DEPARTMENT OF COMPUTER SCIENCE 
& INFORMATION TECHNOLOGY

UNIVERSITY OF SARGODHA

PROPOSED COURSE OUTLINES

FOR

MSc in INFORMATION TECHNOLOGY PROGRAM

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# Table of Contents

**Credit Requirements for MSc (IT) Degree Program** .................................................... 3  
Summary of Required Credit Hours for MSc (IT) Degree ............................................. 3  
**Courses for MSc Degree in Information Technology** .................................................... 4  
**Course Outlines** ................................................................................................................. 6  

- IT 300 - Introduction to Information Technology ...................................................... 6  
- CMP 340 - Object Oriented Programming ................................................................. 6  
- IT 330 - Data Communication and Computer Networks ........................................ 7  
- CMP 301 - Discrete Mathematics ............................................................................ 7  
- CMP 323 – Logic Design and Computer Organization ........................................... 8  
- EN 301 - Writing Workshop ....................................................................................... 9  
- CMP 390 - Software Engineering .......................................................................... 9  
- IT 321 - Internet Architecture and Protocols ......................................................... 10  
- IT 392 - Project Management ................................................................................. 10  
- CMP 470 - Database Systems ................................................................................. 11  
- EN 305 - Business and Technical Writing ............................................................... 12  
- CMP 490 - Object Oriented Analysis and Design .................................................... 12  
- CMP 310 - Data Structures and Algorithms ........................................................... 13  
- SE 493 - Software Quality Assurance .................................................................. 14  
- CMP 420 - Operating Systems .............................................................................. 14  
- CS 410 - Analysis of Algorithms .......................................................................... 15  
- SE/IT 442 - Enterprise Application Development ............................................... 15  
- SE 490 - Software Design and Architecture ......................................................... 16  
- CS 411 - Theory of Automata and Formal Languages ......................................... 17  
- CS 443 - Compiler Construction ........................................................................... 17  
- IS 471 - Advanced Databases .............................................................................. 18  
- IS 475 - Data Warehousing and Mining ................................................................. 18  
- IS 472 - Management Information Systems .......................................................... 19  
- IT 473 - Enterprise Resource Planning ................................................................. 19  
- IT 433 - Network Design and Management ........................................................... 20  
- CS 431 - Network Security ................................................................................... 21  
- EC 481 - Financial Accounting ............................................................................ 21  
- EC 482 - Entrepreneurship ................................................................................... 22  
- IS 476 - Information System Security .................................................................... 23  
- CMP 341 - Advance Computer Programming ....................................................... 23  
- IT 434 - Wireless and Mobile Communications ..................................................... 24  
- IT 436 - System Administration ........................................................................... 25  
- IT 435 - Net Centric Computing ............................................................................ 25  
- SE 496 - Advance Topics in Software Engineering ............................................... 26  
- CS 460 - Artificial Intelligence .............................................................................. 26
# Credit Requirements for MSc (IT) Degree Program

## Summary of Required Credit Hours for MSc (IT) Degree

<table>
<thead>
<tr>
<th>Category</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing Core Courses</td>
<td>54</td>
</tr>
<tr>
<td>Specialization – Core Courses</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total Credit Hours</strong></td>
<td><strong>69</strong></td>
</tr>
</tbody>
</table>
# Courses for MSc Degree in Information Technology

## Computing — Core Courses (54 Credits Hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 300</td>
<td>Introduction to Information Technology</td>
<td>3</td>
</tr>
<tr>
<td>CMP 340</td>
<td>Object Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>IT 330</td>
<td>Data Communication &amp; Networks</td>
<td>3</td>
</tr>
<tr>
<td>CMP 301</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>CMP 323</td>
<td>Logic Design and Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>EN 301</td>
<td>Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>CMP 390</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CMP 341</td>
<td>Advance Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>IT 321</td>
<td>Internet Architecture &amp; Protocols</td>
<td>3</td>
</tr>
<tr>
<td>CMP 310</td>
<td>Data Structure and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>IT 392</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>EN 305</td>
<td>Business and Technical Writings</td>
<td>3</td>
</tr>
<tr>
<td>CMP 420</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CMP 470</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CMP 490</td>
<td>Object Oriented Analysis and Design</td>
<td>3</td>
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<tr>
<td>IT 490</td>
<td>Capstone Project I</td>
<td>3</td>
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<tr>
<td>IT 491</td>
<td>Capstone Project II</td>
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<tr>
<td>*CS 410</td>
<td>Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>*IS 471</td>
<td>Advance Database</td>
<td>3</td>
</tr>
<tr>
<td>*EC 482</td>
<td>Entrepreneurship</td>
<td>3</td>
</tr>
</tbody>
</table>

* one of the three subjects according to the specialization form the core subject list

## Core Courses in Software Engineering (15 credit hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE 442</td>
<td>Enterprise Application Development</td>
<td>3</td>
</tr>
<tr>
<td>SE 493</td>
<td>Software Quality Assurance</td>
<td>3</td>
</tr>
<tr>
<td>SE 490</td>
<td>Software Design &amp; Architecture</td>
<td>3</td>
</tr>
<tr>
<td>SE 496</td>
<td>Advance Topics in Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SE 4xx</td>
<td>Elective 1</td>
<td>3</td>
</tr>
</tbody>
</table>

## Core Courses in Computer Science (15 credit hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS’411</td>
<td>Theory of Automata and Formal Languages</td>
<td>3</td>
</tr>
<tr>
<td>CS 460</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 442</td>
<td>Enterprise Application Development</td>
<td>3</td>
</tr>
<tr>
<td>CS 443</td>
<td>Compiler Construction</td>
<td>3</td>
</tr>
<tr>
<td>CS 4xx</td>
<td>Elective 1</td>
<td>3</td>
</tr>
</tbody>
</table>

## Core Courses in Information Systems (15 credit hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 460</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 410</td>
<td>Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>IS 472</td>
<td>Management Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>IS 475</td>
<td>Data Warehousing &amp; Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>IS 476</td>
<td>Information System Security</td>
<td>3</td>
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**Core Courses in Electronic Commerce (15 credit hours)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 480</td>
<td>Electronic Commerce</td>
<td>3</td>
</tr>
<tr>
<td>EC 481</td>
<td>Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>IT 442</td>
<td>Enterprise Application Development</td>
<td>3</td>
</tr>
<tr>
<td>IT 473</td>
<td>Enterprise Resource Planning</td>
<td>3</td>
</tr>
<tr>
<td>EC/IT 4xx</td>
<td>Elective 1</td>
<td>3</td>
</tr>
</tbody>
</table>

**Core Courses in Computer Networks (15 credit hours)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 433</td>
<td>Network Design &amp; Management</td>
<td>3</td>
</tr>
<tr>
<td>IT 434</td>
<td>Wireless &amp; Mobile Communication</td>
<td>3</td>
</tr>
<tr>
<td>CS 431</td>
<td>Network Security</td>
<td>3</td>
</tr>
<tr>
<td>IT 436</td>
<td>System Administration</td>
<td>3</td>
</tr>
<tr>
<td>IT 435</td>
<td>Net Centric Computing</td>
<td>3</td>
</tr>
</tbody>
</table>
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

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

Reference Books

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

Reference Material
- Richard Stevens, *Unix Network Programming*

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

Reference Material

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
Reference Material


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

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

Prerequisites
Databases
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, 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


Reference Books

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

**Prerequisites**
Software Engineering

**Text Book**

**Reference Material**

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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**

**Reference Material**
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

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

Reference Material
### CMP 310 - Data Structures and Algorithms

**Course Description**

**Prerequisites**
Object Oriented Programming  
Discrete Mathematics

**Text Book**

**Reference Material**
SE 493 - Software Quality Assurance

Course Description

Prerequisites
None

Text Book

Reference Material

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
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, Sorting, 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

Reference Material
None

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
SE 490 - Software Design and Architecture

Course Description

Prerequisites
None

Text Book

Reference Material
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

Reference Material
- Thomas A. Sudkamp, Languages and Machines, An Intro to the Theory of Comp. Sc., 2/e Addison Wesley. ISBN-10: 0201821362

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

Reference Material
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

Reference Material
None

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 hierarchy 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
Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, 1st edition, Morgan Kaufmann; 2000, ISBN-10: 1558604898

Reference Material
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

Reference Books

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

Reference Books

19
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


Reference Material
CS 431 - Network Security

Course Description

Prerequisites
Computer Networks

Text Book

Reference Material

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

Reference Books

EC 482 - Entrepreneurship

Course Description
This course focuses attention on developing the concepts, skills, know-how, information, attitudes and alternatives that are relevant for start-up and early stage 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

Reference Books
IS 476 - Information System Security

Course Description

Pre-requisites
None

Text Book

Reference Books

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 otherModifiers, 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**

**Reference Books**

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**IT 434 - Wireless and Mobile Communications**

**Course Description**

**Pre-requisites**
Data Communication and Computer Networks

**Text Book**


**Reference Books**

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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 Static 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**


**Reference Books**

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**IT 435 - Net Centric Computing**

**Course Description**

Pre-requisites
IT 332 - Data Communication and Networks

Text Book

Reference Books

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

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 Schemes, 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**

**Reference Material**