcroaft & O.D. Ullman, R Mothwani,
2. Theory of Computer Sc.(Automata, Languages and computation): K.L.P. Mishra & N. Chandrasekaran,
3. Introduction to formal Languages & Automata Peter Linz,
4. Fundamentals of the Theory of Computation- Principles and Practice Ramond Greenlaw and H. James Hoover
5. Introduction to the Theory of Computation Michael Sipser

CSE-224 DATABASEMANAGEMENT SYSTEMS

Fundamentals of DBMS, different data models. Relational database systems. ER modelling, Enhanced ER Model, ER to Relational Mapping. Relational Database Design, integrity constraints, functional dependency constraints, assertions, triggers, Normalization in relational approach. Relational algebra and calculus. SQL, overview of query processing and cost estimation, Query Optimization, Transaction processing and concurrency control. Data storage and indexing, B-Trees and B+ Trees, Overview of advanced databases.

References:

1. Fundamentals of Database Systems Elmasri & Navathe
2. Database System Concepts Silberschatz, Korth & Sudershan .
3. An Introduction to Database Systems C. J. Date

CSE-225 ANALYSIS AND DESIGN OF ALGORITHMS

Fundamentals of algorithm, asymptotic complexity, recursive algorithms, recurrence relation, heap, priority queue and heap sort. Algorithm Design Techniques their control abstractions and related problems: Divide and conquer, Greedy strategy, Dynamic programming, Backtracking, Branch and bound, least cost search. Introduction to lower-bound theory, Search Trees: BST, AVL, B and B+ trees. Introduction to NP-Complete and NP Hard problems.

References:

1. Computer Algorithms Horowitz and Sahani.
2. Introduction to Algorithms Cormen and Rivest
3. An Introduction to Algorithms Thomas H Cormen,Ronald L. Rivest

CSE-226 SOFTWARE ENGINEERING

Introduction to software engineering, software process & process models, Software metrics and measurements, software project management, software project planning, scheduling and tracking, cost estimation methods. Requirements analysis: Principles, complexity,

methods, structured analysis, SRS Documentation. Design principles: abstraction, refinement, modularity, control hierarchy, structured partitioning, design types and methods. Software coding: coding style, coding efficiency, capability maturity model (CMM), Software quality assurance, Software testing: Software testing techniques, choice and classification of test data, verification & validation methods. Software maintenance, configuration management, system documentation, software reusability.

References:

1. An Integrated Approach to Software Engineering PankajJalote,
2. Software Engineering: A Practitioner's Approach R S. Pressman.

Subject Name	Out comes
Probability and Queuing Theory	(i) Learn about basic theory of probability and queuing theory.
Computer Architecture	(i) Learn about architecture of computer. (ii) Learn how computer works.
Theory of computation	(i) Learn about theoretical concepts of computer science. (ii) Learn about language hierarchy and their computational machines.
Database Management system	(i) Learn about the concept of data, databases and database management systems. (ii) Learn about how to handle databases.
Analysis and Design of Algorithms	(i) Learn different algorithm design techniques and study related problems. (ii) How to determine algorithm correctness and its efficiency.

V SEMESTER SYLLABUS

CSE-311 COMPILER DESIGN

Compilers and translators, structure of compiler its different phases, Compiler construction tools. Lexical analyzer, Specification and recognition of tokens, input buffering.

Syntax analyzer, top down and bottom up parsing. Syntax directed definition, syntax directed translation scheme, intermediate codes: syntax tree, post fixed expressions,three address code, quadruples and triples. Code optimization, DAG, Code generation,Symbol table implementation, Error handling

References:

1. Compilers Principle, Techniques & Tools Alfread V. AHO, RaviSethi& J.D. Ullman
2. Theory and practice of compiler writing Tremblay & Sorenson

CSE-312 OPERATING SYSTEMS

Operating system functions and characteristics, design issues, Process abstraction, process management, system calls, threads, process hierarchy, CPU scheduling, comparative study of scheduling algorithms Process synchronization and inter-process communication, message passing mechanisms, Process synchronization constructs Deadlock Characterization, prevention and avoidance, deadlock detection and recovery. Memory management techniques, overlays, dynamic linking, virtual memory concept. Disk structure, Disk scheduling, File System, file access and allocation methods, directory system, file protection mechanisms, implementation issues, Device Management: Hardware organization, device scheduling policies, device drivers. Case Studies: Windows, UNIX, Linux.

References:

1. Operating system Silberschatz and Galvin
2. Operating system Deital
3. Operating system Andrew S. Tanenbaum
4. Operating Systems Gary Nutt &Nabendu Chaki

CSE-313 MICROPROCESSORS

Introduction of Microprocessor, Evolution of Microprocessor, Types of Microprocessor, History of Computers, Memory, Memory organization, Classification of Memory.

8085: Pin Diagram of Microprocessor 8085, Architecture of 8085 and Operations of its Component.

8086: Pin Diagram of Microprocessor 8086-88, Architecture of 8086, Difference between 8085 and 8086, Programming Model, Real mode memory addressing, Introduction to protected mode memory addressing memory paging, Interrupts: hardware and software interrupts.

Addressing modes: Data, program, Stack, memory-addressing modes

Assembly language programming: Instruction set of 8086, Memory Segmentation, Stack and sub routine.

Interfacing: 8251(Universal Synchronous/Asynchronous Receiver/Transmitter), 8253 & 8254 (Programmable Interval Timer), 8255 (Programmable Peripheral Interface), 8259(Programmable Interrupt Controller), 8257(Direct Memory Access), 8279 (keyboard & display, controller).

8051: Introduction to microcontroller 8051, Pin Diagram, Architecture, Memory Organization, Counters and Timers, SFRs (Special Function Registers), Microcontroller Interrupts and Power Consumption Control

Reference:

1. Advanced Microprocessors and Peripherals by Ray and Bhurchandi

VI SEMESTER SYLLABUS

CSE-321 COMPUTER NETWORK

Introduction to TCP/IP and OSI reference model, polling techniques, multiplexing, and concentration, transmission media used in physical layer. MAC protocols ALOHA, CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5) DLL protocols, error correction and detection codes, flow control protocols performance evaluation with error or without error, protocol specification and verification, framing, HDLC. Switching techniques, Routing and congestion in network layer, routing and congestion control algorithms. Connection management in transport layer, protocols of transport layer, TCP , UDP etc., world wide web (www), electronic mail(E-mail), Study of high speed fibre optic networks, FDDI.

References:

1. Computer Network Tannenbaum.
2. Computer Network W. Stalling.
3. Data network Dimitris and Galliger.
4. Computer Networking: A Top down Approach James F. Kurose, Keith W. Ross

CSE-322 DATA WAREHOUSING AND MINING

Data Warehouse Introduction, Concept Hierarchy Generation Data Warehouse and OLAP Technology - A Multidimensional Data Model Stars, Snow flake and Fact Constellations Schemas for Multidimensional Databases, OLAP operations, Data Warehouse Architecture. Introduction to data mining - kinds of data, relational databases, traditional databases, advanced database systems. Data Mining functionalities and patterns generated. Data Pre-processing: - Data Cleaning, Data Integration and Transformation, Data Reduction Data Discretization, Associations and Correlations- The Apriori Algorithm, Finding Frequent Item sets Using Candidate Generation Mining, Frequent Item sets without Candidate Generation Mining, Frequent Item sets Using Vertical Data Format Classification- Classification by Decision Tree Induction, Bayesian Classification Rule-Based Classification, Associative Classification Prediction- Linear Regression and Non linear Regression

Clustering- Partitioning and hierarchical Methods Mining Social Network, spatial databases, multidimensional databases, text databases and World Wide Web.

References:

1. Data Mining: Concepts and Techniques Jiawei Han, Micheline Kamber and Jian Pei,
2. Data Mining Introduction and Advance Topic Margaret H. Dunham and S. Sridhar
3. Next Generation of Data Mining Rajeev Motwani and Vipin Kumar
4. Data Ware Housing: Architecture & Implementation Michael W. Hawkins
5. Data Warehousing: Concepts, Techniques, Products & Applications C.S.R. Prabhu

CSE-322 DATA WAREHOUSING AND MINING

Introduction to data mining - kinds of data, relational databases, traditional databases, advanced database systems. Data Mining functionalities and patterns generated.

Data Preprocessing: - Data Cleaning, Data Integration and Transformation, Data Reduction Data Discretization. Concept Hierarchy Generation Data Warehouse and OLAP Technology- A Multidimensional Data Model Stars, Snow flake and Fact Constellations Schemas for Multidimensional Databases, OLAP operations, Data Warehouse Architecture

Associations and Correlations- the Apriori Algorithm, Finding Frequent Item sets Using Candidate Generation Mining, Frequent Item sets without Candidate Generation Mining, and Frequent Item sets Using Vertical Data Format

Classification- Classification by Decision Tree Induction, Bayesian Classification Rule-Based Classification, Associative Classification

Prediction- Linear Regression and Non linear Regression

Clustering- Similarity and distance measures, Outliers, Partitioning and hierarchical Methods, Mining Social Network, spatial databases, multidimensional databases, text databases and World Wide Web.

References:

1. Data Mining: Concepts and Techniques Jiawei Han, Micheline Kamber and Jian Pei,
2. Data Mining Introduction and Advance Topic Margaret H. Dunham and S. Sridhar
3. Data Warehousing in the real World, Sam Anahory and Dennis Murray

CSE-323 ARTIFICIAL INTELLIGENCE

Meaning and definition of artificial intelligence, Production systems: types, characteristics, study and comparison search techniques: BSF, DSF, hill climbing, best first search, A*

algorithm, AO* algorithm etc, types of control strategies. Knowledge representation: Problems faced, propositional and predicate logic, resolution and refutation, deduction, theorem proving. Reasoning: introduction, reasoning methods, Baye‘s theorem, Bayesian network, fuzzy logic. Slot and filler structures: semantic networks, frames, conceptual dependency, scripts etc. Game playing and its techniques, planning techniques, study of blocks world problem in robotics, understanding, natural language processing and common sense. Learning and its techniques, neural networks and its applications, expert systems.

References:

1. Artificial Intelligence Elaine Rich and Kevin Knight .
2. Introduction to Artificial Intelligence Eugene Charniak and Drew McDermott
3. Neural Networks, Fuzzy Logic & Genetic Algorithms: Synthesis & Applications S. Rajasekaran, G.A. VijyalakshmiPai
4. Artificial Intelligence: A New Synthesis Nils J. Nilsson

DEPARTMENTAL ELECTIVES FOR V AND VI SEMESTER

CSE-331 ADVANCE COMPUTER ARCHITECTURE

Pipeline processor principles and design, Instruction set architecture; Memory addressing; Instruction composition; Instruction-level parallelism; Hazards: dynamic scheduling, branch prediction; Memory hierarchy; Processor case studies; Multiprocessor introduction: Shared-memory architectures, their synchronization and consistency issues, advanced multi-core topics; Transactional Memory; Interconnection networks.

References:

1. Computer Architecture and parallel processing Kai Hwang, Briggs
2. Advanced Computer Architecture: Parallelism, Scalability, Programmability Kai Hwang,
3. Computer Architecture: A Quantitative Approach, J. L. Hennessy and D. A. Patterson
4. Parallel Computer Architecture: A Hardware/Software ApproachDavid Culler, J.P. Singh and Anoop Gupta
5. Computer Architecture & Organization John P. Hayes

CSE-332 SOFTWARE REUSABILITY

Software Engineering Process, Software Reuse Factors, Reuse driven Software Engineering Business, Overview of software reuse metrics. Architectural Style: Object oriented software engineering Application and component systems, Use Case Components, Object components, Layered architecture. Approaches for software reuse - Patterns, Frameworks and Components. Pattern and Framework Approaches: Design patterns, Analysis patterns,

Organizational patterns, Anti-patterns. Creational Patterns, Structural Patterns, Behavioral Patterns, Architectural Patterns. Component System Engineering & Application System Engineering: Requirement analysis, Robustness analysis, Designing, Implementing, Testing and Packaging of the Component system. Case Studies.

References:

1. Reusability and Software Construction: C and CJerry D. Smith.
2. Design Patterns: Elements of Reusable Object-Oriented Software Richard Helm, Erich Gamma, John Vlissides and Ralph Johnson.
3. Reuse-Based Software Engineering: Techniques, Organizations, and Controls Hafedh Mili and Sherif M. Yacoub.
4. Software Reusability Wilhelm Schafer, Diaz Prieto and Wilhelm Shafer .

CSE-333 CAD OF DIGITAL SYSTEMS

Digital Systems And VLSI, Basic Electrical Properties Of CMOS, Data Structure in VLSI design, Fabrication And Devices, Logic Gates, Combinational Logic Networks, Sequential Machines, Subsystem/ Peripheral Design, Validation And Testability, Floor planning and Architecture Design

References:

1. Modern VLSI Design: IP-Based Design Wayne Wolf
2. Basics VLSI Design Pucknell and Eshraghian

CSE-334 PARALLEL AND DISTRIBUTED ALGORITHMS

Introduction to parallel algorithm, data parallel and control parallel approach, models of parallel computation, dense matrix algorithm , sorting searching, selection and graph algorithms. Introduction to distributed algorithms, synchronous algorithms network model, leader election algorithm, minimum spanning tree, shortest path, distributed consensus k agreement problem, two phase commit, three phase commit, mutual exclusion algorithms, and applications of distributed algorithm.

References:

1. Parallel algorithms Michael. J. Quinn
2. Distributed algorithm Nancy Lynch
3. Implicit Parallel Programming in Ph, Rishiyur S. Nikhil, 1947- Arvind

CSE-335 DISTRIBUTED DATABASE

Introduction to Distributed Database Systems, Distributed DBMS Architecture, Distributed Database Design, Semantic Data Control, Overview of Query Processing, Introduction to Transaction Management, Distributed Concurrency Control, Parallel Database Systems, Distributed Object Database Management systems, Database Interoperability

References:

1. Principles of Distributed Database Systems, M. TamerOzsu Patrick Valduriez
2. Distributed Databases Principles and Systems, Stefano Ceri and Guiseppe Pelagatti**.**

CSE-336 EMBEDDED SYSTEMS

Introduction, Hardware & electronics fundamentals, Peripherals Program Design and Analysis, Processes and Operating system, Real time Operating system. Memory,

Interfacing Examples of Embedded systems: Digital Camera Examples, Smart card application, embedded database applications, etc. State Machine and Concurrent Process Models, Control Systems Verilog programming, Programming of mobile and Hand-held devices IC Technology Full-Custom (VLSI) IC Technology, Semi-Custom (ASIC) IC Technology, Programmable Logic Device (PLD) IC Technology, FPGA Hardware Software Partitioning, Hardware/Software Co-Simulation, Intellectual Property Cores, Low Power design

References:

1. Embedded system Design, Frank Vahid, Tony Givargis
2. Computer as Components, Wayne Wolf
3. 8051 Microcontroller & Embedded Systems, Rajiv Kapadia
4. The 8051 Microcontroller & Embedded Systems, Mazidi & Mazida

CSE-337 CRYPTOGRAPHY

Introduction to cryptography. Security Attacks, Mechanism and Services. Cryptosystems, Conventional encryption model and techniques, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers. Block ciphers principals, fiestal structure, SPN, DES, triple DES, AES, IDEA encryption and decryption, key distribution. Finite field: Introduction to graph, ring and field, modular arithmetic, Fermat‘s and Euler‘s theorem, Euclid‘s Algorithm, Chinese Remainder theorem, Entropy and huffman’s coding, Comparison of symmetric and public-key cryptographic systems, Modern Trend in asymmetric key Cryptography-Elliptic curve based cryptography,Principals of public key crypto systems, RSA algorithm, Diffle-Hellman

key exchange algorithm, Message Authentication and Hash Function: security of hash functions and MACS, MD5 message digest algorithm, secure hash algorithm (SHA). Digital Signatures.

References:

1. Cryptography and Network Security: Principles and Practice William Stallings,
2. Cryptography Theory and Practice Douglas R. Stinson.
3. Applied Cryptography: Protocols, Algorithms Bruice Schneier

CSE-338 HETEROGENEOUS COMPUTING

Heterogeneous computing: Overview, Types of system, Areas of heterogeneity, Shortcomings of Homogeneous System. Heterogeneous computing by multiple CPUs: Grid, Cluster and Other multi-core architectures. Heterogeneous computing using CPU-GPU: Overview of GPUs, Introduction of GPGPU, Architecture, Features, Programming model, Thread Organization, Memory management, GPU-CPU load balancing, Optimization, Floating Point Performance, Multiple GPUs.

Case study: GPGPU based Heterogeneous computing by OpenCL and CUDA.

References:

1. State-of-the-art in heterogeneous computing Andre R. Brodtkorb
2. Heterogeneous Processing: a Strategy for Augmenting Moore's Law, Amar Shan,
3. Heterogeneous Computing with Open CL Benedict Gaster

CSE-339 DIGITAL IMAGE PROCESSING

Introduction to Image Processing Systems, Digital Image Fundamentals:- Image model, Relationship between Pixels, Imaging geometry, Camera model, Image Sensing and Acquisition, Sampling and quantization, Image Enhancement and in spatial Domain: Point processing, Neighbourhood Processing, High pass filtering, High boost filtering, zooming. Image Enhancement based on Histogram modelling, Image Enhancement in frequency domain: 1D& 2D Fourier transform, Low pass frequency domain filter, High pass frequency domain filters, Homomorphics filtering, Image Segmentation, Detection of discontinuation by point detection, line detection, edge detection, Edge linking and boundary detection Local analysis, global by graph, theoretic techniques, Thresh-holding, Morphology, Representation and description, Discrete image transform, Image Compression, Wavelet transformation, Image geometry, Image restoration.

References:

1. Digital Image Processing Gonzalez & Wood
2. Digital Image Processing A.K. Jain .Image Processing Dhananjay K.

CSE341 E-COMMERCE AND E-GOVERNANCE

Introduction: Electronic Commerce, Technology and Prospects, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, E-Commerce Strategy, E-Commerce emerging Issues and implementation issues, E- Commerce Law, Govt. policies and Agenda. Electronic Payment Systems: Credit cards, debit cards, smart cards, e-credit accounts, e-money, Marketing on the web, marketing strategies, advertising on the web, customer service and support, introduction to m-commerce. E-payment security. E-Government, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, its scope and content, benefits and reasons for the introduction of e- governance, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying ,interactive services/G2C2G. E-readiness, e-government readiness, E- Framework, step & issues, application of data warehousing and data mining in e-government, Case studies: NICNET-role of nationwide networking in e- governance, e-seva. E-Government systems security: Challenges and approach to e-government security, security concern in e-commerce, security for server computers, communication channel security, security for client computers.

References:

1. Electronic Commerce: A Managerial Perspective Efraim Turban, Jae Lee

CSE-342 ADVANCE DATA STRUCTURE

Amortized complexity, Introduction to external sorting, Selection trees & k-way merging, Run generation, Optimal merging of runs, Buffering, Double-ended priority queues. Interval heaps, Leftist trees, Binomial heaps, Fibonacci heaps, Dictionaries, Optimal Binary Search Trees, AVL trees, Red-black trees, B-trees, B+ and B*-trees, Splay trees, Splay Trees, Binary Tries, Compressed Binary Tries, Suffix Trees, Bloom Filters, Interval Trees, Priority Search Trees, Skip lists, Treaps.

References:

1. Fundamentals of data structures in C++, by E. Horowitz, S. Sahni, and D. Mehta, Second Edition, Silicon Press, 2007

CSE-343 PRINCIPLES OF PROGRAMMING LANGUAGE

Preliminary concepts of programming language, Issues in Language Translation: Syntax, Semantics, Stages, analysis and synthesis, Data types, Expressions and Statements, Subprograms and Blocks, Abstract Data types, Exception handling, Logic Programming Language, Functional Programming Languages, Object-oriented programming.

Semantic gap, Language evaluation criteria, Introduction to 4G Languages, Implementations of modern programming languages-Java, C#. Concurrency: Subprogram level concurrency, semaphores, monitors, message passing.

References:

1. Concepts of Programming Language Robert .W. Sebesta
2. Programming Languages Louden
3. Programming languages Ghezzi
4. Programming Languages Design and Implementation Pratt and Zelkowitz,

Subject Name	Outcomes
Artificial intelligence	(i) How to map human intelligence in computer system processes. (ii) How to represent knowledge. (iii) Design of experts system.
Advance Computer Architecture	(i) How high processing and multi core machine works. (ii) Designing of multi core processing unit.
CAD of Digital Systems	(i) Learn about how to design very large scale processing unit. (ii) Hardware programming.
Distributed database	(i) How to manage large databases on distributed machines. (ii) How to make fast access of large data.
Cryptograph	(i) How to secure information. (ii) How to authenticate users.
Digital Image Processing	(i) How to handle and process different types of images in computers.
Software Reusability	(i) Learn the methods of Design and implementation of software components so that they can be reused.
Parallel and Distributed Algorithm	(i) How to design parallel algorithm from serial.

	(ii) How to process parallel algorithm of distributed environment.
Embedded System	(i) Ability to create hardware for any software for real time processing.
Heterogeneous computing	(i) Learn about how to process any code on different types of processing units present on single machine.
E-commerce & E- governance	(i) Learn about various electronic -commerce methods and their security issues. (ii) Learn about various e-governance policies.
Principles of programming languages	(i) To improve ability to develop effective algorithms,Improve use of existing programming languages, increase vocabulary of useful programming constructs, To make easier to design a new programming language.

OPEN ELECTIVES FOR V AND VI SEMESTER

CSE-351 MULTIMEDIA

Introduction to multimedia, Multimedia system design, data and file format standards, data compression and decompression techniques, lossy and lossless compression. Multimedia input and output technologies, storage and retrieval technologies. Multimedia Communications, multimedia communication protocols (UDP, RTP, RTCP, XTP, TELNET, IP Multicast etc), network performance parameters, streaming. Multimedia Applications and Design issues, hypermedia message, integrated multimedia message standards. Multimedia authoring system and tools user interface design.

References:

1. Multimedia system Design Prabhat K Andleigh and KiranThakrar
2. Multimedia Communications Fred Halsall

CSE-352 OBJECT ORIENTED DESIGN AND MODELING

Object oriented programming concepts, Object Orientation, OMT Methodology, Object and Class, Link and Association, Generalization, Aggregation, Multiple Inheritance, Packages. Object Meta modeling, Functional Modeling. Analysis: Object Model, Data Dictionary, Dynamic Model, Functional Model, Interaction Modeling-Use case model, Sequence model, and Activity models, System Design, Object Design, Implementation-Implementation using programming language and Database, UML Modeling.

References:

1. Object-Oriented Modeling and Design by Michael Blaha / William Premerlani, Prentice Hall
2. Object-Oriented Programming in C++ by Robert Lafore
3. OMT Insights by Dr. James Rambaugh

CSE-353 SIMULATION AND MODELING

Systems, modelling, general systems theory, concept of simulation, simulation as a decision making tool, types of simulation. Pseudo random numbers, methods of generating random variables, discrete and continuous distributions, testing of random numbers, concepts of Queuing theory. Design of simulation experiments: Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation validation. Simulation languages: Comparison and selection of simulation languages, study of these simulation language. Case studies: Development of simulation models using simulation language

studied for systems like queuing systems, Production systems, Inventory systems, maintenance and replacement systems and Investment analysis.

References:

1. System Simulation Geoffrey Gordon
2. System Simulation with Digital Computer Narsingh Deo

CSE-354 UNIX INTERNALS AND SHELL PROGRAMMING

Evolution of Unix OS, Architecture of the UNIX OS, Heavy kernel and micro kernel architecture,the buffer cache, internal representation of files (inode, accessing blocks, releasing blocks, structure of regular files, conversion of a path name to an inode, inode assignment to a new file, allocation of disk block) Comparisons of UNIX file system with other file systems. System calls for the file systems, OPEN, READ, WRITE, and CLOSE, PIPES, the pipe system call , opening a named pipes, reading and writing pipes, closing pipes, DUP, mounting and amounting file system, LINK ,UNLINK, SYSTEM call for TIME and CLOCK. The structure of processes, process states and transitions, layout of system memory, the context of a process, saving the context of the process, manipulation of the process address space.Light weight process (Threads) kernel level thread, user level threadProcess control, process creation, signals, process termination, awaiting process termination, the user id of a process, changing the size of the process, the system BOOT and INIT process. Shell programming, study of different type of shell like C shell, Bourne shell etc. shell script, shell command, looping and making choices, for Loop, while and until, passing arguments to scripts, programming in different shells. Inter process communication, process tracing, network communication, sockets multiprocessor system, problem of multiprocessor systems, solution with master a slave processor, solution with semaphores, study of distributed UNIX system.

References:

1. The Design of UNIX Operating System Maurice J Bach.

CSE-355 INFORMATION THEORY AND CODING

Information and entropy information measures, Shannon's concept of information. Channel coding, channel mutual information capacity (BW) , theorem for discrete memory less channel, information capacity theorem , error detecting and error correcting codes, types of codes : block codes, hamming and Lee metrics, description of linear block codes ,parity check codes ,cyclic code, masking techniques. Compression : loss less and lossy, Huffman codes, LZW algorithm, Binary image compression schemes, run length encoding, CCITT group 3 1-D compression, CCITT group 3 2D compression, CCITT group 4 2D Compression.

Convolution codes, sequential decoding. Video image compression: CITT H 261 Video coding algorithm, audio (speech) compression. Cryptography and cipher.

References:

1. R Bose, “Information Theory, Coding and Crptography”, TMH 2007
2. Multimedia system Design by Prabhat K Andleigh and KiranThakrar(PHI Publications).
3. Multimedia Communications by Fred Halsall(Pearson Publications).

CSE-356 STATISTICAL METHODS

Introduction to Statistics, Meaning of Statistics as a Science, Importance of Statistics. Scope of Statistics, Introduction to Data Analysis, Population and Sample, Types of characteristics , Types of data, Notion of a statistical population, Methods of sampling, Presentation of Data, Data Visualization, Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis, Theory testing ,Optimization, Hypothesis Testing, Bayesian Statistics,7 Subjective Probabilities, Heuristic analysis, Histograms:, Regression, Correlation, Error, Relational Databases, Cleaning Data:

References:

1. Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata.
2. Dawn Griffiths: Modern Head First Statistics, O Reilly Publication
3. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers
4. Mukhopadhyay, P.: Mathematical Statistics (1996), New Central Book Agency, Calcutta, Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York.

Subject Name	Outcomes
Multimedia	(i) Learn about various types of multimedia formats and their processing.
Simulation & Modelling	(i) Learn how to design a model for any real life problem (ii) Mathematical representation of any real life problem.
Object-oriented Programming	(i) Learn different types of object oriented concepts and their implementation.
UNIX internals & shell programming	(i) Learn about internal architecture of UNIX operating system.

	(ii) How to design shell scripts. (iii) Learn how to modify kernal code.

VII SEMESTER

CS-411TCP/IP AND WEB TECHNOLOGY

Introduction to TCP/IP network model,

IP: Internet Protocol- IP header, IP Routing Principal, IP Fragmentation, Checksum, IP options. Subnetting, Subnet masks, Supernetting, CIDR Directly/indirectly connected machines, IP addresses. Ethernet, framing, ARP, ARP Cache, ARP Packet Format, RARP, Serial Links, Bridges, Spanning Tree algorithm, ICMP- ICMP message type, ICMP address mask request and reply, ICMP Query and Error message, determining the path MTU.RARP and ARP.

Transport layer protocols: TCP and UDP: TCP and UDP header, Connection Establishment and Termination, TCP State Transition diagram, Segmentation, Maximum Segment Size. ISN and sequence numbers. TCP data transfer -- sliding windows, slow start, congestion avoidance, fast retransmit, fast recovery.TCP – Timeout and Retransmission. Sockets.

Web Technology: DNS, IGMP, FTP, POP, SMTP, HTTP, HTML, XML Basic concept of client/server computing.

References:

1. W Richard Stevens, TCP/IP Illustrated Vol. I: The Protocols, Pearson Education Asia, 2000.
2. W Richard Stevens, TCP/IP Illustrated Vol. III: TCP for Transaction, HTTP, NNTP, and the UNIX Domain Protocols, Pearson Education Asia, 2000.

VIII SEMESTER

CSE-421 NETWORK SECURITY

Introduction to Network security: Network security needs. Threats to network security, kind of computer security. security policies, security mechanisms, Attacks, security tools and Basic Cryptography, Transposition/Substitution, Block Cipher Principles, Introduction to Symmetric crypto primitives, Asymmetric crypto primitives, Secret Key Cryptography , Data Encryption Standard (DES), Message Digests, MD5, Message Authentication and Hash Functions, Hash And Mac Algorithms, RIPEMD , HMAC, Principles of Public Key Cryptosystems, Diffie Hellman Key Exchange , Elliptic Curve Cryptography, Cryptanalysis, SHA-1, RSA, Selection of public and private keys. Key distribution centres and certificate authorities, digital signature standards (DSS), proof of digital

signature algorithm. Kerberos, Real-time Communication Security, IPsec, Electronic Mail Security. Firewalls and Web Security, Intruders and Viruses, trusted system, password management. Cyber crime, zero knowledge proof, malware – privacy, honey pot, defence programming, web application vulnerability, DHS , attack , semantic attack, DOS, DDOS, wireless attack.

References:

1. Cryptography and Network Security William Stallings
2. Introduction to network security Krawetz, Cengage

SUBJECT NAME	OUTCOME
Network Security	(i) How to secure information on Internet. (ii) How to authenticate users on Internet.

DEPARTMENTAL ELECTIVES FOR VII AND VIII SEMESTER

CSE-431 SOFTWARE TESTING

Software Testing Principles, Quality, Testing flow process. Defect Classification: Origin of Defects, Classes, Repository and Design, Developer/Tester Support for Developing a Defect Repository. Test Case Design Strategies: Black Box Approach , Random Testing, Equivalence Class Partitioning, Boundary Value Analysis, COTS, White Box approach, Test Adequacy Criteria, Coverage and Control Flow Graphs, Covering Code Logic, Additional White Box Test Design Approaches, Evaluating Test Adequacy Criteria. Unit testing, Integration tests, System testing, Regression testing and Acceptance testing, Test Plan Writing. Testing Tools. Criteria for Test Completion.

References:

1. Software Testing in the Real World – Improving the Process Edward Kit
2. Effective Software Testing Elfriede Dustin
3. The Art of Software Testing Glenford J. Mayers
4. Foundations of Software Testing Aditya P. Mathur

CSE-432 CLOUD COMPUTING

Cloud Computing: Introduction, Working of cloud computing, benefits; Understanding Cloud Computing: Developing cloud computing services, Discovering cloud services; Cloud Computing for Everyone: Centralizing email communications, Cloud computing for community; Cloud Computing for the Corporation: Managing Schedules, Managing Projects; Using Cloud Services: Collaborating on Calendars, Schedules, and

Task Management, Collaborating on Project Management Outside the Cloud: Other Ways to Collaborate Online: Collaborating via Web-Based Communication Tools, Collaborating via Social Networks and Groupware.

References:

1. Cloud Computing Michael Miller,
2. Implementing and Developing Cloud Computing Applications David E.,Y. Sarna,

CSE-433 DISTRIBUTED COMPUTING

Distributed Computing: Introduction, Types, and Various system models. Communication and Processes: RPC, RMI and others, Client and Server threads. Clock Synchronization: Types of clock and their synchronization, Introduction to distributed mutual exclusion, Election of a process, Consensus and related problems; Consistency: Various types of consistency, Consistency protocols, Fault tolerance: Introduction to fault tolerance, Process resilience; Protection and security in distributed systems: Various types of security techniques, Cryptography; Examples of distributed systems: Distributed file systems, Distributed shared memory and others.

References:

1. Distributed Systems Principles and paradigms Andrew S. Tanenbaum and Maarten
2. Distributed systems, concepts and design, George Colouris, Jean Dollimore and Tim Kindberg.

CSE-434 PATTERN RECOGNITION

Introduction to Pattern Recognition, Regular Pattern, Irregular Pattern, Approaches to Pattern Recognition, Parametric, Non-Parametric Approaches. Parzen window method for density estimation, Feature selection, Search methods, Pattern Recognition Applications., Discriminant functions, Decision surfaces, Classification algorithms: Naive Bayes, Random Tree, Random Forest, Multiple Polynomial Regression, Classification using SVM. Classifier Ensembles, , Linear Regression, Introduction to hidden Markov models (HMMs), Discrete HMMs and Evaluation problem, Forward method for evaluation problem, Backward method for evaluation problem, Parameter estimation for HMMs, Continuous density HMMs (CDHMMs),Types of Clustering, K-Mean Clustering, Iso-data Clustering, Clustering Metrics, Clustering applications, Fuzzy K-Mean, Clustering tendency, Semi Supervised learning. Fuzzy variants of classification and clustering algorithms, Neural networks fundamentals, Genetic Algorithms, Neural and Genetic based

approaches for Pattern recognition, Self organizing maps, Advantages/Disadvantages of Neural based approaches for Pattern Recognition.

References:

1. Pattern recognition and image processing Earl Gose
2. Pattern classification Duda, Hart, stork.

CSE-435 COMPUTER VISION

Introduction to computer vision, computer imaging system, Image formation and sensing CVIP tools, Image representation. Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization. Image Enhancement in the Spatial Domain, Image Enhancement in the Frequency Domain, Homomorphic Filtering. Image Restoration, Colour Image Processing, Segmentation, Thresholding, The Use of Motion in Segmentation, Image Compression, Error-Free Compression, Lossy Compression, Image Compression, Standards, Wavelets and Multiresolution Processing, Multiresolution Expansions, Wavelet Transforms.Chain code, Tracking and Motion model, Reflectance map, Photometric stereo.

References:

1. Computer Vision Young, Tzay Y.
2. Computer vision Dana H. Ballard

CSE-436 RANDOMIZED ALGORITHMS

Introduction to randomized algorithms. Game Theoretic Techniques. Probabilistic Method, MarkovChains and Random Walks. Randomized Data Structures: Treaps, skip lists, Hash tables. Geometric algorithms and linear programming, Graph algorithms, Approximate Counting, Online Algorithms.

References:

1. Randomized Algorithm Motwani and Raghavan

CSE-437 NATURAL LANGUAGE PROCESSING

Introduction, Stages of NLP, Sequence Labeling and Noisy Channel, Argmax Based Computation, Noisy Channel Application to NLP, N-grams, Part-of-Speech Tagging, Hidden Markov and Maximum Entropy Models, Formal Grammars of English, Syntactic Parsing, Statistical Parsing, Information Extraction, NLP and IR Relationship, Question Answering and Summarization, Machine Translation.

References:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition D. Jurafsky and J. Martin
2. Foundations of Statistical Natural Language Processing C. Manning and H. Schutze

CSE-438 MOBILE COMPUTING

Introduction to Mobile Communications and Computing, novel applications, GSM: Mobile services, System architecture, and new data services. (Wireless) Medium Access Control :Motivation for a specialized MAC, DMA, FDMA, TDMA, CDMA. Mobile Network Layer: Mobile IP, IP packet delivery, Dynamic Host Configuration Protocol (DHCP). Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP. Database Issues: client server computing with adaptation, transactional models, and quality of service issues. Mobile Ad hoc Networks (MANETs): Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs. Protocols and Tools: Wireless Application Protocol-WAP. Bluetooth and J2ME.

References:

1. Mobile Communications Jochen Schiller
2. Handbook of Wireless Networks and Mobile Computing Stojmenovic and Cacute
3. Fundamentals of Mobile and Pervasive Computing Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren

CSE-439 QUANTUM COMPUTING

Quantum Computing: Overview of traditional computing and Quantum computing, Church-Turing thesis, Circuit model of computation, Quantum physics and Computation, Dual vectors, Operators; Qubits and Quantum modle of computation: State of a quantum system, Time evolution of a closed system, Composite systems, States and general quantum operations, Quantum gates, Universal sets of quantum gates; Quantum Algorithms: Superdense coding, quantum teleportation, probabilistic versus quantum algorithms, phase kick-bac, the Deutsch algorithm, Quantum phase estimation and Quantum Fourier Transform , Shor's algorithm for order finding ,Quantum search algorithm; Quantum computational complexity and error: Computational complexity, Black-box model, Lower

bounds for searching, General black-box lower bounds, Classical error correction , Fault tolerance, Quantum error correction.

References:

1. Quantum Computing V. Sahni,
2. An introduction to Quantum Computing P. Kaye, R. Laflamme, and M. Mosca,

CSE-441 SENSOR NETWORK

Introduction of ad-hoc/sensor networks: key definitions, advantages, unique constraints and challenges, applications, and wireless communications/radio characteristics. Media Access Control and routing protocols for Ad-Hoc wireless networks: issues, classification and protocols. Networking Sensors: features, deployment of sensor networks, sensor tasking and control. Sensor Network platforms and tools: Berkley Motes ,Sensor network programming challenges ,Embedded Operating System. Transport layer, QoS issues and security protocols for ad hoc and sensor networks. Simulators for wireless ad hoc and sensor networks. Applications of Ad-Hoc/Sensor Network and Future Directions.

References:

1. Ad hoc Wireless Networks C. Siva Ram Murthy & B. S. Manoj
2. Wireless Sensor Networks: Information Processing Approach Feng Zhao and Leonidas J. Guibas.

CSE-442 WEB SEARCH & MINING

Introduction, Document representation, Term-document matrix, Query languages and query, Boolean retrieval, Indexing and searching, Scoring, Term weighting, Vector space model, Ranking, Evaluation in information retrieval, Probabilistic information retrieval, Text classification and Naive Bayes, clustering, Matrix decompositions and latent semantic.

References:

1. An introduction to Information Retrieval Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, Cambridge University Press.

CSE-443 BIG DATA ANALYTICS

Introduction to Big Data Analysis: What is big data, History of big data innovation, Big data architecture, Characteristics of big data, Data in warehouse and data in hadoop, Big data importance, Big data application.

Big Data in Cloud: Introduction to cloud, Storage as a services in cloud, Use of big data in cloud, Accessing big data in cloud using mobile device, Big data productive and prescriptive analytics

Big Data Technology and Tools: Hadoop, MapReduce and YARN, HDFS, HBase, Open source technology for big data analytics, Component of hadoop, Application development in hadoop, Getting your data base in hadoop.

Developing Big Data Application: Parallelism, Application development framework, MapReduce programming model, NoSQL data management for big data, Scheme-less model, Graph analytics for big data.

Big Data Privacy and Ethics: Big data privacy, when data should and should not be used, Fraud and big data, Risk and big data, Credit risk management, Big data ethics, Transparency, Privacy and Identity.

References:

1. Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and GraphBy David Loshin
2. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data: Analytics for Enterprise Class Hadoop and Streaming Data By Paul Zikopoulos, Chris Eaton.
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, By Michael Minelli, Michele Chambers, Ambiga Dhira.

Subject Name	Outcomes
Software Testing	(i) Learn how to test programming models (ii) Learn how to write different test cases for any program to test input/output compellability.
Cloud Computing	(i) Learn how to reduce spending on technology infrastructure (ii) How to get more work done in less time with less people (Streamline processes).
Distributed Computing	(i) Learn about how to design applications which execute on distributed machines. (ii) Learn about how to share resources in distributed environments.

Pattern Recognition	(i) Learn about methods to identify different types patterns present on a data set.
Computer Vision	(i) Learn about how to make computer to understand its environment by getting human like vision capabilities.
Randomized Algorithm	(i) Learn how to employ a degree of randomness as part of its logic. (ii) Learn How to distinguish between algorithms that use the random input to reduce the expected running time or memory usage.
Natural Language Processing	(i) Learn about processing of natural languages on computer system (ii) learn about how to make computer to understand human problems and their solution
Mobile computing	(i) Learn about different types of mobile communication
Quantum computing	(i) learn How a quantum computer will be able to perform any task that a classical computer can.
Sensor Network	(i) Learn about different types of network which can be handled by sensors. (ii) Learn about processing of various protocol and their implementation in Sensor networks.
Web search and Mining	(i) Learn about how to process data present on World Wide Web. (ii) Learn about various types of information retrieval tool and their working.

OPEN ELECTIVES FOR VII AND VIII SEMESTER

CSE-451 GRAPH THEORY

Definition of a graph and directed graph, simple graph. Degree of a vertex, regular graph, bipartite graphs, sub graphs, complete graph, complement of a graph, operations of graphs, isomorphism and homomorphism between two graphs, directed graphs and relations. Walks, paths and circuits, connectedness of a graph, Disconnected graphs and their components, Konigsberg 7-bridge problem, around the world problem, Euler graphs, Hamiltonian paths and circuits, Existence theorem for Eulerian and Hamiltonian graphs. Trees and their properties, distance and centre in a tree and in a graph, rooted and binary trees, spanning trees and forest, fundamental circuits, cut sets, connectivity and separability,1- isomorphism, 2-isomorphism, breadth first and depth first search. Incidence matrix and its sub matrices, Reduced incidence matrix, circuit matrix, fundamental circuit matrix, cut set matrix, fundamental cut set matrix, path matrix, adjacency matrix of a graph and of digraph. Planar graphs, Euler‘s formula, Kuratowski‘s graphs, detections of planarity, geometric dual, combinatorial dual. Chromatic number, independent set of vertices, maximal independent set, chromatic partitioning, dominating set, minimal dominating set, chromatic polynomial, colouring and four colour problem, coverings, matching in a graph. Network flows, Ford-Fulkerson algorithm for maximum flow, Dijkstra algorithm for shortest path between two vertices, Kruskal and Prim‘s algorithms for minimum spanning tree.

References:

1. Graph Theory with Applications to engineering and computer science Deo Narsingh.
2. A first Look at Graph Theory Clark John and Holton D.A.,
3. Graphs and Applications: An Introductory Approach Aldous and Wilson,
4. Graph Theory Reinhard Diestel,

CSE-452 OPTIMIZATION TECHNIQUES

Engineering application of Optimization, Formulation of design problems as mathematical programming problems, General Structure of Optimization Algorithms ,Constraints, The Feasible Region, Branches of Mathematical Programming ,Gradient Information, The Taylor Series, Types of extrema, Necessary and Sufficient Conditions for Local Minima and Maxima, Classification of Stationary Points , Convex and Concave Functions, Optimization of Convex Functions, General Properties of Algorithms ,An Algorithm as a Point-to-Point Mapping, An Algorithm as a Point-to-Set Mapping Closed Algorithms , Descent Functions, Global Convergence, Rates of Convergence. Unconstrained Optimization: One dimensional

optimization techniques: Dichotomous Search, Fibonacci Search ,Golden-Section Search, Quadratic Interpolation Method ,Cubic Interpolation, The Algorithm of Davies, Swann, and Campey, Inexact Line Searches , Multidimensional Gradient Methods ,Steepest-Descent Method, Newton Method Gauss- Newton Method, Conjugate-Direction Methods: Conjugate Directions, Basic Conjugate-Directions Method, Conjugate-Gradient Method, Minimization of Non-quadratic Functions, Fletcher-Reeves Method, Powell's Method, Partan Method. Quasi-Newton Methods: The Basic Quasi-Newton Approach, Generation of Matrix Sk ,Rank-One Method, Davidon-Fletcher-Powell Method, Broyden-Fletcher- Goldfarb-Shanno Method, Hoshino Method, The Broyden Family, The Huang Family, Practical Quasi- Newton Algorithm, Applications of Unconstrained Optimization, Nonlinear Least Squares Problem and Algorithms. Linear Programming: Graphical method, Simplex method, Duality in linear programming (LP),Sensitivity analysis, Interior-Point Methods, Primal-Dual Solutions and Central Path, Primal Affine- Scaling Method, Primal Newton Barrier Method, Primal-Dual Interior-Point Methods. Nonlinear Constrained Optimization: Constrained Optimization, Constraints, Classification of Constrained Optimization Problems, Simple Transformation Methods ,Lagrange Multipliers , First-Order Necessary Conditions, Second-Order Conditions, Convexity , Duality Quadratic And Convex Programming: Convex QP Problems with Equality Constraints, Active-Set Methods for Strictly Convex QP Problems , Interior- Point Methods for Convex QP Problems, Cutting-Plane Methods for CP Problems, Ellipsoid Methods. Minimax Methods: Minimax Algorithms, Improved Minimax Algorithms,

References:

1. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou
2. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak

CSE-453 CYBER CRIME AND INFORMATION WARFARE

Introduction of cyber crime, challenges of cyber crime, categorizing cyber crime, cyber terrorism, virtual crimes, perception of cyber criminals: hackers, insurgents and extremist group, interception of data, surveillance and protection, criminal copy right infringement, cyber stalking, hiding crimes in cyber space and methods of concealment. Anonymity and markets, privacy and security at risk in the global information society, privacy in cyber space, war fare concept, information as an intelligence weapon, attack and retaliation attack and defense. An I-WAR risk analysis model, implication of I –WAR for information managers, perceptual intelligence and I-WAR, handling cyber terrorism and information warfare, Jurisdiction.

References:

1. Principle of cyber-crime Jonathan Clough
2. Information warfare: Corporate attack and defence in digital world William Hutchinson, Mathew Warren

CSE-454 WIRELESS NETWORKS

Introduction to wireless communication, and future trends, Wireless Generations and Standards, Wireless Physical Layer Concepts, fundamentals of antennas, Cellular Concept and Cellular System Fundamentals. Spread Spectrum Modulation Techniques, Coding and Error Control, Multiple Access Technique for Wireless Communications, OFDM. Wireless LAN Technologies, Wireless IEEE Standards, Mobile Network Layer (Mobile IP). Mobile Transport Layer (Mobile TCP), Mobile Data network (GPRS), WAP Model and architecture, Introduction to Ad hoc networks, Sensor networks, Bluetooth networks and Wireless Mesh networks.

References:

1. Wireless communication Principles and Practice, T. S. Rappaport
2. Mobile Communications Schiller
3. Principles of Wireless Networks: A Unified Approach Pahalvan, K. and Krishnamurthy,
4. Wireless Communications and Networking William Stallings

CS-455 NEURAL NETWORKS

Introduction to neural networks, working of a biological and an artificial neuron, neural network architectures, single and multi-layer neural networks, perceptron, linear seperability, perceptron training algorithm, back propagation algorithm.

Adeline, madalines, adaptive multi-layer networks, prediction networks, radial basis functions, polynomial networks and regularization.

Difference between supervised and unsupervised learning, winner takes all networks, counter-propagation networks, adoptive resonance theory, neocognitron, Hopfield networks, Bolzmann's training.

Various types of optimization methods like gradient descent simulated annealing etc, bi-directional associative memory networks.

Introduction to fuzzy logic, neuro-fuzzy systems, applications of neural networks.

References:

1. Elements of artificial neural networks by Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.

2. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
3. Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India.

CSE-456 EHTICAL HACKING

Ethical hacking Overview, TCP/IP Concepts Review, network and computer Attacks, Network enumeration and Foot printing- DNS query, Whois query, OS finger printing, Banner grabbing Programming for security professionals- Web application vulnerabilities, Buffer overflow attack, Session hijacking, Code injection attacks- Cross Site Scripting attack, SQL injection attack

Password hacking, windows hacking, network hacking, anonymity and email hacking. Web servers hacking, session hijacking, Surveillance, desktop and server OS Vulnerabilities, Database attacks, hacking wireless networks, cryptography, network protection systems, Trojan and backdoor applications, legal resources, virtualization and Ethical Hacking.

References:

1. Ethical Hacking and Network Defense. Michael T. Simpson, Kent Backman, James Corley
2. Hacking Exposed—Network Security Secrets & Solutions, Stuart McClure Joel Scambray, George Kurtz

CSE-457 BIOMETRICS

Introduction and definitions of biometric. Traditional authenticated methods and technologies. Biometric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palmprint, On-Line Signature Verification, 3D Face Recognition, Dental Identification and DNA. The Law and the use of Multibiometrics systems. Statistical measurement of biometric. Biometrics in Government Sector and Commercial Sector. Case Studies of biometric system., Biometric Transaction. Biometric System Vulnerabilities.

Reference:

1. Biometrics for network security, Paul Reid, hand book of Pearson
2. Handbook of Fingerprint Recognition, D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, Springer Verlag.
3. BIOMETRICS: Personal Identification in Networked,A. K. Jain, R. Bolle, S. Pankanti (Eds.), Society, Kluwer Academic Publishers, 1999.
4. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.), Springer.

CSE-458 MACHINE LEARNING

Supervised Learning-Feature Selection, Cross Validation, Bootstrapping, Normalization

Classification: Naïve Bayes, Bayesian Network, C4.5, Id3, Svm, Neural Network, Vc Dimension, Regularization, Regression: Linear, Polynomial, Multiple Linear Regression, Svr

Committee Machines/ Ensemble Learning: Bagging, Boosting

Unsupervised Learning- Clustering: K-Nn, K-Means, Fuzzy K-Means, Hierarchical Clusturing, Single Linkage, Complete Linkage, Average Linkage, Non Spherical Clustering Algorithms

Hmm-Statistical Testing Methods, Probabilistic Inference

Machine Learning Applications: Text Classification, Disease Diagnosis, Biometric Systems

Subject Name	Outcomes
Graph Theory	(i) Learn about different types of algorithm which can be applied on graph. (ii) learn about different types of application of graph theory in computer science.
Optimization Techniques	(i) Learn the different types of methods for optimization
Cyber crime and information warfare	(i) Learn about different types of cyber attacks. (ii) Learn how to secure the computer/networks from these cyber attacks.
Wireless Networks	(i) Learn about different types of wireless networking models. (ii) Learn about processing of various protocol and their implementation in wireless network.
Ethical hacking	(i) Learn about various flaws of what is being hacked. (ii) Learn about how to reveal and fixed these flaws.