**B.Sc.(Hons) COMPUTER SCIENCE**

**FIRST YEAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Code** | **Course Description** | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | |  |  |  |
| ENGL 11X | English Language | 2 | 2 | Compulsory |
| COMPS 111 | Intro. to Computers and Applications 1 | 2 | 4 | Compulsory |
| PHYS 111 | General Physics 1 | 3 | 4 | Service Course |
| MATH 11X | General Mathematics 1 | 3 | 4 | Service Course |
| STAT1 111 | Statistics for Information Technology | 3 | 4 | Service Course |
| COMPS 112 | Intro. to Computer Programming | 3 | 3 | Core Course |
| STS 110 | Science, Technology and Society | 2 | 2 | Compulsory |
| **SUB-TOTAL** |  | **18** | **23** |  |
| **SEMESTER 2** | |  |  |  |
| ENGL 12X | English Language | 2 | 2 | Compulsory |
| COMPS 123 | Intro. to Computers and Applications 2 | 2 | 4 | Compulsory |
| PHYS 121 | General Physics 2 | 3 | 4 | Compulsory |
| MATH 12X | General Mathematics 2 | 3 | 4 | Service Course |
| COMPS 124 | Discrete Maths | 2 | 3 | Service Course |
| COMPS 125 | Programming with Visual Basic | 3 | 4 | Service Course |
| ELTT 121 | Introduction to Electronics | 3 | 4 | Service Course |
| **SUB-TOTAL** |  | **18** | **25** |  |

**SECOND YEAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Code** | **Course Description** | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | |  |  |  |
| ENGL 21X | English Language | 2 | 2 | Compulsory |
| COMPS 216 | Programming with Java | 3 | 4 | Core Course |
| COMPS 217 | Computer operating System | **3** | **3** | Core Course |
| COMPS 218 | Data Structure and Algorithms | 3 | 3 | Core Course |
| COMPS 219 | Introduction to Database Management | 3 | 4 | Core Course |
| BIT 213 | Data Analysis & Statistical packages | 3 | 4 | Service Course |
| TMATH 221 | Mathematical methods 1 | 3 | 4 | Service Course |
| **SUB-TOTAL** |  | **20** | **24** |  |
| **SEMESTER 2** | |  |  |  |
| ENGL 22X | English Language | 2 | 2 | Compulsory |
| COMPS 2210 | Human – Computer Interaction | 3 | 3 | Core Course |
| COMPS 2211 | System Analysis and Design | 3 | 3 | Core Course |
| COMPS 2212 | Data communications & Networking 1 | 3 | 4 | Core Course |
| COMPS 2213 | Introduction to Web Development | 3 | 4 | Core Course |
| COMPS 2214 | Programming with C++ | 3 | 4 | Core Course |
| TMATH 222 | Mathematical methods 2 | 3 | 4 | Service Course |
| **SUB-TOTAL** |  | **20** | **24** |  |

**THIRD YEAR**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Code** | | **Course Description** | | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | | | |  |  |  |
| EED 31X | | | Entrepreneurship | 3 |  | Compulsory |
| COMPS 3115 | | | Numerical Techniques | 3 |  | Core Course |
| COMPS 3116 | | | Computer Architecture & Organizations | 3 |  | Core Course |
| COMPS 3117 | | | Artificial Intelligence | 3 |  | Core Course |
| COMPS 3118 | | | Object - Oriented Programming with Java | 3 |  | Core Course |
| BIT 319 | | | Management Information Systems | 3 |  | Elective |
| COMPS 3119 | | | Software Engineering | **3** |  | Elective |
| COMPS 3120 | | | Advanced Database Management | 3 |  | Elective |
|  | | |  |  |  |  |
| **SUB-TOTAL** | | |  | **18** |  |  |
| **SEMESTER 2** | | | |  |  |  |
| EED 32X | Entrepreneurship | | | 3 |  | Compulsory |
| COMPS 3221 | Scientific Programming | | | 3 |  | Core Course |
| COMPS 3222 | Object - Oriented Programming using C++ | | | 3 |  | Core Course |
| COMPS 3223 | Research Methods | | | 3 |  | Service Course |
| BIT 3113 | Operations Research | | | 3 |  | Service Course |
| COMPS 3224 | Data Mining and Warehousing | | | 3 |  | Elective |
| COMPS 3225 | Web & Internet Technologies | | | 3 |  | Elective |
| COMPS 3226 | Data Communications & Networking 2 | | | 3 |  | Elective |
| **SUB-TOTAL** |  | | | **18** |  |  |

**FOURTH YEAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Course Description** | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | |  |  |  |
| COMPS 4127 | Programming with Visual Basic.net | 3 |  | Core Course |
| COMPS 4128 | Distributed and Concurrent Systems | 3 |  | Core Course |
| COMPS 4129 | Computer Graphics | 3 |  | Core Course |
| COMPS 4130 | Professional, Ethical and Legal Issues in IT | 3 |  | Core Course |
| ELTT 4117 | MS Server Administration | 3 |  | Service Course |
| COMPS 4131 | Multimedia Design and Development | 3 |  | Elective |
| COMPS 4132 | Computer and Network Security | 3 |  | Elective |
| BIT 412 | Project Design and Management | 3 |  | Elective |
| **SUB-TOTAL** |  | **18** |  |  |
|  |  |  |  |  |
| **SEMESTER 2** | |  |  |  |
| COMPS 4233 | Internship |  |  | Compulsory |
| COMPS 4234 | Dissertation/ Project |  |  | Compulsory |
| **TOTAL** |  | **131** |  |  |

Students should choose **ONE** elective from the 300 and 400 series

**ENGL 11X English Language (2 Credits)**

(Course structure with English Language department)

**COMPS 111 Introduction to Computers and Applications I**

This course is divided into 2 sections: Understanding the Personal Computer **and** Introduction to Windows.

Understanding the Personal Computer: Terminology; A Short History of Computing; Software Evolution; Installing a New Computer; Hardware Components; The Function of the CPU; Memory; Input Devices; Output Devices; Storage Devices and Options; Overview of Operating Systems; The Internet and Online Services; Troubleshooting PC Problems and Errors.

Introduction to Windows**:** Windows Operating System; Desktop, Icons and Start Menu; Hardware; Opening and Closing Windows; Using Tags; Taskbar and Task Manager; Changing Views and Scrolling; Using Shake, Snap and Peek Features; Creating, Organizing, Moving and Copying Folders; Creating Shortcuts; Desktop Options Menu; Windows Gadgets; Using the Clipboard and more.

**PHYS 111 General Physics I (Mechanics, and Thermal Physics) - (3 credits)**

Measurements of length, time and mass. SI units. Principle of venire. Vectors and scalars. Addition and resolution of vectors. Motion in a straight line and projectiles. Newton’s laws of motion and their applications. Momentum and Impulse. General conditions of equilibrium; center of gravity; levers and pulleys. Work and energy; conservation laws of energy and momentum. Circular motion; simple Harmonic Motion (SHM); period and frequency; simple pendulum – determination of ‘g’. Solids, liquids and gases; atoms, electrons and nuclei. Friction, surface tension and viscosity (qualitative). Hydrostatics.

Temperature and its measurement including thermocouple. Thermal expansion: solids & liquids. Specific heat and latent heat. Ideal gas laws. Absolute zero of temperature. Transfer of heat: conduction, convection, and Radiation.

**MATH 11X General Mathematics I (3 credits)**

(Course Structure with Mathematics Department)

**STAT 111 Statistics for Information Technology (3 Credits)**

This course introduces students to statistical techniques used to collect, summarize, interpret and present numerical information, with particular emphasis on applications from commerce, economics and the social sciences. The unit aims to show students how statistics contributes to their chosen area of study. Topics: Presentation of data in tabular and graphical form. Frequency distribution, measures of central tendency and variation. Probability, discrete and continuous data. Binomial and Normal probability distributions. Sampling, confidence limits, and hypothesis testing. Regression, correlation, and chi-square test. Applications to data and problems relevant to information technology. Students are introduced to the use of a spreadsheet package for the analysis of data.

**COMPS 112 Introduction to Computer Programming (3 Credits)**

Programming Concepts: History of computation and programming languages. Types and purposes of programming languages. Program Development: The Notion of an Algorithm;

Top-Down design; Design of correct, concise, and effective algorithms. Control flow, basic logic, and boolean expressions

Usage of data types, arithmetic expressions, input/output, functions and arguments.

Effective methods for checking and debugging programs.

Programming in an integrated development environment (IDE).

**STS 110 Science, Technology & Society (2 Credits)**

**ENGL 12X English Language (2 Credits)**

(Course Structure with Language Department)

**COMPS 123 Introduction to Computers and Applications 2 (3 Credits)**

Microsoft Word: understanding of how to manage documents with specific time savers such as deletions, moving, and cutting and pasting, how to set margins and tabs, create envelopes and labels from tables, and more.

MS Excel: basic introduction to spreadsheets, how to set up a spreadsheet, create basic formulas, editing, and printing.

PowerPoint and Publisher: basic introduction to presentation of software. Students will learn about the presentation environment, how to create individual slides, slide shows and insert graphics. In this class you will learn how to create letters, forms, greeting cards, brochures, business cards, calendars, envelopes, newsletters, postcards, and much more.

Introduction to Microsoft Access

**PHYS 122 General Physics 2 (Waves, Optics, Electricity & Magnetism) - (3 Credits)**

Initial concepts of waves. Displacement, amplitude, wavelength, velocity. Progressive waves: Transverse and longitudinal waves. Superposition of waves: Interference, stationary waves, resonance, beats. Vibration of air columns and strings. Introduction to electromagnetic waves.

Rectilinear propagation of light, Reflection at plane and spherical surfaces. Laws of reflection of light. Refraction through plane medium – refractive index; total internal reflection. Refraction through a prism. Laws of refraction. Determination of focal length of a lens. Magnification of simple optical instruments. Simple spectrometer.

Magnetism: Properties of a magnet. Magnetic field. Earth’s magnetic elements and their determination; dip circle. Electrostatics: Role of electrons; Electrification by friction and induction. Conductors and insulators. Gold – leaf electroscope. Coulomb’s law. Electrostatics field, potential and energy; capacitors. Current electricity: Ohm’s law. Resistance and resistivity. Simple treatment of wheatson’s Bridge. Potentiometer principle. Heating effect of current. Magnetic effect of current. Electromagnetic induction – generators (a.c & d.c.), motors D.C ammeter and Voltmeters.

**MATH 12X General Mathematics II (3 Credits)**

(Course Structure with Mathematics Department)

**COMPS 124 Discrete Mathematics (3 Credits)**

Basic set theory. Venn diagrams, Functions and relations; Partial orderings; equivalence relations and closure. Mathematical induction and other proof techniques. Recurrence relations (for program analysis) and O-notation.

Counting and Combinatorics: Ordered samples and permutations. Unordered samples without repetition: binomial coefficients. Unordered samples with repetition. Permutations involving indistinguishable objects. The principle of inclusion and exclusion.

Graphs: Euler and the seven bridges, Trees and spanning trees, Planar graphs and Euler’s theorem

Logic: Propositions and predicates, Basic Boolean calculus, Quantifiers, formal arguments and validity.

**COMPS 125 Programming in Visual Basic (3 Credits)**

User interface and algorithm design; Specifying VISUAL Controls for the user interface, design menus, use common dialog boxes, understand Event Driven programming; Algorithm Design and Elements of Program Style, definition of algorithm and role in problem solution, expressing algorithms in pseudo code or flowchart form; Coding programs in VISUAL BASIC, string and numeric variables and constants, evaluation of expressions and assignment statements, setting and changing VISUAL Control properties, object methods, logical operators and decision statements, looping structures, use of elementary VISUAL BASIC functions: numeric and string, subroutines and programmer created functions, including elementary parameter passing, creation and use of Control arrays, declaration and use of arrays including a simple bubble type sort, sequential file input and output operations; Elements of program testing and debugging, saving, retrieving and running VISUAL BASIC programs, choosing good test data, hand tracing and using an online debugger, checking the program's results; Structure and documentation of programs, the structured constructs, sequence, selection, repetition, using subroutines to modularize programs, how to improve readability of a program by use of remarks, indentation, and spacing and well chosen variable names.

**ELTT 102 Introduction to Electronics for Computer Science (3 Credits)**

Direct Current Circuits, Alternating Current, Digital Signals, Semi-Conductors, Diodes, Rectifiers, Diode as a logic gate, Bipolar Junction Transistor, Bias circuits of BJT, Transistor as logic gate, Families of logic circuits, Binary Systems, Boolean Algebra and Logic Gates.

**SECOND YEAR**

**ENGL 21X English Language (2 Credits)**

(Course structure with English Language department)

**COMPS 216 Programming with Java (3 Credits)**

Java Environment: Using a SDK and selected Integrated Development Environments to edit, compile, debug, and execute a Java application; Using the SDK and selected Integrated Development Environments to edit and compile a Java applet and its associated HTML file;

Using a Web browser and AppletViewer to execute an applet

JAVA Syntax: Primitive data types for variables and constants (final); Operators;System

input and output – conversion of input to numbers; Selection and Repetition control

structures; Methods: definition, calling, return types, parameters, call by value,

overloaded methods; Simple recursive methods; Math class methods

**COMPS 217 Computer Operating Systems (3 Credits)**

Introduction and overview. History of operating systems; Operating system structures.

Process management: process concept, concurrent processes, CPU scheduling, scheduling algorithms.

Process co-ordination: critical section, process synchronization, semaphores, monitors, critical regions, process communication.

Deadlocks: deadlock prevention, avoidance, detection and recovery.

Memory hierarchy: cache memory, associative memory.

Memory management: swapping, fixed and variable partitions, relocation, paging and segmentation (external and internal fragmentation).

Virtual memory: page replacement algorithms, thrashing.

Secondary storage management.

File management: file-system organization, file operations, access methods, directory-structure organization

**COMPS 218 Data Structure and Algorithms. (3 Credits)**

Abstract data types. Pointers, dynamic memory, static and dynamic implementation of data structures. Storage management. Arrays, linked lists, stacks, queues. Recursion, recursive mathematical functions, recursive procedures, divide and conquer, backtracking, Hashing. Binary trees, tables, graphs. Canned data structures. Choice and use of algorithms. Fundamental algorithms for searching and sorting

**COMPS 219 Introduction to Database Management (3 Credits)**

Covers an introduction to information security basics, Internet search engines, and different types of database management systems. Students will use MS Access to create and link tables, sort and search (query) tables, use forms and create reports. Data integrity tools such as combo boxes and validation rules will be presented. E-R diagrams will be used to model relations. Ethical discussions will include information privacy, appropriate use and destruction of data, and data integrity.

**BIT 213 Data Analysis & Statistical packages (3 Credits)**

http://handbook.murdoch.edu.au/images/dot_clear.gif This unit introduces students to methods of collection, storage, retrieval and statistical analysis of data of particular relevance to the environmental and biological sciences. Topics: the design and analysis of simple experiments, sampling methods, analysis of data arising in particular applications and the interpretation of statistical analyses presented in published scientific papers and reports. The unit incorporates an integrated component on the retrieval and analysis of data and information from databases.

**TMATHS 211 Mathematical Methods 1 (3 Credits)**

Algebra: Equations in one-variable: algebra, graphical solution, numerical solution; inequations in one variable: algebra, graphical solution; transformation of equations and formulae.

Sequences and series: informal introduction to the concepts of convergence of a series and limits, monotonic sequences, infinite series, the harmonic series, alternating series, simple tests for convergence

Functions and Graphs: Review of functions and graphs, including polynomials, rational functions and a review of trigonometry, problems of domain, limits, asymptotes, partial fractions, inverse trigonometric functions, hyperbolic and inverse hyperbolic functions.

Linear Algebra: Matrices, determinants, solution of systems of linear equations, matrix inverse, Gaussian and complete elimination.

**ENGL 22X English Language (2 Credits)**

(Course structure with English Language department)

**COMPS 2210 Human- Computer Interaction (3 Credits)**

Human-computer interface styles, including: I/O devices employed in the human-computer interface; Interface paradigms, such as teletype-based, GUI and virtual reality; Design principles for the human-computer interface; Relevance of the human-computer interface to the software engineering process; Describing the human-computer interface (Dialogue network diagrams, etc.)

Cognitive modelling and evaluation of usability (Usability metrics, Task-Action Grammars, GOMS –Goals; Operators, Methods and Selection Rules, Heuristic evaluation etc.)

Design for users with special needs

Implementation of high-quality human-computer interfaces (including the role of object-orientation, class libraries and visual programming)

Human-computer interaction devices; Human-computer interface component technologies.

**COMPS 2211 Systems Analysis and Design (3 Credits)**

Introduces methods and techniques for analysing problematic organisational situations, particularly those leading to the development of an information system, and draws on both technical and organisational material to provide the knowledge and skills necessary to design and implement an operational system.

**COMPS 2212 Data Communication and Networking 1 (3 Credits)**

Data communication: Components, basic concepts - Line configuration: point to point, multipoint; Topology - mesh, star, tree, bus, ring, hybrid; Access methods - command/response, interrupt-driven, Token passing, CSMA/CD; Transmission modes - simplex, half-duplex, full-duplex; Categories of networks - LAN, MAN, WAN.

The OSI Model: Layered Architecture, Functions of the layers. DTE-DCE interface, Modems: Role of modems, modem functions, operation of a modem, connecting modem to telephone line; Multiplexing: FDM, synchronous TDM, statistical TDM, WDM

Data link control: Line Discipline, flow control, error control: ARQ, stop-and –wait ARQ, sliding window ARQ, Go-back-N ARQ, Selective-Reject ARQ.

Data link protocols - Asynchronous protocols: XMODEM, synchronous protocols - Character oriented protocols: Binary Synchronous Communication (BSC), Bit Oriented Protocols: SDLC, HDLC.

**COMPS 2213** dot_clear **Introduction to Web Development (3 Credits)**

An introduction to web fundamentals and web page layout using a WYSIWYG editor (Macromedia Dreamweaver or any available). Students will develop websites that will include inter- and intra-document links, colour and graphics, document and image formatting, and sound and video.

Students will also learn to add functionality, animation, and interactivity to both HTML and dynamic web pages; incorporate elements such as sound, graphics, animation, forms, and tables.

Students will also be introduced to cascading style sheets, and JavaScript. A hands-on approach will be used throughout this course so that the students can “learn-by-doing.”

**COMPS 2214 Programming with C++ (3 Credits)**

Students are introduced to the procedural programming paradigm using the C programming language. Topics include: language syntax, the Preprocessor, common coding styles and idioms and the implementation of selected data structures and algorithms in C.

Students will learn how to design and build modular multi-file C programs; Simple and Structured Data Types, Operators, Control, Functions; Pointers; Expressions and operators; Quick Review of Selection and Iteration control structures (For-while, do-while, If, if–else, switch, Break, continue, exit); Use of functions in modular programming; Arrays, Structures, and use of pointers to structures; Files and interactive I/O (Review)

A paradigm in programming which deals with classes and objects; a number of features of the C++ language will be covered including inheritance, polymorphism, templates, exceptions and the Standard Template Library

**TMATHS 222 Mathematical Methods 2 (3 Credits)**

Complex numbers: Arithmetic, geometrical representation, cartesian and polar forms, powers and roots, exponential form, fundamental theorem of algebra.

Differentiation: Implicit and logarithmic differentiation, optimisation, detailed graphing including inflection, rates, approximations, error analysis, Taylor polynomials, indeterminate forms, limits. Integration: Substitution, parts, general techniques, use of extensive tables, areas, centroids, volumes, arc lengths, surface areas, numerical integration.

Differential Equations: First order separable, exact, linear, orthogonal trajectories, second order linear with constant coefficients and simple right hand sides.

**THIRD YEAR**

**EED 31X Entrepreneurship Education (3 Credits)**

(Course structure with Economics department)

**COMPS 3115 Numerical Techniques (3 Credits)**

Experimental, rounding & truncation errors, convergence, order

Numerical solution of algebraic equations: interval bisection, fixed point iteration, Newton's method; initial approximation & convergence criteria; fzero, fsolve; function of functions and handles

Interpolation & curve fitting of scalar functions: polynomial and piecewise-polynomial; interpolants, least-squares, fast Fourier transform; interp1, spline, polyfit, fft

Numerical integration & differentiation: trapezium and Simpson's rule, Gauss quadrature- quad

Numerical solution of ODEs: explicit and implicit Euler, midpoint rule, trapezoidal, predictor-Corrector and Runge-Kutta methods; ode45, ode15s, odeset

**COMPS 3116 Computer Architecture and Organisation (3 Credits)**

Overview: The Main Components of a Computer; Standards Organizations; Historical Development; The Computer Level Hierarchy; The von Neumann Model

Data Representation in Computer Systems: Positional Numbering Systems; Decimal, octal, hexadecimal and Binary Conversions; Signed Integer Representation; Floating-Point Representation; Character Codes; Codes for Data Recording and Transmission; Error Detection and Correction

Boolean Algebra and Digital; Boolean Algebra; Logic Gates; Digital Components; Combinational Circuits; Sequential Circuits

CPU Basics and Organization: The Bus; Clocks; The Input/Output Subsystem; Memory Organization and Addressing; Registers and Buses; Register Transfer Notation

Instruction Processing; The Fetch-Decode-Execute Cycle; Interrupts and I/O

Instruction Set Architectures: Instruction Formats; Instruction Types; Addressing

Exceptions, Interrupts and traps   
Memory: Types of Memory; The Memory Hierarch; Cache Memory; Virtual Memory, Paging, Segmentation

Input/Output and Storage Systems: Amdahl’s Law; I/O Architectures; Magnetic Disk Technology; Optical Disks; Magnetic Tape; RAID

**COMPS 3117 Artificial Intelligence (3 Credits)**

Intelligent systems: philosophical questions; fundamental definitions; modeling the world:

Search and constraint satisfaction: problem spaces; brute-force search; best-first search; constraint satisfaction;

Adversarial search: Knowledge representation and reasoning: propositional and first-order logic; monotonic and non-monotonic

Reasoning; structured knowledge representation: Planning: definition and examples of planning systems; planning as search; operator-based planning; propositional planning; static world planning systems; planning and execution

Uncertain knowledge and reasoning: Bayes theorem; probabilistic reasoning; Bayesian networks and inference; belief networks; qualitative representation; reasoning on action and change

Learning: definition and examples of machine learning; supervised learning; unsupervised learning; reinforcement learning; introduction to neural networks

**COMPS 3118 Object-Orientated Programming with Java (3 Credits)**

Objects and Classes; Inheritance; Designing projects: Use of Unified Modeling Language for class diagrams and Guidelines for class design

Strings and StringBuffers: String class; StringBuffer class (Comparison with String class and Common methods); StringTokenizer Class

Comparison of Java references and C++ pointers

Memory Allocation: dynamic memory allocation (for arrays and objects); dynamic memory allocation (garbage collection)

Arrays and linked lists

Graphics: The Java Graphics API (Application Program Interface); Color class; Drawing geometric figures (drawLine(), drawOval(), drawRect(), drawPolygon())

Introduction to user interfaces: The jara.awt and javax.swing packages; Frames, applets, containers, components, panels, layout managers; GUI components: text boxes, labels, scroll bars, sliders, buttons, check boxes, radio buttons; Event driven programming: listeners and event handlers

Exception handling: Definition, Java predefined exception classes; User-defined exceptions; Claiming an exception (use of throw); Handling an exception: try-catch block

**BIT 319 Management Information Systems (3 Credits)**

This course is a study of management information systems (MIS) and the impact that MIS has on management decision-making. The emphasis of the course is on data collection techniques, information flow within the organization, techniques of analysis, and implementation of a system.

Competencies: Using information systems to collect, analyze, and distribute information

Information technology’s impact on society and business

Types of data computers can handle; Roles of transaction-processing systems;

MIS support of two primary functions

**COMPS 3119 Software Engineering (3 Credits)**

Introduction to Software Engineering: Overview and relevance of Software Engineering.   Professional and ethical responsibility;   Process Models: Sequential, iterative/incremental and rescue-based paradigms.   
Process activities; Project Management; Project planning; Project scheduling; Risk Analysis   
Identification, analysis and planning ;Software Requirements; Preparing software requirements document; Requirement elicitation, analysis and management   
System models: Object Oriented Software Design; System modeling using UML; CRC cards;   
Verification and Validation; Static and dynamic models   
Testing: System and dynamic methods; Test case design;

Software Evolution; Software maintenance; Evolution process

**COMPS 3120 Advanced Database Management (3 Credits)**

An introduction to database design, implementation and management: data modeling, the relational model, logical and physical database design, database application design, transaction management, concurrency, recovery, security, database architectures, data administration and database administration, and emerging issues in database practice.

An exploration into advanced concepts of database modeling using an enterprise level database management system. Topics will include object-oriented database processing, data integrity, transactions, locks, concurrency control, backup, recovery, optimization, Internet databases, server programming, and security.

**EED 32X Entrepreneurship Education (3 Credits)**

(Course structure with Economics department)

**COMPS 3221 Introduction to Scientific Programming (3 Credits)**

An introduction to programming for computationally oriented scientists. Fundamental programming skills, using MATLAB. Problem analysis, algorithm design, plotting and visualizing data, with examples drawn from simple numerical and discrete problems. The topics include: Basics of Programming in MATLAB; MATLAB/Simulink as a Technical Computing Language; Development, Environment and Basic Operations; Arrays and Array Operations

Data Structures, Types of Files, Managing Data Input/Output Programming with MATLAB;

2D and 3D Plotting; Animations.

Major numerical methods in MATLAB/Simulink: Accuracy of Digital Computations

Numerical Linear Algebra and Eigenvalue Problems; Root Finding, Optimization, Curve Fitting to Measured Data, Numerical Differentiation, Numerical Integration.

Modeling in MATLAB and Simulink

Solving Initial Value Problem in MATLAB

Simulink Basics

MATLAB - Simulink Interaction

Mathematical Modeling of System's Dynamics

**COMPS 3222 Object - Oriented Programming with C++ (3 Credits)**

# Object Oriented Programming Concepts and C++

Classes: Vocabulary and Syntax

Vocabulary of objects: object, method or member function, attribute or data member, information hiding or encapsulation, object instantiation, client

Constructors (Definition, role of, overloaded, default, copy); Destructors (Definition, role of, when needed); Member functions (design, syntax, use, when to use const Operator overloading; Friend functions (Definition, when to use ; *This* pointer and its relationship to the current object; Private, protected and public members of a class, static class members; Inheritance (Base and derived classes

Composition vs); Inheritance (Virtual and pure virtual function, abstract base class); Polymorphism (Implementation via virtual functions)

Introduction to Unidirectional Linked Lists: 1-D Array as Abstract Data Type list; Dynamic array (implemented with new); Singly linked list Abstract Data Type

Defining a linked list class; Advantages/disadvantages of using a linked list instead of list as array; Recursive traversal and other simple list operations.

**COMPS 3223 Research Methods (3 Credits)**

Purposes and types of educational research; Ethical issues in educational research; Steps in carrying out a research study; Selecting and developing research questions; Conducting a literature review; Development and validation of assessment instruments (e.g., surveys, attitude scales, questionnaires, rating scales, etc.); Research designs (experimental, quasi-experimental, and non-experimental)

Data collection techniques; Principles of sampling; Basic statistical methods for data analysis

Interpreting and Drawing Conclusions from Research Results; Reporting Results

**BIT 32 X Operations Research (3 Credits)**

The nature of operations research; Formulating problems and objective Analysis; Types of problems, risk Situation, maximizing effectiveness & Efficiency; Maximum; Model Construction and approximations; Structure decision models; Transportation and assignment problem, simples method, duality; Nature and Structure of inventory problems.

**COMPS 3224 Data Mining and Warehousing (3 Credits)**

Data Mining Technology: Introduction to data mining; Data mining algorithms (ID3, Association Rules, etc.)

Data Warehousing Technology: Database, data warehouse, OLTP and OLAP

Data warehouse design

Data cleansing, loading, refreshing and summation

Data Cube and analytic operations

**COMPS 3225 Web and Internet Technologies (3 Credits)**

Students will learn to add functionality, animation, and interactivity to both HTML and dynamic web pages. Students will learn to incorporate elements such as sound, graphics, animation, forms, and tables. Students will also be introduced to cascading style sheets, and JavaScript. A hands-on approach will be used throughout this course so that the students can “learn-by-doing.”

**COMPS 3226 Data Communication and Networking 2 (3 Credits)**

Switching - Switching networks, Circuit switching: Space-Division switching, Time-Division switching, Packet switching: Datagram, Virtual Circuit [SVC, PVC], Message switching.

X.25: X.25 layers-Physical layer, frame layer, packet layer, PLP packets

Networking Devices: Repeaters, Bridges, Routers, Gateways.

Routing Algorithms: Distance Vector routing, link state routing, shortest path Algorithm- Flyod’s Algorithm.

ATM: ATM Architecture-Virtual connection, Identifiers, Cells, Connection, Establishment & Release

ISDN: Integrated Digital network, ISDN, ISDN channels-B, D, H Channels, ISDN Interfaces, Functional grouping, ISDN protocol architecture- Physical layer, data link layer, network layer, ISDN addressing.

**FOURTH YEAR**

**COMPS 4127 Introduction to Programming using Visual Basic.net (3 Credits)**

User interface and algorithm design: Specifying and proper use of appropriate control objects for user interface based on the application’s logic, Design “pulldown” menus, Use common dialog boxes, Understand the capabilities of Event Driven programming, Saving, retrieving and executing VISUAL BASIC.NET applications.

Algorithm Design and Elements of Program Style: Definition of algorithms and its importance in application logic and its possible solutions, Expressing initial algorithm design in pseudo code or flowchart form.

Coding application programs in VISUAL BASIC.NET : String, numeric, Boolean, and object variables; Numeric and string constants; Evaluation of arithmetic and string expressions and assignment statements; Setting and changing object property characteristics during run time execution; Object event methods; Logical Boolean operators and decision statements (if, case structure); Looping structures (for, while, until) including the positioning of the test criteria in the DO; Use of common VISUAL BASIC.NET numeric and string functions; Subroutines and programmer created functions, including variable parameter passing; String processing capabilities; Declaration and use of arrays including the built in Visual BASIC.Net sorting features; Sequential data file write and read operations, accessing and interfacing a Microsoft ACCESS database; Visual BASIC.NET timer, image, worldwide web access and sound capabilities to enhance application presentation to a user.

Structure and documentation of programs: Using subroutines to modularize application logic; Improve maintenance efficiency by including comment remarks, indentation, and spacing and well chosen variable naming conventions

**COMPS 4128 Distributed and Concurrent Systems (3 Credits)**

Distributed systems models and architectures, impact of computer networking on distributed systems, concurrency, CSP, IPC, RPC, communication standards and protocols, multiprocessor interconnection networks, LAN, WAN, naming in DSs, deadlock detection, mutual exclusion, leader election, group membership, distributed OS, security and fault tolerance issues, case studies

**COMPS 41****29 Computer Graphics (3 Credits)**

A rigorous study of concepts, theory, and algorithmic aspects of two and three dimensional computer graphics. Topics include graphics hardware and programming, file-formats, algorithms for curves and image generation, splines, transformations, perspectives, illumination, shading, depth, solid-modeling, ray-tracing, animation, fractalization, texturing, and alternate rendering models. Programming in both general-purpose and ray-tracing languages.

**COMPS 4130 Professional, Ethical and Legal Issues in IT (3 Credits)**

Computer ethics and society   Computer crime (viruses, worms, Trojan horses, hacking)   
Implementing computer ethics   Computer professionals and social responsibilities   
Software copyright, piracy, privacy, security, and civil liberties   
Selected topics such as: Philosophical Foundations of Ethics, Ethical Dissent And Whistle-blowing, Monopolies And Their Economic,  Social and Ethical Implications

**ELTT 4117 MS Server Administration (3 Credits)**

**COMPS 4131 Multimedia Design and Development (3 Credits)**

This course introduces students to the world of multimedia. Students will learn to create and manipulate objects, develop screen designs, and begin to build multimedia applications that incorporate graphics, animation, audio and video.

**COMPS 4132 Computer and Network Security (3 Credits)**

Confidentiality, integrity and availability: the pillars of security.  
The ethics issues facing the security professional.  
Physical access to information resources: secure sites, security policies, backups, disaster recovery  
The human factor: social engineering  
Malware: viruses, worms, Trojan horses, mailers etc  
Penetration testing: threat discovery, assessment and system hardening.  
Confidentiality, integrity and non-repudiation: the use of cryptography in security (hash functions, message digests, public/private key cryptography)  
Tools for securing systems and preventing and detecting attacks: firewalls, IDSes, anti-malware (antivirus, anti-spyware, anti-rootkit)

**BIT 413 Project Design and Management (3 Credits)**

The course introduces the students to the various concepts and methodologies of Project Management.  Exercises and Case Studies (Workshops) are introduced within the learning scope, whereby assessing general implications.  Brief introduction to Microsoft Project is given as well.  Students will build hands-on training from especially prepared workshops. This course is deployed and administered in such a way that enriches the students' understanding of best practices and the advantages of using project management skills, to increase their productivity and enable them reach higher returns from investments in Information Technology (IT).

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