# UNIVERSITY OF THE PUNJAB

## NOTIFICATION

It is hereby notified that on the recommendations of the Board of Studies in Information Technology & Computer Science, the Vice-Chancellor has, in anticipation of the approval of other relevant bodies approved the adoption of new M.Sc. IT curriculum for affiliated colleges starting fall 2008, already adopted by the Punjab University College of Information Technology subject to the condition that affiliated colleges must improve their facilities, faculty and infrastructure by January 2009 in order for them to properly implement the curriculum the new M.Sc. IT degree program.

Sd/-
**Prof. Dr. Muhammad Naeem Khan**
**Registrar**

**Admin. Block**
**Quaid-e-Azam Campus,**
**Lahore.**

No. D/5833/Acad. Dated: 20-08/2008.

Copy of the above is forwarded to the following for information and necessary action:-

1. Dean, Faculty of Sciences.
2. Principal, PUCIT
3. All the Principals of University Affiliated Colleges (M.Sc. IT)
4. Members of the Board of Studies in Information Technology & Computer Science.
5. Director, Undergraduate Program
6. Controller of Examinations
7. Deputy Controller (Examinations)
8. Deputy Registrar (Affiliation)
9. A.R. (Statutes)
10. A.O. (Secrecy)
11. A.O. (Information Cell)
12. Secretary to the Vice-Chancellor
13. Secretary to the Registrar
14. P.A. to Additional Registrar

20/8/08

(Ch. Muhammad Siddiq)
Deputy Registrar (Academic)
for Registrar

# UNIVERSITY OF THE PUNJAB

## NOTIFICATION

It is hereby notified that the Vice-Chancellor has, under section 15(3) of the University of the Punjab Act, 1973, in anticipation of the approval of the other relevant bodies, approved the recommendations of the Board of Studies in Information Technology & Computer Science regarding renaming of the existing Master of Information of Technology (MIT) degree startec in Fall 2003 to Master of Science in Information Technology (M.Sc. IT) and approval of consolidation of existing Master degree Program as one Master of Science in Information Technology (MSc. IT) degree Program under Semester System with effect from Fall 2007, with the following second year specializations :-

a) Software Engineering
b) Computer Science
c) Information System
d) Electronic Commerce
e) Computer Networks

Curriculum and Semester wise plan and Outlines of the Course Master of Science in Information Technology (MSc. IT) are attached vide Annexure III and IV.

Sd/-
**Prof. Dr. Muhammad Naeem Khan**
**Registrar**

**Admin. Block**
**Quaid-e-Azam Campus,**
**Lahore.**

Dated:12-11-2007.

No. D 5545/Acad.

Copy of the above is forwarded to the following for information and necessary action :-

1. Dean, Faculty of Science.
2. Principal, PUCIT
3. Members of the Board of Studies in Information Technology & Computer Science.
4. Director, Undergraduate Program
5. Controller of Examinations
6. Deputy Controller (Examinations)
7. Deputy Registrar (Affiliation).
8. A.O. (Statutes)
9. A.O. (Secrecy)
10. A.O. (Information Cell)
11. Secretary to the Vice-Chancellor
12. Secretary to the Registrar.

12/11/07

Deputy Registrar (Academic)
for Registrar

Annexure III

# Requirements for MSc Degree in Information Technology

## Course Contents

### Summary of MSc Information Technology Degree Requirements

| Category | Credit Hours |
|---|---|
| Computing Core Courses | 51 |
| Specialization Core Courses | 18 |
| Total Credit Hours | 59 |

### (a) Common Core Courses (51 credit hours)

| | | Credit Hours |
|---|---|---|
| Discrete Mathematics | CMP 301 | 3 |
| Data Structure and Algorithms | CMP 310 | 3 |
| Logic Design and Computer Organization | CMP 323 | 3 |
| Object Oriented Programming | CMP 340 | 3 |
| Advance Computer Programming | CMP 341 | 3 |
| Software Engineering | CMP 390 | 3 |
| Operating Systems | CMP 420 | 3 |
| Database Systems | CMP 470 | 3 |
| Object Oriented Analysis and Design | CMP 490 | 3 |
| Writing Workshop | EN 301 | 3 |
| Business and Technical Writings | EN 305 | 3 |
| Introduction to Information Technology | IT 300 | 3 |
| Internet Architecture & Protocols | IT 321 | 3 |
| Data Communication and Networks | IT 330 | 3 |
| Project Management | IT 392 | 3 |
| Capstone Project I | IT 490 | 3 |
| Capstone Project II | IT 491 | 3 |
| | | 51 |

### (b) Software Engineering Specialization Core Courses (18 credit hours)

| | | |
|---|---|---|
| Analysis of Algorithms | CS 410 | 3 |
| Enterprise Application Development | SE 442 | 3 |
| Software Quality Assurance | SE 493 | 3 |
| Software Design & Architecture | SE 490 | 3 |
| Advance Topics in Software Engineering | SE 496 | 3 |
| Elective | SE 4xx | 3 |
| | | 18 |

### (c) Computer Science Specialization Core Courses (18 credit hours)

| | | |
|---|---|---|
| Theory of Automata and Formal Languages | CS 411 | 3 |
| Artificial Intelligence | CS 460 | 3 |
| Enterprise Application Development | CS 442 | 3 |
| Compiler Construction | CS 443 | 3 |
| Analysis of Algorithms | CS 410 | 3 |
| 4xx Elective | CS 4xx | 3 |
| | | 18 |

**(d) Information Systems Specialization Core Courses (18 credit hours)**

| | | |
|---|---|---|
| Artificial Intelligence | CS 460 | 3 |
| Analysis of Algorithms | CS 410 | 3 |
| Management Information Systems | IS 472 | 3 |
| Data Warehousing & Data Mining | IS 475 | 3 |
| Information System Security | IS 476 | 3 |
| Advanced Databases | IS 471 | 3 |
| | | 18 |

**(e) Electronic Commerce Specialization Core Courses (18 credit hours)**

| | | |
|---|---|---|
| Electronic Commerce | EC 480 | 3 |
| Financial Accounting | EC 481 | 3 |
| Entrepreneurship | EC 482 | 3 |
| Enterprise Application Development | IT 442 | 3 |
| Enterprise Resource Planning | IT 473 | 3 |
| Elective | EC/IT 4xx | 3 |
| | | 18 |

**(f) Computer Networks Specialization Core Courses (18 credit hours)**

| | | |
|---|---|---|
| Analysis of Algorithms | CS 410 | 3 |
| Network Security | CS 431 | 3 |
| Network Design & Management | IT 433 | 3 |
| Wireless & Mobile Communication | IT 434 | 3 |
| Net Centric Computing | IT 435 | 3 |
| System Administration | IT 436 | 3 |
| | | 18 |

10-Net

9-Net

# Requirements for MSc in Information Technology

## Semester-wise Plan of Courses

### Common First Year

| Fall Semester | | | Spring Semester | | |
|---|---|---|---|---|---|
| CMP 301 | Discrete Mathematics | 3 | CMP 310 | Data Structure and Algorithms | 3 |
| CMP 323 | Logic Design and Computer Organization | 3 | CMP 341 | Advance Computer Programming | 3 |
| CMP 340 | Object Oriented Programming | 3 | CMP 390 | Software Engineering | 3 |
| EN 301 | Writing Workshop | 3 | EN 305 | Business and Technical Writings | 3 |
| IT 300 | Introduction to Information Technology | 3 | IT 321 | Internet Architecture & Protocols | 3 |
| IT 330 | Data Communication and Networks | 3 | IT 392 | Project Management | 3 |
| | | 18 | | | 18 |

### Second Year (Software Engineering)

| | | | | | |
|---|---|---|---|---|---|
| CMP 420 | Operating Systems | 3 | CS 410 | Analysis of Algorithms | 3 |
| CMP 470 | Database Systems | 3 | SE 442 | Enterprise Application Development | 3 |
| CMP 490 | Object Oriented Analysis and Design | 3 | SE 490 | Software Design & Architecture | 3 |
| SE 493 | Software Quality Assurance | 3 | SE 4xx | Elective | 3 |
| SE 496 | Advance Topics in Software Engineering | 3 | IT 491 | Capstone Project II | 3 |
| IT 490 | Capstone Project I | 3 | | | |
| | | 18 | | | 15 |

### Second Year (Computer Science)

| | | | | | |
|---|---|---|---|---|---|
| CMP 420 | Operating Systems | 3 | CS 410 | Analysis of Algorithms | 3 |
| CMP 470 | Database Systems | 3 | SE 442 | Enterprise Application Development | 3 |
| CMP 490 | Object Oriented Analysis and Design | 3 | CS 443 | Compiler Construction | 3 |
| CS 411 | Theory of Automata | 3 | SE 4xx | Elective | 3 |
| CS 460 | Artificial Intelligence | 3 | IT 491 | Capstone Project II | 3 |
| IT 490 | Capstone Project I | 3 | | | |
| | | 18 | | | 15 |

### Second Year (Information Systems)

| | | | | | |
|---|---|---|---|---|---|
| CMP 420 | Operating Systems | 3 | IS 471 | Advanced Databases | 3 |
| CMP 470 | Database Systems | 3 | IS 475 | Data Warehousing & Data Mining | 3 |
| CMP 490 | Object Oriented Analysis and Design | 3 | IS 476 | Information System Security | 3 |
| CS 410 | Analysis of Algorithms | 3 | IS 472 | Management Information Systems | 3 |
| CS 460 | Artificial Intelligence | 3 | IT 491 | Capstone Project II | 3 |
| IT 490 | Capstone Project I | 3 | | | |
| | | 18 | | | 15 |

### Second Year (Electronic Commerce)

| | | | | | |
|---|---|---|---|---|---|
| CMP 420 | Operating Systems | 3 | EC 482 | Entrepreneurship | 3 |
| CMP 470 | Database Systems | 3 | IT 442 | Enterprise Application Development | 3 |
| CMP 490 | Object Oriented Analysis and Design | 3 | IT 473 | Enterprise Resource Planning | 3 |
| EC 480 | Electronic Commerce | 3 | EC/IT 4xx | Elective | 3 |
| EC 481 | Financial Accounting | 3 | IT 491 | Capstone Project II | 3 |
| IT 490 | Capstone Project I | 3 | | | |
| | | 18 | | | 15 |

### Second Year (Computer Networks)

| | | | | | |
|---|---|---|---|---|---|
| CMP 420 | Operating Systems | 3 | CS 410 | Analysis of Algorithms | 3 |
| CMP 470 | Database Systems | 3 | CS 431 | Network Security | 3 |
| CMP 490 | Object Oriented Analysis and Design | 3 | IT 435 | Net Centric Computing | 3 |
| IT 433 | Network Design & Management | 3 | IT 436 | System Administration | 3 |
| IT 434 | Wireless & Mobile Communication | 3 | IT 491 | Capstone Project II | 3 |
| IT 490 | Capstone Project I | 3 | | | |
| | | 18 | | | 15 |

Annexure IV

# PUNJAB UNIVERSITY COLLEGE OF INFORMATION TECHNOLOGY

## UNIVERSITY OF THE PUNJAB

# PROPOSED COURSE OUTLINES

# FOR

# MSc IN INFORMATION TECHNOLOGY

# MSc Information Technology Course Outlines

## IT 300 - Introduction to Information Technology

### Course Description

In today's information age, computers are used in almost each and every aspect of human life: from cell phones to cruise missiles, from disease diagnostics to design of space ships, etc. Objective of this course is to get a breadth-first overview of computing and information technology, and to make students productive with widely used software applications and the World-Wide Web (WWW). The following topics will be covered in the course: The Information Age, Computer Hardware, Introduction to Internet Explorer, Software, Central Processing Unit, Introduction to Microsoft Office, Input & Output, Storage & Multimedia, Microsoft Word, Computer Networks, The Internet, Spreadsheets & Business Graphics, Programming Languages, Software Engineering, Management Information Systems, Artificial Intelligence, Microsoft Excel, Database Management Systems, Microsoft Access, Microsoft Power Point, Introduction to Web Development, Introduction to HTML, Images & Links, Lists and Tables, Forms, Maps and Frames, Introduction to Microsoft FrontPage, Introduction to JavaScript, E-commerce, Security, Privacy and Cyber-Ethics, Introduction to Programming, Algorithms & Flowcharts, Variables & Data Types, Operators & Precedence, Conditional Statements, Loops, Functions, Arrays, HTML Tabular Data Control, New hardware/software technologies.

### Prerequisites

None

### Text Book

Capron, *Computers – Tools for an Information Age*, Sixth Edition, Prentice Hall, ISBN-10: 0131405640
Deitel, *Internet & World Wide Web – How to Program*, Prentice Hall, ISBN-10: 0131405640

### Reference Books

- Brookshear; *Computer Science – An Overview*; Addison-Wesley, ISBN-10: 0201781301
- Sanders; *Computers Today*; McGraw Hill, ISBN 9780070547018

## CMP 340 - Object Oriented Programming

### Course Description

Computer programming is an art of developing computational solutions to precisely describable problems. The purpose of this course is to introduce students with basic concepts of structured programming and object oriented programming. After completing this course, they should be able to write elegant structured programs to solve different computational problems. Programs are demonstrated using the Java programming language. However, the concepts are taught in a language-independent fashion. Note that the basic purpose of this course is to learn programming instead of a particular programming language. The following topics will be covered in this course: Introduction to Programming Languages and Compilers; Flowcharts, Pseudo-code; Data Storage; Introduction to Java Programming Language, history, significance, Java syntax, Role of Java Virtual Machine; Basic Java Language Constructs, Data types, Variable and Constants, Operator and Expressions, Input and Output (I/O), Escape; Structured Programming in Java Language, Decision making using selection control structure, Repetition control structure; Procedural programming in Java Language: methods, method overloading,, call by value and call by reference, library methods, scope and life time of variables. Arrays: definition, processing, and passing of array to a methods, multi dimensional arrays; Strings class, string and characters, String class methods; Garbage collection; Wrapper classes; Java Collections; Java File Processing, files and streams, Sequential Access and Random Access, low level and high level streams, byte oriented and character oriented streams; Introduction to Object oriented Programming, class, object, constructor, constructor overloading, composition, inheritance, method overriding, polymorphism.

### Prerequisites
Introduction to Computing

### Text Book
Deitel & Deitel, *JAVA How to Program, 6th Edition,* Prentice Hall, 2005, ISBN-81: 297-1195-8

### Reference Books
- Herb Schildt, *Java The Complete Reference, J2SE* 5th Edition, ISBN: 0-07-223073-8
- Deitel, *Advanced Java 2 Platform How to Program,* 2nd Edition, Prentice Hall, 2002, ISBN: 0-13-089560-1

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## IT 330 - Data Communication and Computer Networks

### Course Description
The aim of this course is to introduce students to the basic concept of computer networks and communication. It will provide a detailed overview of the Network models (OSI, TCP/IP) and Protocol Standards. Emphasis will be given on the understanding of modern network concepts. The following topics will be covered in the course: 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, Internetworking, Routing, Bridging, Transport layer protocols TCP/IP, UDP, Network security issues, Programming exercises or projects involving implementation of protocols at different layers.

### Prerequisites
Operating Systems

### Text Book
Behrouz A Forouzan, *Data Communication and Networking*, 4th Ed., McGraw-Hill, 2006, ISBN-13: 978-0073250328

### Reference Material
- Richard Stevens, *Unix Network Programming*
- Andrew S. Tenenbaum , *Computer Networks,* 4th Ed., Prentice Hall, 2002, ISBN-10: 0-13-066102-3
- William Stallings, *Data and Computer Communication,* 8th Ed., Prentice Hall, 2006, ISBN-13: 978-0132433105
- Larry Peterson, Bruce Davie, *Computer networks: a systems approach,* Princeton Univ., Princeton.
- James F Kurose, Keith W Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, 2/e, Addison Wesley 2003. ISBN: 0-201-97699-4.

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## CMP 301 - Discrete Mathematics

### Course Description
This course introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. It 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 calculus, tree and graph structures. The following topics will be covered in the course: Introduction to logic and proofs, Direct proofs, proof by contradiction, Sets, Combinatorics, Sequences, Formal logic, Prepositional and predicate

calculus, Methods of Proof, Mathematical Induction and Recursion, loop invariants, Relations and functions, Pigeon whole principle, Trees and Graphs, Elementary number theory, Optimization and matching, Fundamental structures, Functions (surjections, injections, inverses, composition), relations (reflexivity, symmetry, transitivity, equivalence relations), sets (Venn diagrams, complements, Cartesian products, power sets), pigeonhole principle; cardinality and countability.

### Prerequisites
None

### Text Book
### Text Book
Rosen, *Discrete Mathematics and Its Applications,* 5th edition, 2002, McGraw-Hill, ISBN: 0072424346

### Reference Material
- Richard Johnsonbaugh, *Discrete Mathematics,* Prentice Hall, 1996, ISBN: 0135182425
- Kolman, Busby & Ross, *Discrete Mathematical Structures*, 4th Edition, 2000, Prentice-Hall, ISBN: 0130831433

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## CMP 323 – Logic Design and Computer Organization

### Course Description
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. The students will be capable to acquire knowledge that is specific to Intel 80x 86 processor families, as well as knowledge that is universal. They will learn the programming methodologies showing how to use Assembly Language for Application Software's, System Programming and Terminate and Stay Resident. They will develop programs based on the interaction between Assembly Language and Operating System, Security Software's, encryption and decryption programs, programs for Reverse Engineering, programs for small scale Embedded Systems and Games specially Networking Games using serial and parallel ports. Following topics will be covered in this course: Processor Architecture and Organization, Memory Architecture, Intel 8086 Registers, Addressing Modes, Memory Addressing, MOV The Basic Instruction, Debugger, Mathematical and Bit wise Logical instruction, Stack Instructions, Interrupts, Memory Models, Practice of Program Writing and Debugging, Control Transfer and Conditional Action Instructions, Procedures, Macros, Shift and Rotate Instructions, Procedures to Input and Display Binary, Decimal, Hexadecimal Numbers, Reading DOS Command Tail, Data Communication, File Handling, Recursion, High–Level Logic Structures, Interfacing of Assembly and C++ , Languages, Storage of Real Numbers, Math co-processor, String instructions, Introduction to Machine Code, Protected Mode, Terminate and Stay Resident Programs, Micro Controller Programming (8051)

### Prerequisites
Digital Logic Design

### Text Book
Barry B. Brey, 'The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor, Pentium II, Pentium III and Pentium 4, Architecture, Programming and Interfacing' Seventh Edition, Prentice Hall, 2006, ISBN-9780131195066

Kip R. Irvine, *Assembly Language for Intel Based Computers, Fifth* Edition, Prentice-Hall Publishing, 2006,-ISBN-13: 9780132383103

### Reference Material
- Allen L. Wyatt, Using Assembly Language, 3rd Edition, Publishing Que Corporation 1992,-ISBN: 0-88022-884-9
- I Scott Mackenzie, Raphael C.-W.Phan, *8051 Micro-controller Programming*, 4th Edition, Prentice Hall PTR, 2006, ISBN 0130195626

## EN 301 - Writing Workshop

### Course Description
The basic philosophy behind writing workshop is to allow students to daily spend time writing for real purposes about things that interest them. Students can experiment with a variety of genres. English, spelling, handwriting and other mechanics can be taught within writing workshop. Students learn the craft of writing through practice, conferring, and studying the craft of creative and fundamental writings. Topics: Introduction of communication; 4 skills of communication; Importance and Benefits of Effective communication; Components of communication; Components of communication; Concepts and problems of communication; Forms of communication: verbal/ nonverbal; The general principles of communication; The general principles of communication; Communication and the Global Context; Strategies for Successful Speaking. Project Documentation and Presentation must be treated as compulsory part of this paper. Note for the instructor: make frequent use of worksheets in class and in homework assignments.

### Prerequisites
None

### Text Book
George Stern, *Learners' Writing in English, Learners Publishing,* ISBN: 981-4107-03-4

### Reference Books
- Hand outs: Synonyms, Antonyms, Idiomatic Phrases and Difference Between American and British English
- Useful links: www.owl.english.purdue.edu, www.askoxford.com

## CMP 390 - Software Engineering

### Objectives
The aim of this is course is 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. The following topics will be covered in the course: The Scope of Software Engineering, Software Process, Software Development Life Cycle, Project Management Concepts, (Planning, Costing, Risk Analysis, Quality Assurance, Risk Management, 4Ps of Project Management), Software Measurement concepts, Product metrics (LOC based and FP based metrics), Software Quality Metrics, Software Project Planning, Software Cost Estimation techniques, COCOMO model, Project Scheduling, (GANTT chart, Critical Path Method), Requirements Engineering, Use Case Techniques, Entity Relationship Diagram, State Transition Diagram, Data Flow Diagrams, Software Designing, Abstraction, refinement, modularity, software architecture, Cohesion & Coupling, Architectural Design, Data Design, Mapping ER to Data Model, Interface Design, Human Computer Interface, Modular Design, Mapping Design to Code, Software Testing, White Box Testing & Black Box Testing, Test Case Design using Cyclometic Complexity Technique, Debugging practices, Software Inspection, Software Quality Assurance, Software Quality Standards.

### Prerequisites
Databases

### Text Book
Roger Pressman, *Software Engineering: A Practioner's Approach,* McGraw-Hill, 2005. ISBN 9780073019338

### Reference Material
- Ian Sommerville, *Software Engineering,* McGraw Hill, 6th Edition ISBN-10: 020139815

## IT 321 - Internet Architecture and Protocols

### Course Description

The aim of this course is to provide an in-depth understanding of the Internet Architecture, its protocols and technologies used in it. It discusses the design philosophy of the Internet and its basic architectural components. It will provide comprehensive knowledge of major Internet technologies, Internet service providers and their role in Internet architecture. It also enables the students to strengthen their concepts of TCP/IP Protocol Suite. The following topics will be covered in this course: Internet Basics, History, Internet Backbones, Network Edge and Core, Types of Delays in Packet Switched Networks, Internet Technologies, Dial up, Frame Relay, ATM, ISDN, Mobile IP, VPN, DSL, Cable Modem, SONET, TCP/IP Protocol Suite, IPv4, IPv6, ARP, ICMP, TCP, UDP, SMTP, FTP, ISP Architecture and Components, Bridging and Switching, Spanning Tree, Virtual LANs (VLANs), Routing Basics, Static Routing, Routing Protocols, Distance Vector Routing Protocols, RIP, IGRP, Link State Routing Protocols, OSPF, Path Vector Routing, BGP, Implementation of Routing Protocols, Quality of Service.

### Prerequisites

Computer Networks

### Text Book

James F. Kurose and Keith W. Ross, *Computer Networking A Top-Down Approach Featuring the Internet*, 3rd Ed., 2005, ISBN-13: 978-0321227355

Stephen McQuerry, *CCNA Self-Study: Interconnecting Cisco Network Devices (ICND) 640-811, 640-801*, 2nd Edition, 2003, Cisco Press, ISBN-13: 978-1587051425

### Reference Books

- Andrew S. Tanenbaum, *Computer Networks*, 4th Edition, Prentice Hall, 2003, ISBN-13: 978-0130661029
- Behrouz A. Forouzan, *TCP/IP Protocol Suite*, 2nd Edition, McGraw-Hill, 2005, ISBN-13: 978-0072967722
- 3. William Stallings, *Data Communications and Computer Networking with Internet Protocols and Technology*, 7th Edition, Prentice Hall, 2004, ISBN-13: 978-0131482524
- Douglas E. Comer, *Internetworking with TCP/IP Volume I: Principles, Protocols and Architecture*, 4th Edition, Prentice Hall, 2001, ISBN-13: 978-0130183804
- Todd Lammle, CCNA: *Cisco Certified Network Associate Study Guide*, 5th Edition, Sybex, ISBN-13: 978-0782143911
- William Stallings, *Data and Computer Communications*, 8th Edition, Prentice Hall, 2006, ISBN-13: 978-0132433105, Seventh Edition, 2004

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## IT 392 - Project Management

### Course Description

This course will enable students to initiate software projects, perform project scheduling, plan the resources, carry out the staffing, track the progress, apply software metrics, manage and motivate the team, and manage the crisis situation. The following topics will be covered in the course: Introduction to Project Management, Project Phases and Project Life Cycle, Project Integration Management, Project Scope Management, Project Estimation, Size and Schedule Management, Activity Control, Schedule Development, Controlling Changes to the Project Schedule, Project Cost Management, Resource Planning, Cost Budgeting, Cost Control, Project Human Resource Management, Organizational Planning, Project Staff Acquisition, Team Development, Project Risk Management, Quantitative and Qualitative Risk Analysis, Current and Prevailing Practices, Software Configuration Management, Project Monitoring and Control, Project Quality Management, Software release Management, Process improvement frameworks.

### Prerequisites

Software Engineering

### Text Book

Kathy Schwable, *IT Project Management,* Course Technology; 3rd Bk & Cdr edition (July 2003), ISBN-10: 0619159847

### Reference Material

- Robert K. Wysoki, *Effective Project Management,* Wiley; 2nd Bk&Cdr edition (March 2, 2000), ISBN-10: 0471360287
- Punkaj Jalote, *Software Project Management,* Addison-Wesley Professional; 1st edition (January 31, 2002), ISBN-10: 0201737213
- Roger S. Pressman, *Software Engineering- A practitioner's approach,* 5th Edition, ISBN 9780073019338
- Robert Futrell, *Quality Software Project Management* Prentice Hall PTR; 1st edition (2002), ISBN-10: 0130912972

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## CMP 470 - Database Systems

### Course Description

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. The following topics will be covered in the course: Traditional File Based Systems, Roles in Database Environment, ANSI-SPARC Architecture, Data Manipulation Language (DML), Data Models, Multi-User DBMS Architectures, Relational Data Structures, Database Schemas, Relational Integrity, Introduction to SQL, Data Manipulation, Creating a Database, Tables, Index, Views, Transactions, Database Application Life Cycle, Database Planning, Database Design, Data Administration & Database Administration, Entity Types, Relationship Types, Structural Constrains, Problems with ER Models, Specialization/Generalization For EERD, Anomalies, Functional Dependency, Process of Normalization, Database Design Methodology, Database Security, Client Server Architecture, Centralized and Distributed Databases, Advance Topics.

### Prerequisites

Data Structures and Algorithms

### Text Book

C.J. Date, *An Introduction to Database Systems,* 8th edition, Addison Wesley Publications Co., 2003. ISBN-10: 0321197844

### Reference Material

- R.Connolly and P.Begg, *Database Systems: A Practical Approach to Design, Implementation and Management,* Addison-Wesley Publications Company, 2004. ISBN: 0201708574
- Elmasri and Navathe, *Fundamentals of Database Systems,* 5th edition, Addison-Wesley. 2006. ISBN-10: 0321369572

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## EN 305 - Business and Technical Writing

### Course Description

The objective of this course is to upgrade students' ability to write effectively in the world of science, technology and business, to produce experts and specialists in the business and technical writing, to enhance students' skills for the effective delivery of technical information to audience (listeners or viewers). It will help the students to generate thorough understanding of common types of reports, special format items and other technical features of business documents, to develop verbal and non verbal communication skills for an effective display of personality. The following topics will be covered in the course: Business communication overview, Communication and organizational effectiveness, Process of creating effective messages, five planning steps and organizational plans, Different Forms of Written communication including Persuasive messages, Good News and Neutral messages, Bad News, Memorandum writing, Letter writing, Informative and positive messages, Academic, research and business

proposals writing, Formal Report Writing, Business Research Methods, Documentation and Research Citation, Oral presentation, Strategies for an effective Audience Analysis, Non-verbal communication, Employment communication, Cross-cultural communication, Business Communication and the Ethical Contexts.

### Prerequisites:
Communication Skills

### Text Book
*The Modern Business and Professional Communication,* Revised Edition, Organized and Complied by Samreen Jawed, Published by University Book Corner, Urdu Bazar.

### Reference Material:
- Handouts provided by the instructor
- Greenfield, T., *Research Methods. Guidance for Postgraduates*, Arnold, 1996, ISBN-10: 0340806567

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## CMP 490 - Object Oriented Analysis and Design

### Course Description
The objective of this course is to demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to computer science and software applications. It involves the applications of object-oriented concepts and to Identify and analyze criteria and specifications appropriate to specific object oriented problems, and plan strategies for their solution. It will help the students to analyze, design, and implement computer-based systems. It will also enable them to select and apply appropriate Design Pattern. The following topics will be covered in the course: Introduction to Object Oriented Concepts. Object-Oriented Analysis and Design, Linear and Iterative Process Models, Requirement Engineering utilizing Object-Oriented Techniques, Software Design and Architectures, Object-Oriented Design, UML modeling, Use-Case Modeling, Domain Modeling, Interaction Diagrams, Design Modeling, and Implementation Modeling; Design Patterns (GRASP), User Interface Design, Usage of Rational Rose, Object-Oriented Testing, Object-Oriented Metrics, Component Based Development, Reusability.

### Prerequisites
Software Engineering

### Text Book
Craig Larman, *Applying UML and Patterns*, Pearson Education, Third Edition, 2005. ISBN- 81-7758-979-2
Stephan Schach, Irwin, *Object-Oriented Software Engineering*, 1999. ISBN: 0072418729

### Reference Material
- Roger Pressman, *Software Engineering: A Practioner's Approach*, McGraw-Hill, 2005. ISBN 9780073019338

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## CMP 310 - Data Structures and Algorithms

### Course Description
This course is designed to teach students structures and schemes, which allow them to write programs to efficiently manipulate, store, and retrieve data. "An apprentice carpenter may want only hammer and saw, but a master craftsman employs many precision tools; (Robert L. Kruse Data Structure and Program Design)". Computer programming likewise requires sophisticated tools to cope with complexity of real applications and only practice with these tools will build skill in their use. Topics: Introduction: Introduction to Course, Review of Object Oriented Programming Concepts. Algorithm Specification: Properties of Algorithm, examples, performance, analysis, measurement, and Big Oh notation. Introduction

to ADTs: Array and Polynomial as an ADT, and Representation of Arrays. Stack ADT, Expressions, Postfix Notation, and Infix to postfix conversion. Recursion: Recursive Definition and Processes, Writing Recursive Programs. Queue: The Queue ADT, Circular and Double Ended Queue. Self-Referential Classes, Linked List: Linear/Circular Singly/Double Linked Lists, Linked Stacks and Queues. Trees: Introduction to Trees, Logical construction and Traversing of Binary Trees, Implementation of Binary Trees (Insertion and Traversing), Searching and deletion in Binary Trees, Binary Search Tree, Introduction to Balanced and AVL Trees. Heaps: Heaps and Heaps as Priority Queues, Double Ended Priority Queue. Hashing: Hash Functions: Division; Overflow Handling: Chaining; Introduction to Some advance topics like: B-Trees, Indexing, Sets, Compression and Network Flows etc. Sorting Types and Techniques: Logical and Algorithmic Implementation of Selection, Bubble, Insertion, Shell, Radix, Merge, Quick, Heap, and Tree Sorts. Graphs: Graph terminology, Adjacency List and Adjacency Matrix and Adjacency list representation of Graph; Elementary Graph Operations: Breadth First Search and Depth First Search, Spanning Trees (BFSST, DFSST), Minimum Cost Spanning Trees.

### Prerequisites

Object Oriented Programming
Discrete Mathematics

### Text Book

Mark Allen Weiss, "Data Structure and Algorithms in C++", 2nd Ed., Addison Wesley, 1999, ISBN 0201361221
Ellis Horowitz, Sartaj Sahni, and D. Mehta "Fundamentals of Data Structures in C++", 2nd Ed., Computer Science Press, 1995. ISBN 81-7808-792-8

### Reference Material

- Michael T. Goodrich, "Data Structures and Algorithms in C++", I st Ed., John Wiley & Sons, 2006, ISBN: 0470075619
- Adam Drozdek "Data Structure and Algorithm in Java", 2nd Ed., Brooks/Cole Publishing Co, 2001, ISBN 0-534-37668-1
- D. Samanta. "Classic Data Structures", 2nd Ed., Prentice Hall, 2001, ISBN: 8120318749
- Tenenbaum, M. Augenstein, and Y. Lang Sam, "Data Structures using C and C++" 2nd Ed., Prentice Hall, 1999, ISBN-10: 0130369977
- Standish, Thomas A., "Data Structures, Algorithms, and Software Principles in C", I st Ed., 1994, Addison-Wesley, ISBN 0201528800.
- Timothy Budd "Data Structures in C++ using the STL I st Ed., 1998, Addison Wesley, ISBN 0201308797
- Standish, Thomas A., "Data structure techniques Reading", Ist Ed., Addison-Wesley, 1980, ISBN 0201072564

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## SE 493 - Software Quality Assurance

### Course Description

The objective of this course is to study in detail the issues involved in software quality engineering. The course focuses on current practice, research and trends in Quality. The following topics will be covered in the course: Introduction to Software Quality Assurance, Software Quality in Business Context, Quality Assurance in Software Support Projects, Product Quality and Process Quality, Models for Software Product Quality, Hierarchal Quality Model, Factor Criteria Metrics model (FCM), McCall's Model, Boehm's Model , FURP Model, ISO 9126 Model, Dromey's Quality Model, QMOOD, SATC's Quality Model , Non Hierarchal Models, Bayesian Belief Model, Star Model, CMM, Software Metrics, Defect Metrics, Reliability Metrics, GQM, Introduction to Testing, Software Testing Principles, Test Planning, Measurement, Execution, and Reporting, Software Testing Techniques, White Box Testing, Black Box Testing, Software Testing Strategies, Regression Testing, Alpha Testing, Beta Testing, Integration Testing, Bottom-Up Integration Testing, Verification and Validation, Unit Testing, Integration Testing, Validation Testing, System Testing, Recovery Testing, Security Testing, Performance Testing, Stress Testing, Review Techniques.

### Prerequisites
None

### Text Book
Nina S Godbole, *Software Quality Assurance,* Alpha Science International, Ltd, 2004, ISBN-10: 1842651765

### Reference Material
- R A Khan, K Mustafa, SI Ahson, *Software Quality: Concepts and Practices*, Naroosa Publications, 2006, ISBN: 8173197229
- Srinivasan Desikan, Gopalaswamy Ramesh, *Software Testing Principals and Practices*, Pearson Education India, 1st Ed, 2005, ISBN: 817758121X
- Stephen H. Kan, *Metrics and Models in Software Quality Engineering*, 2003, 2nd Ed, ISBN: 8129701758

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## CMP 420 - Operating Systems

### Course Description
The objective of this course is to give students knowledge of construction and working of Operating systems, to enable them to understand management and sharing of computer resources, communication and concurrency and develop effective and efficient applications and also to appreciate the problems and issues regarding multi-user, multitasking, and distributed systems. The following topics will be covered in the course: Introduction to Main Frames System, multi programmed System, batch system, Time sharing system, Desktop System, Multiprocessor system, distributed system, client server, Real time system, Hand held System, Computer System Structure, Caching, Coherency and consistency, Operating System Structure, Process management, System calls, Process control, Communication, micro-kernels, Virtual machines, Processes, Threads, multithreading models, CPU Scheduling, Process Synchronization, Critical section problem, Semaphores, Deadlock, Memory Management, Memory allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand paging, Page replacement, Allocation of frames, Thrashing, File System Interface, Directory structure, File system mounting, File System Implementation, NFS, Protection.

### Prerequisites
Data Structures and Algorithms

### Text Book
Silberschatz A., Peterson, J.L., and Galvin P.C., *Operating Systems Concepts,* 7th Edition, John Wiley & Sons, Inc., 2004, ISBN: 0-471-69466-5

### Reference Material
- Tanenbaum A.S., *Modern Operating Systems,* 2nd Edition, Prentice Hall PTR, 2001. ISBN-10: 0130313580

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## CS 410 - Analysis of Algorithms

### Course Description
The objective of this course involves a detailed study of the basic notions of the design of algorithms and the underlying data structures. Several measures of complexity are introduced. Emphasis will be given on the structure, complexity, and efficiency of algorithms. The following topics will be covered in the course: Introduction; Asymptotic notations, Recursion and recurrence relations, Divide-and-conquer approach, Search trees, Heaps, Hashing, Greedy approach, Dynamic programming, Graph algorithms,

Shortest paths, Network flow, Disjoint Sets, Polynomial and matrix calculations, String matching, NP complete problems, Approximation algorithms.

### Prerequisites
Discrete Mathematics

### Text Book
T. H. Cormen, C. E. Leiserson, and R. L. Rivest, *Introduction to Algorithms,* MIT Press, McGraw-Hill, New York, NY, 1990. ISBN-10: 0262531968

### Reference Material
None

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## SE/IT 442 - Enterprise Application Development

### Course Description
This course intends to teach the technologies underpinning modern enterprise wide applications including client-server, distributed and object-based systems. The purpose of the course is to explain the role of enterprise java beans in enterprise application development and its relationship to other J2EE technologies such as JSP, Servlets , JMS, CORBA and XML .This course includes explanation of EJB architecture: role of EJB container ,transaction control, authorization control and object pooling and EJB development lifecycle: Java source code compilation ,XML deployment descriptors , EJB compilation and deployment and use by an application server. It will provide a sound foundation for distributed application development. Emphasis of the course is on enterprise level development of applications. The following topics will be covered in this course: Overview of enterprise Java beans: Component architecture and service oriented architecture, Enterprise application design issues , Distributed computing model applying RMI, Naming and directory service(JNDI, LDAP) overview, Enterprise Fundamentals: Enterprise beans overview ,types of beans ,Entity beans: CMP,BMP and session beans: Stateless session beans and stateful session beans , Development of an EJB component: Remote interface ,Home interface, local interface, local home interface, bean class ,deployment descriptor and bean deployment Introduction to JMS and MDBs , Introduction to JINI ,Introduction to Java namespaces, Introduction to Java Mail API, Introduction to Java cryptography, Model view controller. This course also covers different frameworks and technologies used in enterprise applications development: AJAX, Hibernate, Struts, and Java Server Faces.

### Prerequisites
Advance Software Programming

### Text Book
Ed Roman and Gerald Brose, *Mastering Enterprise Java beans*, 3rd Edition, WILEY, 2005, ISBN: 9780764576829.
Marty Hall and Larry Brown, Core Servlets and JavaServer Pages, 2nd Edition, Pearson, Sun Microsystems, 2004, ISBN: 81-297-0300-9

### Reference Books
- Ed Roman and Floyd Marinescu, *EJB Design Patterns Advanced Patterns, I Processes, and Idioms, John Wiley & Sons, 2002,* ISBN 978-0471208310.
- http://www.coreservlets.com/
- http://courses.coreservlets.com/Course-Materials/csajsp2.html
- http://courses.coreservlets.com/Course-Materials/scwcd.html
- http://courses.coreservlets.com/Course-Materials/msajsp.html
- http://www.coreservlets.com/JSF-Tutorial/
- http://courses.coreservlets.com/Course-Materials/ajax.html

- http://courses.coreservlets.com/Course-Materials/struts.html
- http://courses.coreservlets.com/Course-Materials/java5.html
- http://java.sun.com/
- http://www.theserverside.com/
- http://java.sun.com/docs/books/tutorial

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## SE 490 - Software Design and Architecture

### Course Description
An in-depth look at software design and architecture. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, scalability. Measuring internal qualities and complexity of software. Learn evaluation and evolution of designs. The following topics will be covered in the course: Software Design: Concepts, Context, Principals, Process, Models, Enabling Techniques; Software Design Quality Concerns: Concurrency, Control and Handling, Distribution, Fault Tolerance, Interactive Systems, Persistence; Software Structure and Architecture: Structures and View Points; Architectural Styles (Macro-Architectural patterns): General structures, Distributed Systems, Interactive Systems, Adaptable Systems; Design Patterns (Micro-Architectural patterns): Creational, Structural, Behavioral; Families of Programs and Frameworks; Software Design Quality Analysis and Evaluation: Software Design Quality Attributes; Quality Analysis and Evaluation Techniques: Reviews, Simulations, Prototyping ; Software Quality Design Measures: Structured and Object oriented

### Prerequisites
None

### Text Book
L. Bass, P. Clements, and R. Kazman, *Software Architecture in practice*, Addison-Wesley, 2nd Ed, 2003, ISBN-10: 0321154959

### Reference Material
- D. Budgen, Software Design, Addison-Wesley, 2nd Ed, 2003, ISBN-10: 0201722194
- F. Buschmann, R. Meunier, H. Rohnert, and M. Stal, *Patterns Oriented Software Architecture – Asystems of Patterns*, Wiley and Sons, Vol-1, 2007, ISBN: 978-0-471-95869-7

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## CS 411 - Theory of Automata and Formal Languages

### Course Description
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'. The following topics will be covered in the course: Formal language, Defining Language, Regular Expression, Finite Automata, Transition Graphs, Kleene's Theorem, Finite Automata with output, Regular Languages, Non regular Languages, Decidability, Demonstration Of JFLAP, Context Free Grammars, Grammatical Format, Pushdown Automata (PDA), CFG=PDA, Non-Context-Free Languages, Context-Free Languages, Decidability, Turing Machine, The Chomsky Hierarchy.

### Prerequisites
Discrete Mathematics

### Text Book

- Denial Cohen, *Introduction to Computer Theory*, John Wiley & Sons, Inc. ISBN-10: 0471137723

### Reference Material

- J Hopcraft, D. Ullman, *Introduction to Automata Theory, Languages and Computation*, Addison Wisely, 2nd Edition, ISBN-10: 0201441241
- Thomas A. Sudkamp, *Languages and Machines, An Intro to the Theory of Comp. Sc.*, 2/e Addison Wesley. ISBN-10: 0201821362

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## CS 443 - Compiler Construction

### Course Description

The course will help the students to understand the structure of a compiler, and 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. The following topics will be covered in the course: Introduction to Compiler, Theory of Formal languages, Functional Phases of the compiler, Types of Compiler, Difference between compilation and interpretation, Lexical Analysis, Regular expression, Finite Automata and their Types, Kleen's Theorem, Thompson's Algorithm, Subset construction Algorithm, Principles and Techniques for implementation of Lexical Analyzer, Error recovery techniques; Syntax Analysis, Context Free Grammar and BNF, Derivation and derivation trees, Errors in Context Free Grammars, Push Down Automata and its types, Types of Grammars and Chomsky hierarchy, Implementation of Syntax Analyzer, Top Down Parsing Techniques, Panic Mode Error Recovery Techniques, Bottom up Parsing Techniques, Syntax Directed Translation, Semantic Analysis, Static and Dynamic Type checking, Implementation of Semantic Analyzer, Types of Intermediate Code, Global and Local Optimization, Peep hole Optimization, Register Allocation and memory management, Code generation.

### Prerequisites

Theory of Automata and Formal Languages

### Text Book

Alfred V. Aho, Ravi Sethi, *Compiler Design and Construction*, Hardcover 2nd edition, 1987, Van Nostrand Reinhold; ISBN: 0317636367.

### Reference Material

- Kenneth C. Louden, Galgotia, *Compiler Construction Principles and Practice*
- Seth Bergmann, *Compiler Design: Theory, Tools and Examples*

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## IS 471 - Advanced Databases

### Course Description

The aim of this course is to provide advanced database concepts to the students. The following topics will be covered in the course: Review of relational databases SQL in the real world, embedded SQL, data passing, status, cursor, connection, transaction, stored procedure; dynamic SQL, parameter, descriptor, JDBC, SQLJ, ODBC, Relational calculus, Object databases, Object-relational databases, objects in SQL, CORBA, IDL, ORB, dynamic invocation, DB services XML databases, description and query of semi-structured, nested, complex data, XML basics, XML Schema, XSLT, FLWR expression, evaluation, built-in functions, user-defined functions, aggregation, quantification, XQuery and XML Schema, proj, sel, construction, group, join, recursive function, wildcard types, XqueryX, XPath and XQuery, laws, Query processing, Query optimization, OLAP, vs OLTP, Vs data mining, multidimensional model, star schema, aggregation, drilling, rolling, slicing, dicing, CUBE, ROLLUP, Materialized views, ROLAP and MOLAP, data mining, associations, priori algorithm, other kinds, machine learning, data warehouse, ETL tools, metadata, incremental updates.

### Prerequisites

None

### Text Book

Philip M. Lewis, Arthur Bernstein, and Michael Kifer, *Database and Transaction Processing: An Application-Oriented Approach*, Addison Wesley, 2003. ISBN: 0321185579

### Reference Material

None

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## IS 475 - Data Warehousing and Mining

### Course Description

Introduction and Overview; Logical and Physical Data warehouse Modeling; OLAP Implementation Techniques; Advanced Dimensional Modeling; Extraction, Transformation, Loading (ETL) Processes; Join Techniques and Performance Evaluation; data warehouse alternate architectures, Indexing Techniques; Advanced Physical Database Design; Meta Data Concepts; Advanced Data Warehousing Concepts. The following topics will be covered in the data mining module:: Introduction, architecture and classification of data mining systems, Data preprocessing, data reduction, discretization and concept hierarch generation, descriptive data mining, comparison mining , statistical measures in large data sets, Association rule mining, Classification and Prediction, Cluster analysis.

### Prerequisites

Artificial Intelligence

### Text Book

Paulraj Ponniah, *Data Warehousing Fundamentals*, John Wiley & Sons, 2001.
ISBN: 978-0-471-41254-0
Jiawei Han and Micheline Kamber, *Data Mining Concepts and Techniques*, 1st edition, Morgan Kaufmann; 2000, ISBN-10: 1558604898

### Reference Material

- Ralph Kimball, *The Data Warehouse Lifecycle Toolkit: Expert Methods for Designing, Developing and Deploying Data Warehouses*, John Wiley & Sons, 1998. ISBN: 978-0-471-25547-5
- David Hand, Heikki Mannila, Padhraic Smyth, *Principles of Data Mining*, 2004, MIT Press, ISBN 0-262-08290-X

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## IS 472 - Management Information Systems

### Course Description

Today, more than ever, there is a pressing need for information systems that effectively support the strategic objectives of the organization. Consequently, the individuals creating and managing such systems have to be much more familiar with the business aspect of their organization than was necessary in the past. Focus on management skills and knowledge required to make efficient use of information in the organization. Learn about significant aspects of both business management and information systems knowledge. Understand how to specify, develop and manage information systems as a strategic organizational resource. This program is geared for the business professional seeking an understanding of information management. The following topics will be covered in this course: Introduction, Information Systems, Strategic Management and Performance Evolution, Developing and Implementing change Programs, Organization and Management Issues.

### Prerequisites

None

### Text Book

David Body and Albert Boonstra, *Managing Information Systems: An Organizational Perspective*, 2nd Edition, Prentice Hall, 2004. ISBN-10: 0273686356

### Reference Books

- N. Kumar, Management Information Systems, Anmol Publications Pvt Ltd, 2005. ISBN-10: 8126116749

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## IT 473 - Enterprise Resource Planning

### Course Description

This course will help students determine if an organization is ready for an ERP Implementation, examine the benefits of implementing an ERP System, and build a compelling business case in support of an ERP Implementation. Students will also understand the aims, the composition and the function of ERP systems. The course will cover the following topics: ERP Systems fundamental concepts; The Evolution of ERP Systems: A Historical Perspective; Aims and challenges for ERP systems; The architecture of ERP systems; Life Cycle of ERP Systems; ERP Systems Modules: Features and Functions; Technology to implement ERP systems; Integrating ERP systems in the Supply Chain Management and The Customer Relationship Management; Case study

### Prerequisites

None

### Text Book

Ellen Monk and Bret Wagner, *Concepts in Enterprise Resource Planning*, 2nd Edition, ISBN 13: 978-0-619-21663-4 and ISBN 10: 0-619-21663-8
Enterprise Resource Planning Solutions and Management, Nah, Fiona Fui-Hoon, ISBN: 1-931777-06-3
Enterprise Resource Planning (ERP). The Dynamics of Operations Management; Liaquat Hossain, Jon David Patrick, Mohammad A. Rashid; ISBN: 1-930708-36-X

### Reference Books

- *Mary Summer, Enterprise Resource Planning, October2004* edition, ISBN13: 9780131403437 ISBN10: 0131403435

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## IT 433 - Network Design and Management

### Course Description

After taking this course, the students will be able to evaluate the appropriate network requirements for different commercial situations, design a network addressing plan design a network structure and select network components and services to meet identified requirements, explain the network design and its impact to the customer, implement, configure, manage and troubleshoot all basic servers based on Linux and Windows. They will also focus on routing protocols, network management criteria, security criteria and designing the enterprise network in a hierarchical modular fashion. The topics to be covered include Internetworking Design Basics, Designing Modular Network Topologies, Designing the IP subnet space, working of DNS, Managing web services using IIS, Remote Access Services, Disk Management, Active Directory management, Management of CISCO routers, LAN management by STP, LAN management by VLAN, User Administration, Backup, Samba server, Web Server, Managing Disk usage with Quotas, Mail Server, Internet Traffic Management using Squid, Remote Disk Access with NFS, Management tools, and Implementation of MRTG.

### Prerequisites

Internet Architecture and Protocols

### Text Book

Todd Lammle, Cisco Certified Design Associate Study Guide, 2nd Edition, Sybex, 2003. ISBN-10: 0782142001 ISBN-13: 978-0782142006

Catherine Paquet, Diane Teare, Building Scalable Cisco Internetworks (BSCI): Authorized Self-study Guide, 3rd Rev Ed edition, Cisco Press, U.S., 2007, ISBN-10: 1587052237, ISBN-13: 978-1587052231

### Reference Material

- Priscilla Oppenheimer, Joseph Bardwell, Troubleshooting Campus Networks: Practical Analysis of Cisco and LAN Protocols, 1st edition, Wiley, 2002, ISBN-10: 0471210137, ISBN-13: 978-0471210139
- John Blommers, OpenView Network Node Manager: Designing and Implementing an Enterprise Solution, 1st edition, Prentice Hall PTR, 2000, ISBN-10: 0130198498, ISBN-13: 978-0130198495
- Arne Mikalsen, Per Borgesen, Local Area Network Management, Design and Security: A Practical Approach, John Wiley and Sons Ltd, 2002, ISBN-10: 047149769X, ISBN-13: 978-0471497691
- Teresa C. Piliouras, Network Design: Management and Technical Perspectives, 2nd edition, AUERBACH, 2004, ISBN-10: 0849316081, ISBN-13: 978-0849316081
- Steven Karris, Networks, Design and Management, Orchard Publications, 2003, ISBN-10: 0970951140, ISBN-13: 978-0970951144
- Kauffels F.J., Network management: problems, standards and strategies, Addison-Wesley Publ. Co., 1992, 0-201-56534-X
- Mani Subramanian, Network Management: Principles and Practice, 1st edition, Addison Wesley, 2000, ISBN-10: 0201357429, ISBN-13: 978-0201357424
- Ball L., Cost Effective Network Management, New York: McGraw-Hill, 1992

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## CS 431 - Network Security

### Course Description

The aim of this course is to provide extensive knowledge of security issues. It will give a comprehensive understanding of the security threats and risks, Authentication and Encryption techniques and challenges of network security. The following topics will be covered in this course: Introduction, Defining Network Security, Overview of Security Architecture, Developing Security Policies, System Failure Modes, Some Well-Known Attacks, Introduction to Cryptography, Symmetric and Asymmetric Cryptographic Techniques, Problems with Key Distribution in Symmetric Key Cryptography, Diffie-Hellman Key Exchange Algorithm, Cryptographic Algorithm Types and Modes of Operation, DES Flow Chart, Overview of Asymmetric Key Cryptography, Comparison of both techniques, Digital Envelope, Hash Functions, Digital Signatures, Public Key Infrastructure, Analyzing Networks Security, Nmap, Netstat, Viruses, Worms and Trojan Horses, Deploying Anti-virus Software, Transport Layer Security, SSL, TLS, Application Layer Security, SHTTP, Email Security, S/MIME, PGP, User Authentication, AAA/RADIUS, Kerberos, Firewalls Overview, Types of Firewalls, NAT, Firewall Technologies, Packet Filtering, SPI, Proxy or Application Gateway Firewalls, Using Windows as a Firewall, Configuring Personal Firewall, Microsoft ISA Server, Virtual Private Networks, IPSEC, Intrusion Detection Systems, Analyzing Network Security, Security tools (Snort, TCPView, Networks Monitor, Ethereal)

### Prerequisites

Computer Networks

### Text Book

William Stallings, *Cryptography and Network Security*, 4th Edition, 2005, ISBN-13: 978-0131873162
Kaufman, Perlman, Speciner, *Network Security: Private Communication in a Public World*, 2nd Edition, Prentice Hall, 2002, ISBN-13: 978-0130460196

### Reference Material

- Charles P. Pfleeger, Shari Lawrance Pfleeger, *Security in Computing*, 4th Edition, Printice Hall, 2006, ISBN-13: 978-0132390774
- Mark Rhodes-Ousley, Roberta Bragg, Keith Strassberg, *Network Security: The Complete Reference*, 1st Edition, McGraw-Hill, 2003, ISBN-13: 978-0072226973
- Mark Burgess, *Principles of Network and System Administration*, 1st Edition, John Wiley & Sons. 2000. ISBN-10: 0471823031 ISBN-13: 978-0471823032
- Chris Brenton, Cameron Hunt , *Active Defense: A Comprehensive Guide to Network Security*, Bk&CD-Rom edition , Sybex Inc, 2001. ISBN-10: 0782129161 ISBN-13: 978-0782129168
- Matthew Strebe, Charles L. Perkins, *Firewalls 24seven*, 1st Edition, Sybex Inc, 1999. ISBN-10: 0782125298 ISBN-13: 978-0782125290
- Stephen Northcutt , Lenny Zeltser , Inside Network Perimeter Security, 2nd Edition, Sams, 2005. ISBN-10: 0672327376 ISBN-13: 978-0672327377
- Atul Kahate, Cryptography and Network Security, TATA MCGRAW HILL PUBLIHSERS, 2003. ISBN: 0070494835
- Eric Maiwald, Network Security: A Beginner's Guide, Osborne/McGraw-Hill (May 7, 2001). ISBN-10: 0072133244 ISBN-13: 978-0072133240

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## EC 481 - Financial Accounting

### Course Description

To provide students with the knowledge of elementary accounting principles and prepare them to be able to use accounting for business recordings and analytical purposes. Students will be made aware of the conditions underlying the applicability of the Accounting and Finance that they use for analysis. Students will learn accounting principles about book-keeping, preparation of financial statements and certain classified accounting methods, through the contents of this course especially for IT students. They will be able to calculate and prepare reports using typical financial accounting functions of business and corporations Perform financial statement analytical procedures, interpret and explain analysis. This course intends to introduce the student with the knowledge of Financial Accounting required to help them in their business management and modern accounting information systems.

### Prerequisites

Introduction to Information Technology

### Text Book

Williams, Haka, Bettner, Meigs, *Financial & Management Accounting "The Basis For Business Decisions"*, McGraw Hill 13th Edition. Year 2006 ISBN: 0073526819

### Reference Books

- Lawrence J. Gitman, *Principals Of Managerial Finance*, 10th Edition, ISBN: 0201844826
- Smith, Keith, Stephens, *Accounting Principles*,(3rd Edition, ISBN-10: 0070591830 and ISBN-13: 978-0070591837
- Hermanson , Ewdwards & Salmonson, *Accounting Principles*, 4th Edition, ISBN: 0256059357
- Swanson, Ross, Hanson & Boynton, *Century 21 Accounting*, 3rd Edition, ISBN-10: 0538023007 and ISBN-13: 978-0538023009
- Van Horne, *Fundamentals of Financial Management*, 11th Edition, ISBN-10: 0139167277 and ISBN-13: 978-0139167270

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## EC 482 - Entrepreneurship

### Course Description

This course focuses attention on developing the concepts, skills, know-how, information, attitudes and alternatives [illegible] are relevant for start-up and [illegible] entrepreneurs and entrepreneurial managers in

larger firms. Students will be encouraged to examine current entrepreneurial opportunities in their own community. Identify how successful entrepreneurs and investors create, find and differentiate profitable and durable opportunities from "other good ideas," and how opportunities evolve over time. Evaluate and determine how successful entrepreneurs and investors create and build value for themselves and key stakeholders (customers, investors, and employees). Identify and determine the necessary financial and non-financial resources available for new ventures identify the criteria used to screen and evaluate proposals, their attractiveness and risk, and how to obtain start-up and early growth capital. Determine the critical tasks to be accomplished, the hurdles to be overcome during start-up and early growth, and what has to happen to succeed. Apply venture opportunity screening techniques to an actual start-up idea, and subsequently, develop and prepare a business plan suitable for guiding the start-up. Develop and analyze financial projections for start-up ventures.

### Pre-requisites

None

### Text Book

Robert. D. Hisrich, *Entrepreneurship,* Tata McGraw Hill, 2005 6th Edition, ISBN: 9780072971859
Kuratko, Hodgetts., *Entrepreneurship – Theory, Process, Practice* , Thomson South-Western, 2005 6th Edition, ISBN: 981-265-636-7

### Reference Books

- Kalakota. Ravi, *E-Business 2.0 road map for success,* Pearson Education, July 2001 Edition, ISBN: 81-297-0655-5
- Napier, Judd, *Creating a Winning E-Business,* Course Technology, 2001 Edition, ISBN: 0-619-03386-X
- Timmons, Jeffry , *New Venture Creation – Entrepreneurship for the 21st Century,* Irwin McGraw-Hill, 7th Edition, Year 2006 ISBN: 978-0073285917

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## IS 476 - Information System Security

### Course Description

Explosive growth in use of information systems for all manner of applications in all parts of life has made provision of proper security essential. Security of information systems is an international matter because the information systems themselves often cross national boundaries and the issues to which they give rise may most effectively be resolved by international consultation and co-operation. Introduction, Defining Information System Security, Overview of Security Architecture, Developing Security Policies, System Failure Modes, Some Well-Known Attacks, Introduction to Cryptography, Symmetric and Asymmetric Cryptographic Techniques, Problems with Key Distribution in Symmetric Key Cryptography, Diffie-Hellman Key Exchange Algorithm, Cryptographic Algorithm Types and Modes of Operation, DES Flow Chart, Overview of Asymmetric Key Cryptography, Comparison of both techniques, The Best of both worlds, Digital Envelope, Hash Functions, Digital Signatures, Message Digest, Public Key Infrastructure, Analyzing Networks Security: Nmap, Netstat, Viruses, Worms and Trojan Horses, Deploying Anti-virus Software, Transport Layer Security: SSL, TLS; Application Layer Security: SHTTP; Email Security: S/MIME, PGP; User Authentication: AAA/RADIUS, TACACS+, Kerberos, Security in Windows 2000; Firewalls Overview, Types of Firewalls, NAT and PAT, Firewall Technologies: Packet Filtering, Stateful Firewalls, Proxy or Application Gateway Firewalls, Using Windows as a Firewall, Configuring Personal Firewall, Microsoft ISA Server, Virtual Private Networks, IPSEC, Intrusion Detection Systems, Analyzing Network Security: Snort, TCPView, Networks Monitor,

### Pre-requisites

None

### Text Book

Gurpreet Dhillon Robert. D.Hisrich, *Information Security Management: Global Challenges In the New Millennium,* IGI Global, ISBN-10: 1878289780

### Reference Books

- John M. Hunter, *An Information Security Handbook (Computer Communications and Networks)*, Springer, ISBN-10: 1852331801

## CMP 341 - Advance Computer Programming

### Course Description

The objective of this course is to provide an in-depth understanding of the fundamental ideas behind the object-oriented approach to programming; through the widely-used Java programming language. The major focus of the course will be on teaching object oriented programming principles and good practices.. *The following topics will be covered in this course:* Introduction to Object Oriented Programming, Abstraction, Object Instantiation, Concept of Information Hiding, Composition, Inheritance, Use of Access Modifiers and other Modifiers, Constructors, Constructor Overloading, Invoking Overloaded Constructors, Invoking Parent Class Constructor, Passing and returning Object from Method, Array of Objects, Passing Array of Objects to Method, Returning Array of Objects from Method, Call by Reference and Call by Value, Allocation and De-allocation of Memory associated with Objects, Garbage Collection, Polymorphism, Implementing Polymorphism though Abstract Classes and Interfaces, Abstract Classes and Interfaces, Method Overriding, Inner Classes, Anonymous Inner Classes, Exception Handling, Checked and Unchecked Exceptions , Creating and Throwing Custom Exceptions, Multithreading, Controlling Thread States, Thread Synchronization, Inter Thread Communication, Monitors, Database Programming, Creating Graphical User Interfaces for desktop applications using Java Foundation Classes, Swing GUI Components and Containers, Event Delegation Model, Event Handling, Layout Managers, Java Graphics Capabilities, 2D Graphics Capabilities and Game Programming, Socket Base and Datagram Base Network Programming, Distributed Application Development, Remote Method Invocation, CORBA and Java Collections. This course also covers developing programs using layered architecture.

### Pre-requisites

Object Oriented Programming

### Text Book

Deitel & Deitel, *JAVA How to Program, 6th Edition,* Prentice Hall, 2005, ISBN-81: 297-1195-8

### Reference Books

- Herb Schildt, *Java The Complete Reference, J2SE* 5th Edition, ISBN: 0-07-223073-8
- Deitel, *Advanced Java 2 Platform How to Program,* 2nd Edition, Prentice Hall, 2002, ISBN: 0-13-089560-1

## IT 434 - Wireless and Mobile Communications

### Course Description

The objective of this course is to teach wireless communications and networks in a comprehensive fashion. It includes introduction of the full spectrum of engineering demands across all wireless networks and systems. The main topics covered in this course are principles of air interface design, principles of wireless network operation, wireless WANs, wireless LAN, wireless PANs, wireless local loop (WLL), cellular wireless networks, wireless local broadband and ad hoc networks. The following topics will be covered in this course: Transmission Fundamentals, RF Basics, RF Propagation, Unguided Transmission Medium, Microwave and Radio Signals, Antennas, Multipath propagation, Radio Modems, Advance Signal Encoding and Modulation Techniques used in wireless networks, Carrier Modulated Transmission, Digital Cellular Transmission, Broadband Modems, OFDM, Spread Spectrum, PN Sequences, Orthogonal Codes, Correlation, GMSK, Error Control Coding, Hamming Codes, Cyclic Codes, Block Interleaving, Convolutional Codes, Diversity Techniques, Adaptive Equalization, Speech Coding Techniques used in Wireless Networks, ADPCM, RPE, Wireless Medium Access, Fixed-Assignment Access for Voice-Oriented Networks, FDMA, TDMA, CDMA, Random Access for Data-Oriented Networks. Aloha Based Wireless Random Access, CSMA-Based Wireless Random Access Techniques, CSMA/CA, Wireless

Network Topologies, Infrastructure Network Topology, Ad Hoc Wireless Network Topology, Cellular Topology, Cell Fundamentals, Frequency Reuse, Capacity Expansion Techniques, Channel Allocation Techniques, Mobility Management, Location Management, Location Update Algorithms, Paging Schemes, Handoff Management, Handoff Decision Time Algorithms, Mobile IP, Power Control, Power Saving Mechanisms in Wireless Networks, Security in Wireless Networks, Wireless Voice-Oriented WANs, First Generation Analog Wireless Networks, AMPS/N-AMPS, AMPS Technology, Narrowband AMPS, Second Generation Digital TDMA Technology, GSM, GSM Services, GSM Network Architecture, Mobile Station, BSS, BTS, BSC, Network Subsystem, Radio Link Aspects of GSM, TDMA Format, Speech Encoding and Data Encoding Technique in GSM, GSM Signaling Protocol Architecture, Second Generation CDMA Wireless Networks, IS-95, Third Generation System, W-CDMA, cdma2000, IMT-2000, UMTS, Wireless Data Networks, Independent, Shared, Overlay Mobile Data, ARDIS, CDPD, GPRS, EDGE, Cordless Systems, DECT, Adaptive Differential Pulse Code Modulation, Wireless Local Loop (WLL), Orthogonal Frequency Division Multiplexing (OFDM), Broadband Wireless Technologies: Local Multipoint Distribution Services (LMDS), Multichannel Multipoint Distribution Service (MMDS), IEEE 802.16 Fixed Broadband Wireless Access Standard, Mobile IP, WAP, Wireless LAN Technology, Infrared LANs, Spread Spectrum LANs, Narrowband Microwave LANs, IEEE 802.11 Wireless LAN Standard, Architecture, Services, MAC, Physical Layer, Personal Area Networks, Bluetooth, Satellite Communication.

### Pre-requisites

Data Communication and Computer Networks

### Text Book

K. Pahlavan and P. Krishnamurthy, *Principles of Wireless Networks - A Unified Approach*, Prentice Hall, 2002, ISBN: 0-13-093003-2

W. Stallings, *Wireless Communications and Networks*, Prentice Hall, 2nd Edition, 2004, ISBN: 0131967908.

### Reference Books

- Theodore S. Rappaport, *Wireless Communication: Principles and Practice*, Prentice Hall, 2002, ISBN-10: 0-13-042232-0

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## IT 436 - System Administration

### Course Description

The objective of this course is to give a detailed description of the networking capabilities of the Windows and Unix/Linux Operating System. It involves extensive practical knowledge related to the configuration and management of main servers of Windows and Unix/Linux environment. The course will be accompanied by an intensive series of practical where students will obtain hands-on experience of all aspects of the course. The following topics will be covered in this course: Implementing, Managing, Monitoring, and Troubleshooting Hardware Devices and Drivers, Configuring and Troubleshooting the Desktop Environment, Implementing, Managing, and Troubleshooting Network Protocols and Services, Configuring, Managing, and Troubleshooting Security, Managing and Maintaining Access to Resources, Diagnose and resolve issues related to Terminal Services security, Implementing, Managing, and Maintaining IP Addressing Statically and dynamically, Implementing, Managing, and Maintaining Name Resolution, Implementing, Managing, and Maintaining a Web server. Implementing, Managing, and Maintaining Routing and Remote Access, Planning and Maintaining Network Security, Planning and Implementing an Infrastructure, Planning and Implementing User, Computer, and Group Strategies, Planning and Implementing Group Policy, Implementing, Managing, and Maintaining Proxy Server and Cache Server, Implementing, Managing, and Maintaining Anti Virus Server, Implementing, Managing, and Maintaining Mail Server, Implementing Managing, and Maintaining Print Server.

### Pre-requisites

IT 332 - Data Communication and Networks

### Text Book

Evi Nemeth and Garth Snyder , *UNIX System Administration Handbook*, 3rd Edition, Prentice Hall, 2000, ISBN-13: 978-0130206015

Yves Lepage and Paul Iarerra, *UNIX System Administrator's Bible*, Bk&CD Rom edition , Wiley Publishing, 1998, ISBN-13: 978-0764531620

### Reference Books

- Kalakota. Ravi, *E-Business 2.0 road map for success*, Pearson Education, July 2001 Edition, ISBN: 81-297-0655-5
- Napier, Judd, *Creating a Winning E-Business*, Course Technology, 2001 Edition, ISBN: 0-619-03386-X

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## IT 435 - Net Centric Computing

### Course Description

Review of TCP/IP Model IP Addressing and Subnetting, Introduction to Net Centric Computing. Multiservice Access technologies, Voice/Data Integration, Voice over IP, H.323, SIP Network Caching, Browser bases client caching, WCCP Network Caching, HTTP Caching Standards, Proxy Servers Virtual Private Networks, Dynamic & Overload Bypass, Reverse Proxy, Introduction to Winsock/ Berkley Sockets. Sockaddr, sockaddr in WSADATA structures, Sockets Address Structure, Byte Ordering functions, Byte Manipulation Functions, Introduction to I/O Multiplexing, I/O Models, Batch Input, TCP. echo Server, Non-Blocking Mode. Asynchronous functions, Async Select, Async UDP Server/ Client, Cellular Technology, Cellular, GSM, AMPS, D-AMPS 3rd Generation, Types of Wireless Technology, IEEE802.11 Physical Layer, DSSS & FHSS, IEEE802.11 MAC Layer, Clock Synchronization, Logical Clocks, Mutial Exclusion, Cristian's & Berkley Algo, Review of the course, Exterior Routing & VLSM, BGP & its Attributes, BGP Implementation Scenarios, Internetwork Packet Exchange, SPX, SAP, IPX Routing Techniques, IPX Header Format, IPX LAN encapsulations, IPX Implementation Scenarios, Access Control, IP Access List, IPX Access List & SAP filters implementation, Dynamic Data Exchange and its role in distributed networks, DDE Implementation, File access and transfer, Anonymous FTP session example, NFS Implementation, Multiprocessors, Homogeneous and Heterogeneous Multicomputer Systems, Application Layering, Middleware, Security Threats, Design Issues, Cryptography, Conventional Encryption, DES, Implementation of S-Boxes & decryption issues, Public Key Encryption, Implementation Issues, RSA, Knap-Sack Algorithm, NP-Complete problem & implementation, Secure Socket Layer, Introduction to TLS.

### Pre-requisites

IT 332 - Data Communication and Networks

### Text Book

George Coulouris, Jean Dollimore, Tim Kindberg, *Distributed Systems Concepts and Design*, 3rd Ed., Pearson Education, 2003, ISBN-10: 0201624338

Tenenbaum, M. van Steen, *Distributed Systems*, 2nd Ed., Prentice Hall, 2002, ISBN10: 0132392275

### Reference Books

- Douglas E. Comer, *Internetworking with TCP/IP*, 3rd Edition, Prentice Hall International. ISBN 0-13-216987-8

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## SE 496 - Advance Topics in Software Engineering

### Course Description

To introduce state-of-the-art advanced tools and techniques for medium and large-scale software systems development, develop the critical skills to judge which technique would be most appropriate for solving software problems, fully grasp the concepts of agile software management, software reengineering, and cleanroom software engineering, Agile software development, Agile project management, Agile modeling, Rationale management, and System integration/build management, Formal Methods, Software architecture

patterns, Cleanroom Software Engineering, Agent-based Software Engineering, Machine Learning for Agents and Multi-Agent Systems, Agent Framework, Formal Method for the Development of Agent-Based Systems, Software Reengineering, Refactoring, Aspect Oriented Software Engineering, Test Driven Software Development Techniques, the topics may vary depending on the time and extent of research in the area.

### Pre-requisites
Software Engineering

### Text Book
Handouts and Anthology of research papers will be encouraged for the course

### Reference Books
None

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## CS 460 - Artificial Intelligence

### Course Description
The aim of this course is to introduce students to the diverse field of Artificial Intelligence, give them an insight into its underlying principles and techniques, and enable them mimic human intelligence in problem solving. The following topics will be covered in the course: Introduction to the field, types of problems addressed, Symbolic AI, the physical symbol system hypothesis, Knowledge Representation Schemas, Logic, frames, semantic nets, scripts, Issues in knowledge representation, Search, exhaustive & heuristic search techniques, Logic programming, knowledge representation, Reasoning in logic programming, unification, horn clause logic, resolution, Prolog as example logic programming formalism, Expert systems and case studies of Mycin, Dendral, etc. Advanced topics including Game playing, Planning, Natural language processing, Fuzzy logic, Genetic algorithms, Artificial neural networks, Computer vision and robotics.

### Prerequisites
Data Structures, Algorithm Analysis, Discrete Math, Calculus II, Statistics

### Text Book
George F. Luger, *Artificial Intelligence- Structures & Strategies for Complex Problem Solving*, 5th edition, Pearson Education, 2004. ISBN-10: 0321263189

### Reference Material
- Elaine Rich and Kevin Knight, *Artificial Intelligence*, 2nd edition, McGraw Hill, 1991. ISBN-10: 0071008942
- Ben Coppin, *Aritificial Intelligence Illuminated*, Narosa Publishing, 2004. ISBN-10: 0763732303
- Eugene Charnaik and Drew Mcdermott, *Introduction to Artificial Intelligence*, Pearson Education, 1985. ISBN-10:0201119455
- Stuart Russell & Peter Norvig, *Artificial Intelligence A Modern Approach*, Pearson Education, 2002. ISBN-10:0137903952