

Introductory Programming

Note: Topics from the following courses are not definitive.

This would include programming courses similar to COSC1046 with Java programming language or other programming languages such as C++ and Python:

COSC 1046 Introduction to Computer Science.

This course is required of students in the B.A. or B.Sc. Computer Science programs. It introduces problem analysis and structured program design. Control structures for conditional execution, repeated execution, subprograms and recursion are introduced. Representation of information, including homogeneous and non-homogeneous linear data structure and files, is investigated.

- Programming in Java, variables
- Selection statements
- Math Methods
- Characters, Strings
- Looping Structures
- Methods
- Arrays
- Objects and Classes

Introductory Statistics

MATH 2236 Probability and Statistics. This course is intended for students majoring in Mathematics or Computer Science. The laws of probability, discrete distributions (hypergeometric, binomial, Poisson), continuous distribution (uniform, normal, gamma family) and the Central Limit theorem are studied. Students are introduced to the statistical techniques of hypothesis testing and estimation as they relate to means, variances, proportions, and frequency tables. An introduction to stochastic processes, including application to queuing problems and simulation, is provided.

- Introduction to statistics, probability axioms, sample spaces, events
- Conditional probability, Bayes' formula, independent events
- Random variables, jointly distributed random variables
- Expectation, variance, covariance, moments, Chebyshev inequality
- The Bernoulli, binomial, and Poisson random variables
- The uniform, and exponential distributions
- The normal, Chi-square, and t-distributions
- Distribution of sampling statistics
- Sample mean, -variance, and -distribution; central limit theorem
- Parameter and interval estimation, maximum likelihood estimators
- Hypothesis testing
- Least squares approximation
- Random number generation



Computer Organization

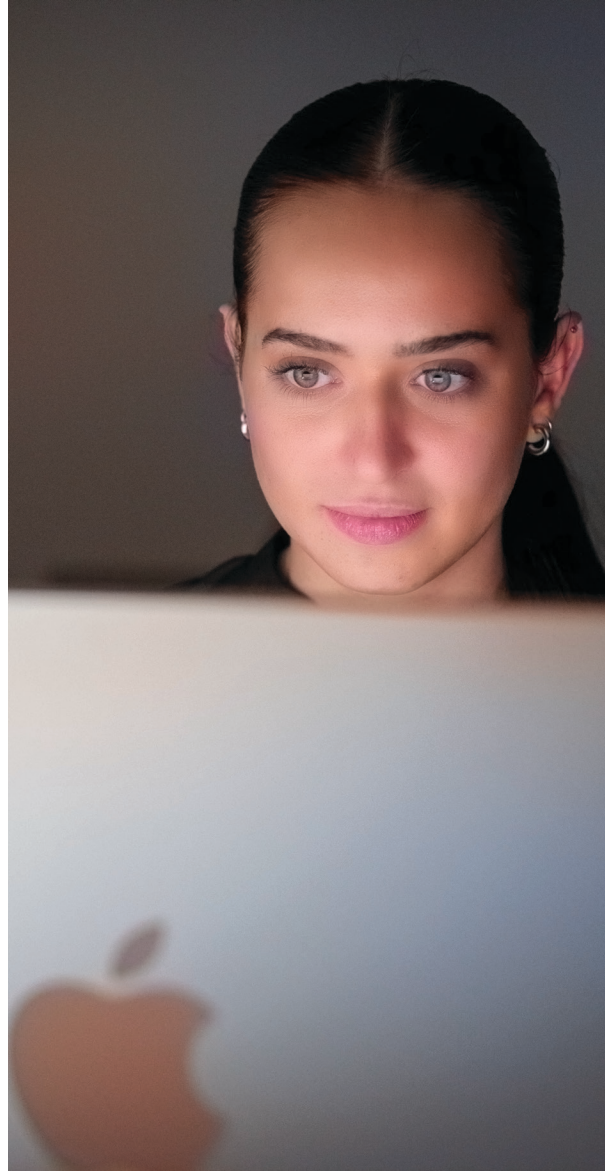
COSC 3406. Introduction to the organization and structuring of the major hardware components of computers and to the methods of information transfer. Basic logic design. The central processing unit. Data flow and control design; microprogrammed control. Memory organization.

- Introduction, overview of computer organization
- Computer System functions
- Cache Memory
- Internal Memory and External Memory
- I/O and OS Support
- Arithmetic and Number Systems
- Digital Logic
- Instruction Sets
- Processor and RISC
- Parallelism Processor and Control Unit
- Parallel processing and Multicore

Data Structures II

COSC 2007. An introduction to data structures and their associated algorithms. Pointers and dynamic memory. Treatment of stacks, queues, and linked lists. Searching and sorting algorithms. Analysis of time and space Requirements. Study of data structures and the analysis of algorithms, trees, binary search trees, balanced trees, B-trees. Recursive programming techniques, elimination of recursion

- Recursion
- Recursive solutions
- Counting things
- Searching an Array
- Organizing data
- Recursion, and efficiency
- Recursion as a Problem-Solving Technique
- Backtracking.
- Defining languages.
- The relationship between recursion and mathematical induction
- Advanced Java topics
- Inheritance revisited
- Dynamic binding and abstract classes
- Java Generics
- Algorithm efficiency and sorting
- Measuring the efficiency of algorithms
- Sorting algorithms and their efficiency
- Trees. Terminology
- The ADT Binary Tree
- 6 Trees. The ADT Binary Search Tree
- General Tables and Priority Queues
- The ADT table
- Tables and Priority Queues
- The ADT priority queue
- Tables and priority queue in the JCF
- Advanced implementation of tables
- Balanced search trees. 2-3 trees. 2-3-4 trees
- Advanced implementation of tables. Red-Black trees
- AVL trees. Hashing
- Graphs. Terminology. Graphs as ADTs
- Graph Traversals
- Topological sorting
- Spanning trees
- Minimum spanningtrees
- Shortest paths.
- Circuits



Theory of Computing

COSC 3106 Theory of Computing. Finite automata and regular languages. Models of computation and undecidability. Chomsky hierarchy. Semantics of programming languages.

- Elementary Set Theory
- Cardinality, Recursion, and Induction
- Words and Languages
- Finite State Machines
- Nondeterministic Finite Automata
- Lambda NFAs
- Introduction to Context Free Grammars
- Grammars and Languages
- Grammars and NFA's, Chomsky Normal Form & the Pumping Lemma
- Normal Forms and Parsing
- Automata Accepting LCF
- PDA's/CFG's/Closure Properties
- Turing Machines
- Turing Machine Computations
- Turing Machine Variants
- Church's Thesis
- Universal Turing Machines
- Classical Undecidability Problems
- Closure Properties and Post Correspondence

Computer Networks

COSC 4436 Computer Networks. This course is based on the seven-layered ISO Open Systems Interconnection model for computer networks. Both hardware and software topics will be considered. Typical applications including mail networks, electronic offices and distributed file systems will be studied. Standard transport technologies based on point-to-point links and on broadcast principles will be covered.

- Introduction: Computer Networks and the Internet
- Service models (OSI, TCP/IP)
- Application Layer
- Transport Layer
- Network Layer: Addressing, IP, Subnets, Routers, ICMP
- Network Layer: Routing, Distance Vector (RIP)
- Link State (OSPF)
- Link Layer, Local Area Networks
- Network Security

