

Road Map for Affiliated Colleges under Semester System

M.Sc. Computer Science Session 2020-2022

Semester 1

Course Code	Course Title	Credit Hours
CSI-521	Introduction to Computer Science & Information Technology	4 (3 -1)
CSI-523	Introduction to Computer Programming	4 (3 -1)
CSI-525	Database Management Systems	4 (3 - 1)
CSI-527	Digital Logic and Design	3 (2 - 1)
ENG-421	Communication & Presentation Skills	3 (3 - 0)
CSI-529	Discrete Structure	3 (3 - 0)
	Total	21(17-4)

Semester 2

Course Code	Course Title	Credit Hours
CSI-522	Object Oriented Programming	4 (3 – 1)
CSI-524	Theory of Automata and Formal Languages	3 (3 – 0)
CSI-526	Distributed Database Systems	3 (2 – 1)
CSI-528	Computer Organization and Assembly Language	3 (2 – 1)
SWE-572	Software Engineering	3 (3 – 0)
CSI-530	Operating Systems	3 (2 – 1)
	Total	19(15-4)

Semester 3

Course Code	Course Title	Credit Hours
CSI-621	Data Structures and Algorithms	3 (2 – 1)
CSI-623	Computer Graphics	3 (2 – 1)
CSI-625	Theory of Compiler Construction	3 (2 – 1)
CSI-627	Web Engineering	3 (2 – 1)
CSI-629	Data Communication and Networks	3 (2 – 1)
CSI-633	Artificial Intelligence	3 (2 – 1)
	Total	18(12-6)

Semester 4

Course Code	Course Title	Credit Hours
SWE-656	Software Project Management	3 (3 – 0)
CSI-622	Research Methods and Data Analysis	3 (3 – 0)
CSI-624	Wireless and Mobile Communication	3 (3 – 0)
CSI-680	Thesis	6 (0 – 6)
	Total	15(9-6)

Semester-1

Course Name: Introduction to Computer Science & Information Technology

Course Structure: Lectures: 3, Labs: 1 **Credit Hours: 4**

Prerequisites: None

Objectives: This course focuses on a breadth-first coverage of computer science discipline, introducing computing environments, general application software, basic computing hardware, operating systems, desktop publishing, Internet, software applications and tools and computer usage concepts; Introducing Software engineering and Information technology within the broader domain of computing, Social issues of computing.

Course Outline: Number Systems, Binary numbers, Boolean logic, History computer system, basic machine organization, Von Neumann Architecture, Algorithm definition, design, and implementation, Programming paradigms and languages, Graphical programming, Overview of Software Engineering and Information Technology, Operating system, Compiler, Computer networks and internet, Computer graphics, AI, Social and legal issues.

Reference Material:

1. Computers: Information Technology in Perspective, 9/e by Larry Long and Nancy Long,
2. Prentice Hall, 2002 / ISBN: 0130929891
3. *An Invitation to Computer Science*, Schneider and Gersting, Brooks/Cole Thomson Learning, 2000
4. *Computer Science: An overview of Computer Science*, Sherer,

Course Name: Introduction to Computer Programming

Course Structure: Lectures: 3, Labs: 1 **Credit Hours: 4**

Prerequisites: None

Objectives: The course is designed to familiarize students with the basic structured programming skills. It emphasizes upon problem analysis, algorithm designing, and programme development and testing.

Course Outline: Overview of computers and programming. Overview of language for e.g. C language C. Basics of structured and Modular programming. Basic Algorithms and problem solving, development of basic algorithms, analyzing problem, designing solution, testing designed solution. Fundamental programming constructs, translation of algorithms to programmes, data types, control structures, functions, arrays, records, files, testing programmes.

Reference Material:

1. Problem Solving and Program Design in C / 6E
Hanly & Koffman
Addison-Wesley | Published: 02/06/2009
ISBN-10: 0321535421 | ISBN-13: 9780321535429
2. C How to Program, 5/E
(Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13:
9780132404167 Publisher: Prentice Hall Copyright: 2007

Course Name: Database Management Systems

Course Structure: Lectures: 3, Labs: 1 **Credit Hours: 4**

Prerequisites: Data Structures and Algorithms

Objectives: The course aims to introduce basic database concepts, different data models, data storage and retrieval techniques and database design techniques. The course primarily focuses on relational data model and DBMS concepts.

Course Outline: Basic database concepts; Entity Relationship modelling, Relational data model and algebra, Structured Query language; RDBMS; Database design, functional dependencies and normal forms; Transaction processing and optimization concepts; concurrency control and recovery techniques; Database security and authorization. Small Group Project implementing a database. Physical database design: Storage and file structure; indexed files; b-trees; files with dense index; files with variable length records; database efficiency and tuning.

Reference Material:

1. *Database Systems 8E*, C.J.Date, Addison Wesley Pub. Co. (2004).
2. *Database Systems: A Practical Approach to Design, Implementation and Management 5E*, R.Connolly and P.Begg, Addison-Wesley Pub. Co (2009).
3. *Fundamentals of Database Systems, 5/E*, Elmasri and Navathe, Addison-Wesley, ISBN: 0-201-74153-9.

Course Name: Digital Logic and Design

Course Structure: Lectures: 2 / Labs: 1 **Credit Hours:** 3

Prerequisites: Discrete Structures, Introduction to Computing

Objectives: This course introduces the concept of digital logic, gates and the digital circuits. Further, it focuses on the design and analysis combinational and sequential circuits. It also serves to familiarize the student with the logic design of basic computer hardware components.

Course Outline: Overview of Binary Numbers, Boolean Algebra, switching algebra, and logic gates, Karnaugh Map and Quin-McCluskey methods, simplification of Boolean functions, Combinational Design; two level NAND/NOR implementation, Tabular Minimization, Combinational Logic Design: adders, subtractors, code converters, parity checkers, multilevel NAND/NOR/XOR circuits, MSI Components, design and use of encoders, decoders, multiplexers, BCD adders, and comparators, Latches and flip-flops, Synchronous sequential circuit design and analysis, Registers, synchronous and asynchronous counters, and memories, Control Logic Design, Wired logic and characteristics of logic gate families, ROMs, PLDs, and PLAs, State Reduction and good State Variable Assignments, Algorithmic State Machine (ASM) Charts, Asynchronous circuits, Memory systems, Functional organization, Multiprocessor and alternative architectures: Introduction to SIMD, MIMD, VLIW, EPIC; systolic architecture; interconnection networks; shared memory systems; cache coherence; memory models and memory consistency, Performance enhancements, Contemporary architectures.

Reference Material:

Digital Design, 2nd Ed., M. Morris Mano, Prentice Hall, 1991.

Practical Digital Logic Design and Testing, P K Lala, Prentice Hall, 1996.

Course Name: Communication & Presentation Skills

Course Structure: Lectures: 3, Labs: 0 **Credit Hours: 3**

Objectives:

Enable the students to meet their real life communication needs.

Course Contents

Paragraph writing

Practice in writing a good, unified and coherent paragraph

Essay writing

Introduction

CV and job application

Translation skills

Urdu to English

Study skills

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

Academic skills

Letter/memo writing, minutes of meetings, use of library and internet

Presentation skills

Personality development (emphasis on content, style and pronunciation)

Recommended books:

Communication Skills

- a) Grammar
 1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.
- b) Writing
 1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
 2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
- c) Reading
 1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
 2. Reading and Study Skills by John Langan
 3. Study Skills by Richard Yorky.

Course Name: Discrete Structures

Course Structure: Lectures: 3 / Labs: 0 **Credit Hours: 3**

Prerequisites: None

Objectives: Introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. Further, this course aims to develop understanding and appreciation of the finite nature inherent in most Computer Science problems and structures through study of combinatorial reasoning, abstract algebra, iterative procedures, predicate

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calculus, tree and graph structures. In this course more emphasis shall be given to statistical and probabilistic formulation with respect to computing aspects.

Course Outline: Introduction to logic and proofs: Direct proofs; proof by contradiction, Sets, Combinatorics, Sequences, Formal logic, Propositional and predicate calculus, Methods of Proof, Mathematical Induction and Recursion, loop invariants, Relations and functions, Pigeonhole principle, Trees and Graphs, Elementary number theory, Optimization and matching. Fundamental structures: Functions; relations (more specifically recursions); pigeonhole principle; cardinality and countability, probabilistic methods.

Reference Material:

1. Kenneth H. Rosen, *Discrete Mathematics and Its Applications*, 6TH edition, 2006, Mcgraw Hill Book Co.
2. Richard Johnsonbaugh, *Discrete Mathematics*, 7TH edition, 2008, Prentice Hall Publishers.
3. Kolman, Busby & Ross, *Discrete Mathematical Structures*, 4th edition, 2000, Prentice-Hall Publishers.
4. Ralph P. Grimaldi, *Discrete and Combinatorial Mathematics: An Applied Introduction*, Addison-Wesley Pub. Co., 1985.

Semester-2

Course Name: Object Oriented Programming

Course Structure: Lectures: 3, Labs: 1 **Credit Hours:** 4

Prerequisites: Programming Fundamentals

Objectives: The course aims to focus on object-oriented concepts, analysis and software development.

Course Outline: Evolution of Object Oriented (OO) programming, OO concepts and principles, problem solving in OO paradigm, OO programme design process, classes, methods, objects and encapsulation; constructors and destructors, operator and function overloading, virtual functions, derived classes, inheritance and polymorphism. I/O and file processing, exception handling

Reference Material:

1. C++ How to Program, 6/E
(Harvey & Paul) Deitel & Deitel ISBN-10: 0136152503
ISBN-13: 9780136152507 Publisher: Prentice Hall
2. Java How to Program, 7/E
(Harvey & Paul) Deitel & Deitel ISBN-10: 0132222205 ISBN-13:
9780132222204 Publisher: Prentice Hall

Course Name: Theory of Automata and Formal languages

Course Structure: Lectures: 3 Labs: 0 **Credit Hours:** 3

Prerequisites: Discrete Structures

Objectives: The course aims to develop an appreciation of the theoretical foundations of computer science through study of mathematical & abstract models of computers and the theory of formal languages. *Theory of formal languages* and use of various abstract machines as 'recognizers' and parsing will be studied for identifying/validating the synthetic characteristics of programming languages. Some of the abstract machines shall also study as 'Transducers'.

Course Outline: *Finite State Models:* Language definitions preliminaries, Regular expressions/Regular languages, Finite automata (FAs), Transition graphs (TGs), NFAs, Kleene's theorem, Transducers (automata with output), Pumping lemma and non regular language *Grammars and PDA:* Context free grammars, Derivations, derivation trees and ambiguity, Simplifying CFLs , Normal form grammars and parsing, Decidability, Chomsky's hierarchy of grammars *Turing Machines Theory:* Turing machines, Post machine, Variations on TM, TM encoding, Universal Turing Machine, Context sensitive Grammars, Defining Computers by TMs.

Text Books/Reference Books:

1. An Introduction to Formal Languages and Automata, By Peter Linz, 4th edition, Jones & Bartlett Publishers, 2006
2. Theory of Automata, Formal Languages and Computation, By S. P. Eugene, Kavier, 2005, New Age Publishers, ISBN (10): 81-224-2334-5, ISBN (13) : 978-81-224-2334-1.
3. John Hopcroft and Jeffrey Ullman, *Introduction to Automata Theory, Languages, and Computation*, 2nd edition, 2001, Addison-Wesley.
4. Introduction to Languages and the Theory of Computation, By John C.

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Martin3rd edition, 2002, McGraw-Hill Professional.

Course Name: Distributed Database System

Course Structure: Lectures: 2 Labs: 1 **Credit Hours: 3**

Prerequisites: Database Systems

Objectives: To clearly describe the difference of Centralized database and Distributed database and enable the students to design/model a distributed database.

Course Outline: Introduction, Overview of relational DBMS and Normalization, Distributed DBMS architecture, Distributed database design and Data Distribution Strategies, Replication/Fragmentation, Distributed Transaction Management, Distributed Query Processing, Distributed Concurrency Control, Distributed Data Security, Distributed Database Recovery.

Reference Material:

1. Principals of Distributed Database Systems by Ozsü Tamer.
2. Database Systems by Thomas Connolly.

Course Name: Computer Organization and Assembly Language

Course Structure: Lectures: 2, Labs: 1 **Credit Hours: 3**

Prerequisites: Digital Logic Design

Objectives: The main objective of this course is to introduce the organization of computer systems and usage of assembly language for optimization and control. Emphasis should be given to expose the low-level logic employed for problem solving while using assembly language as a tool. At the end of the course the students should be capable of writing moderately complex assembly language subroutines and interfacing them to any high level language.

Course Outline: Microprocessor Bus Structure: Addressing, Data and Control, Memory Organization and Structure (Segmented and Linear Models), Introduction to Registers and Flags, Data Movement, Arithmetic and Logic, Programme Control, Subroutines, Stack and its operation, Peripheral Control Interrupts, Interfacing with high level languages, Real-time application.

Objectives and Perspectives of Assembly Language, Addressing Modes, Introduction to the Assembler and Debugger, Manipulate and translate machine and assembly code, Describe actions inside the processing chip, Discuss operations performed by an instruction set, Write a fully documented program, Using an assembler of choice.

Reference Material:

1. Stallings, "Computer Organization & Architecture", 7th ed, Prentice HALL, 2006.
2. Irvine, Assembly Language for Intel-based Computers, 5th ed, Prentice Hall, 2007.
3. Computer Organization and Design, The Hardware/Software Interface, 4th ed, by David A. Patterson and John L. Hennessy, 2008. Elsevier Publishers.

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Course Name: Software Engineering

Course Structure: Lectures:3,Labs: 0 **Credit Hours: 3**

Prerequisites: Object Oriented Paradigm/Programming

Objectives: To study various software development models and phases of software development life cycle. The concepts of project management, change control, process management, software development and testing are introduced through hands-on Team Projects.

Course Outline: Introduction to Computer-based System Engineering; Project Management; Software Specification; Requirements Engineering, System Modelling; Requirements Specifications; Software Prototyping; Software Design: Architectural Design, Object-Oriented Design, UML modelling, Function-Oriented Design, User Interface Design; Quality Assurance; Processes & Configuration Management; Introduction to advanced issues: Reusability, Patterns; Assignments and projects on various stages and deliverables of SDLC.

Reference Material:

1. *Software Engineering 8E* by Sommerville Addison Wesley, 2006
2. *Software Engineering: A Practitioner's Approach /7E*, Roger Pressman, McGraw-Hill, 2009

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Course Name: Operating Systems

Course Structure: Lectures: 2, Labs: 1 **Credit Hours: 3**

Prerequisites: None

Objectives: To help students gain a general understanding of the principles and concepts governing the functions of operating systems and acquaint students with the layered approach that makes design, implementation and operation of the complex OS possible.

Course Outline: History and Goals, Evolution of multi-user systems, Process and CPU management, Multithreading, Kernel and User Modes, Protection, Problems of cooperative processes, Synchronization, Deadlocks, Memory management and virtual memory, Relocation, External Fragmentation, Paging and Demand Paging, Secondary storage, Security and Protection, File systems, I/O systems, Introduction to distributed operating systems. Scheduling and dispatch, Introduction to concurrency.

Lab assignments involving different single and multithreaded OS algorithms.

Reference Material:

1. *Applied Operating Systems Concepts*, 7th Edition, Silberschatz A., Peterson, J.L., & Galvin P.C. 2004.
2. *Modern Operating Systems*, 3rd Edition, Tanenbaum A.S., 2008.

Semester-3

Course Name: Data Structures and Algorithms

Course Structure: Lectures: 2, Labs: 1 **Credit Hours:** 3

Prerequisites: Object Oriented Paradigms

Objectives: The course is designed to teach students structures and schemes, which allow them to write programmes to efficiently manipulate, store, and retrieve data. Students are exposed to the concepts of time and space complexity of computer programmes.

Course Outline: Introduction to data structures; Arrays, Stacks, Queues, Priority Queues, Linked Lists, Trees, and Graphs. Recursion, sorting and searching algorithms, Hashing, Storage and retrieval properties and techniques for the various data structures. Algorithm Complexity, Polynomial and Intractable Algorithms, Classes of Efficient Algorithms, Divide and Conquer, Dynamic, Greedy

Reference Material:

1. *Data Abstraction and Problem Solving with C++*, 2nd ed, Frank M. Carrano, Paul Helman, Robert Veroff, Addison-Wesley, 1998.
2. *Data Structures and Algorithms (SAMS teach yourself)*, Lafore, Sams Publishing, 1999.
3. *Fundamentals of Data Structures in C++*, Horowitz, Sahni, and Mehta, Computer Science Press, 1995.
4. *Data Structures in JAVA*, Standish, Addison Wesley, 2000

Course Name: Computer Graphics

Course Structure:Lecture:2 Labs: 1 **Credit Hours:** 3

Prerequisites: Object Oriented Programming , Visual Programming

Objectives: Study of various algorithms in computer graphics and their implementation in any programming language.

Course Outline: Graphics hardware. Fundamental algorithms. Applications of graphics. Interactive graphics programming — graph plotting, windows and clipping, and segmentation. Programming raster display systems, Differential Line Algorithm, panning and zooming. Raster algorithms and software — Scan-Converting lines, characters and circles. Scaling, Rotation, Translation, Region filling and clipping. Two and three dimensional imaging geometry (Perspective projection and Orthogonal projection) and transformations. Curve and surface design, rendering, shading, colour and animation.

Reference Material:

1. *Computer Graphics, Principles and Practice*, J. D. Foley, A. van Dam, S. K. Feiner and J. F. Hughes, Addison-Wesley ISBN: 0-201-12110-7.
2. *Computer Graphics*, F.S.Hill, Maxwell MacMillan ISBN: 0-02-354860-6.
3. *Interactive Computer Graphics: Functional, Procedural and Device-level methods*; Peter Burger and Duncan. F. Gillies; Addison-Wesley, (2003)

Course Name: Theory of Compiler Construction

Course Structure: Lectures: 2 / Labs: 1 **Credit Hours:** 3

Prerequisites: Theory of Automata and Formal Languages

Objectives: At the end of the course students should understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used. They will be aware of the way in which language features raise challenges for compiler builders.

Course Outline: Compiler techniques and methodology. Organization of compilers. Lexical and syntax analysis. Parsing techniques. Object code generation and optimization, detection and recovery from errors. Contrast between compilers and interpreters.

Reference Material:

1. Compilers: Principles, Techniques, and Tools By Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Contributor Jeffrey D. Ullman ,Addison-Wesley Pub. Co., 2nd edition,1987 Original from the University of Michigan
2. Modern Compiler Design, By Dick Grune, Henri E. Bal, Criel J. H. Jacobs, Koen G. Langendoen, John Wiley, 2000.
3. Modern Compiler Implementation in C, By Andrew W. Appel, Maia Ginsburg, Contributor Maia Ginsburg, Cambridge University Press, 2004.
4. Modern Compiler Design by Dick Grune, Henri E. Bal, Criel J. H. Jacobs, Koen G. Langendoen, 2003, John Wiley & Sons.

Course Name: **Web Engineering**

Course Structure: Lectures: 2 Lab:1 **Credit Hours:** 3

Prerequisites: Fundamentals of Information Technology (required)

Objectives:

This course will extend the WWW Technologies and Web Based Applications architecture, development, deployment and management concepts studied in the course of Fundamentals of Information Technology. The instructor is expected to cover an in-depth treatment of the web technology and applications related topics including web standards, protocols, web applications architecture, web services, search engine architectures, content management, web2, and semantic web, to explore some of the technologies used for display, data access and processing, and to give the students practice in integrating these to produce a functional web-based system.

Course Outline:

In-depth study of World Wide Web architectures, protocols and standards (HTTP, HTML, XHTML, CGI, XML, WML, cHTML, etc.), Web Technologies and Tools (such as scripting tools) for web application development and deployment (web servers, application servers, etc.), Web Based Applications including search engines and content management, management of large scale web based information systems, Web Services, Web2, Semantic Web, and Web3, principles of web site design, practical exercise in web site development.

Suggested Text Books:

1. Nuckles, Craig, Web Applications: Concepts and Real World Design, Wiley 2006
2. Programming the World Wide Web (4th Edition) (Paperback), by Robert W.

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Sebesta (Author), Paperback: 752 pages, Publisher: Addison Wesley; 4th edition (August 17, 2007), ISBN-10: 0321489691

Reference Material:

1. Gosselin, Dan, et. al., The Web Warrior Guide to Web Design Technologies, Cengage Learning, 2003
2. Zak, Diane, et. al., The Web Warrior Guide to Web Programming, Cengage Learning, 2003
3. Leasure, T., Bob Leasure and James Leasure, The Web Warrior Guide to Web Database Technologies, Cengage Learning, 2003
4. Morrison, Mike and Joline Morrison, Database Driven Websites, 2/e, Cengage Learning, 2002
5. Web Wizard series for various technologies, Addison-Wesley
6. Jackson, J. C., Web Technologies: A Computer Science Perspective, Pearson (LPE), 2008
7. Web Application Architecture: Principles, Protocols and Practices by Leon Shklar and Richard Rosen (Paperback - Oct 31, 2008), Paperback: 420 pages, Publisher: Wiley; 2 edition (October 31, 2008), ISBN-10: 047051860X
Web Engineering: The Discipline of Systematic Development of Web Applications by Gerti Kappel, Birgit Prýýll, Siegfried Reich, and Werner Retschitzegger (Paperback - Jul 5, 2006)

Course Name: Data Communication and Networks

Course Structure: Lectures: 2, Labs: 1 **Credit Hours:** 3

Prerequisites: None

Objectives: To introduce students to the concept of computer communication. Analogue & digital transmission. Network Layers, Network models (OSI, TCP/IP) and Protocol Standards. Emphasis is given on the understanding of modern network concepts.

Course Outline: Analogue and digital Transmission, Noise, Media, Encoding, Asynchronous and Synchronous transmission, Protocol design issues. Network system architectures (OSI, TCP/IP), Error Control, Flow Control, Data Link Protocols (HDLC, PPP). Local Area Networks and MAC Layer protocols (Ethernet, Token ring), Multiplexing, Switched and IP Networks, Inter-networking, Routing, Bridging, Transport layer protocols TCP/IP, UDP. Network security issues. Programming exercises, labs or projects involving implementation of protocols at different layers

Reference Material:

1. Introduction to Computer Networks /4, A. S. Tanenbaum, Prentice Hall 2003
2. Computer Networks and Internets, 5/E, 2008
Douglas E. Comer, Purdue University ISBN-10: 0136061273 ISBN-13: 9780136061274 Publisher: Prentice Hall
Data and Computer Communications By William Stallings Published by Macmillan Pub. Co., 8th Edition 2006

Course Name: Artificial Intelligence

Course Structure: Lectures: 2, Labs: 1 **Credit Hours:** 3

Prerequisites: Data Structures

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Objectives: This course focuses on the set of computational tools and techniques, which mimic the human decision-making process and capability.

Course Outline: Introduction to Common Lisp. AI classical systems: General Problem Solver, rules, simple search, means-ends analysis. ELIZA, pattern matching, rule based translators, OPS-5. Knowledge Representation: Natural language, rules, productions, predicate logic, semantic networks, frames, objects, scripts. Search: Depth first search, breadth first search, best first search, hill climbing, min-max search, A* search. Symbolic Mathematics: student, solving algebra problems, translating English equations, solving algebraic equations, simplification rules, re-write rules, meta-rules, Macsyma, PRESS, ATLAS. Logic Programming: Resolution, unification, horn-clause logic, Prolog, Prolog programming. Sample case studies of shells and Knowledge Based Systems. A brief appreciation of state of the art computational techniques like neural networks, genetic algorithm, fuzzy sets.

Reference Material:

1. *Artificial Intelligence* by Luger, 4th edition Pearson Education.
Russell and Norvig,
2. *Artificial Intelligence: A Modern Approach*, 2nd ed, Pearson Education.

Semester-4

Course Name: **Software Project Management**

Course Structure: Lectures: 3 /Labs: 0 Credit Hours: 3

Prerequisites: Introduction to Software Engineering

Objectives: To develop ability to plan and manage software development projects successfully, maximizing the return from each stage of the software development life cycle.

Course Outline: Software Crisis and Software Engineering, Classic Mistakes, Overview of Project Management, PMI Process Groups, Software project Phases, Project charter, Statement of Work (SOW), Planning Phase: Development lifecycle models, matching lifecycles to projects, Project plans, Work Breakdown Structures (WBS), Estimation of effort and cost (Expert Judgment, FP and Use Case point methods), Scheduling: Project network diagram fundamentals, CPM, PERT, Gantt charts, Critical chain scheduling, Using MS-Project, Assigning Resources, Resource leveling, Team models, Managing conflict and motivating, Project Monitoring and Control: Status reporting, Project metrics, EVM, Communications Techniques, Risk management and Change control Project Recovery, Documentation, Cutover/Migration, Post Project Reviews, Closing.

Resources

1. Bob Hughes and Mike Cotterell , Software Project Management, 2005, McGraw Hill Higher Education
- Dwayne Phillips. The Software Project Manager's Handbook – Principles that work at work. 2nd Edition, IEEE Computer Society Press and Wiley Interscience, 2004. ISBN 0-471-67420-6

Course Name: Research Methods and Data Analysis

Course Structure: Lectures: 3 Labs: 0 Credit Hours: 3

Prerequisites:

Objective: On completion of the course, students should be able to:

- Understand the overall principles and practice of academic research locally and internationally
- Recognize the fundamental concepts of research methodology (quantitative and qualitative)
- Comprehend the place a research proposal holds in the writing of an MS thesis and the process by which such a research proposal is developed
- Identify a topic for research and apply the theory and practice of research methods to this topic in an appropriate and ethical manner to produce a successful proposal
- Apply these techniques to the structuring and implementation of

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individual/group research projects lifelong

Course Contents Course Outline:

Introduction to Research; Theory Development in Research , Identifying and Developing a Research Proposal; Framing your Research Question(s); Managing the Research Process; effective literature reviews; reviewing/refereeing academic papers; supervisor/student relationships; ethics in research.

Research Methods

Experimental research – laboratory and field experiments; Case Study Research; Rapid Appraisal; Action research; design research; Grounded Theory; Ethnography. Researching through Focus Groups; Combining qualitative and quantitative research approaches (triangulation) Content management tools (Leximancer);

Reference Books

1. McMurray, A., Pace, W. and Scott, D. (2003) Research: a common sense approach, Thomson Learning, ISBN: 0 17 012235 2
2. Neuman, W.L. (2003). Social Research Methods: Qualitative and Quantitative Approaches. 5th Edition. Allyn and Bacon, Massachusetts.
3. De Vaus, D.A. (2002) Surveys in Social Research, 5th Edition, Allen and Unwin, Sydney.
4. Saunders M., Lewis P. and Thornhill A. (2003) Research Methods for Business Students. 3rd Edition. Prentice Hall/Financial Times, Essex.
5. Martella R.C., Nelson R. And Marchand-Martella N.E. (1999) Research Methods: learning to become a critical research consumer, Allyn & Bacon, Massachusetts.
6. Hult C. (2002) Researching and Writing across the Curriculum. 2nd Edition. Allyn & Bacon, Massachusetts.

Course Name: Wireless and Mobile Communication

Course Structure: Lectures: 3 Labs: 0 **Credit Hours: 3**

Course Description: This course covers fundamental techniques in design and operation of first, second, and third generation wireless networks: cellular systems, medium access techniques, radio propagation models, error control techniques, handoff, power control, common air protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc), radio resource and network management. As an example for the third generation air interfaces, WCDMA is discussed in detail since it is expected to have a large impact on future wireless networks. This course is intended for graduate students who have some background on computer networks.

Text Books/Reference Books:

1. W. Stallings, "Wireless Communications and Networks", Prentice Hall, 2002.
2. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall, 2002.

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3. J. Schiller, "Mobile Communications", Addison Wesley, 2000.
4. V.K. Garg, "IS-95 CDMA and cdma 2000", Prentice Hall PTR, 2000.
5. J.P. Castro, "The UMTS Network and Radio Access Technology - Air Interface Techniques for Future Mobile Systems", Wiley, 2001.
6. H. Holma and A. Toskala, "WCDMA for UMTS Radio Access for Third Generation Mobile Communications", John Wiley & Sons, 2001.