



WYŻSZA SZKOŁA BIZNESU
NATIONAL-LOUIS UNIVERSITY

BA in Computer Science Applied Math and Computer Science Undergraduate Curriculum

Applied Mathematics:

MAT 143 Discrete Mathematics

Introduction to contemporary language of mathematics based on combinatorial objects. Elements of graph theories. Induction and recurrence as the primary mathematical tools of an IT specialist.

MAT 144 Linear Algebra and Geometry

Introduction to linear algebra with a special focus on techniques of solving linear equations. Preparation for linear programming. Introduction to techniques of affine and cartesian geometry. Training of geometric intuition supported with computer visualization.

MAT 142 Statistics

Examination of the application of statistical description and inference in business, psychology, and science. Topics include: frequency distribution, graphing techniques, measures of central tendency and dispersion, normal distribution, correlations, regression, probability and sampling methods, hypothesis testing and decision making, t-tests and analysis of variance.

MAT 241 Econometrics

This course acquaints students with basic methods of econometric analysis, analytical skills dealing with selecting, formulating and using appropriate models in solving real-world problems. Topics cover the core material on simple and multiple regression, pooling time-series and cross-sectional data, simultaneous equation models, nonlinear least squares and time series models.

MAT 243 Operations Management

An introduction of mathematical topics to business, economics and the social sciences. This course deals with the problem of minimizing or maximizing a linear function in the presence of linear inequalities. Linear programming is used by decision makers to solve multivariable, multi-goal problems commonly found in accounting, finance, management, marketing, industry, government and urban planning. Topics include the study of linear inequalities, linear programming problems, and solving problems by the simplex method, postoptimality analysis, transportation and assignment problems, integer programming. Networks and PERT/CPM are covered. Computer software will be integrated throughout the problem-solving course.

MAT 244 Integral and differential calculus

Familiarizes students with elements of mathematical analysis based on functions of one or two variables, as well as aspects of optimization.

Computer Science:

INF 151 Foundations of Computer Technology

The course presents the use of computer technology to search for, analyse and disseminate all sorts of information. Exposes students, through the use of hands-on instruction, to different basic computing skills as well as the computer.

INF 153 Introduction to Computing

Algorithms and programs - general concepts. Computer data representation: integers, floating point, fractions. Von Neumann's machine: data and program, instruction format and addressing modes, instruction cycle, idea of assembler language. Program construction by stepwise refinement. Computational complexity, „big Oh" notation. Data structures: lists, stacks, queues, trees, sets. Techniques for algorithm construction: divide and conquer, dynamic programming, greedy method, backtracking.

INF 154 Introduction to Programming

Programming language C/C++. General program structure. Variables and constants. Arithmetics. Control structures: if, for, while, switch, break, continue, goto. Structures and definition of types. Functions, argument passing, variable definition range. Library functions. Pointers and arrays, dynamic memory allocation. Compilation process, preprocessor, linker, debugger. Input-output: streams, formatting. Manipulating text and binary files.

INF 155 Algorithms and Data Structures

Sorting: simple methods (insertion, selection), quicksort, heapsort, mergesort. Sample complexity analyses, lower bounds for sorting. Countsort and bucketsort. Data structures for fast search: binary search trees, AVL trees, B-trees, hashing. Graph algorithms: depth- and breadth-first search, connectivity problems, shortest path, minimum spanning tree, Euler tour. Text search algorithms: KMP method, suffix trees. Geometric problems: convex hull, sweep technique. NP-complete problems.

INF 156 Operating Systems

Basic concepts: operating system, buffering, multiprogramming, time sharing, real time system. Processes and concurrency. Coordination: critical sections, semaphores, deadlock avoidance. Memory management: paging, segmentation, virtual memory. File system: directory structure, access security control. UNIX and LINUX operating systems: basic commands, file system, shell interpreter. System kernel. Selected application programs.

INF 157 Programming Laboratory

An extension of the Introduction to Programming course. Enhances practical programming skills and improves techniques especially in more difficult and frequently used programming language areas. The students construct 3 to 4 advanced programs in the C language under instructor's supervision.

INF 251 Introduction to Database Management

Covers basic database management concepts to enable participants to use, retrieve and print out information from large databases. Presents the usage of particular types of tables, data control and types of relationships between database elements, and methods of selecting optimum tools for recording data. Students will learn how to design and use selected elements of MS Access 2.0 (table, enquiry, report, form). Those skills should enable them to operate other databases to search for, select and present relevant information.

INF 253 Computer Networks

Local area networks: classification, topology and structures. Examples of LAN: Ethernet, Cambridge Ring, IBM Token Ring, Fastnet, FDDI. Network mechanisms in UNIX, data protection in networks, network operating systems, Internet: history, addressing, typical tools, internet access. WorldWideWeb: history, structure, servers and browsers, sample servers, server configuration. Fundamentals of HTML language: formatting, links, graphics, tables and frames, forms.

INF 254 Object Oriented Programming

Intuitive introduction to object oriented techniques. Classes as definitions of objects. Instances as realizations of objects. Syntax of class definition. Class components. Component methods (functions). Reference to class components and methods. Class as encapsulation technique. Public, protected and private components and methods. Static components and methods. Constructors and destructors, Explicit and implicit calls to constructors and destructors. Inheritance and derived classes. Virtual functions. Early and late binding. Abstract classes. Templates.

INF 255 Internet Programming

HTTP protocol. Fundamentals of programming in PERL: data structures, references, regular expressions. CGI protocol. CGI scripts in PERL. Web based client-server programming. JavaScript: fundamentals, JavaScript objects and events. Java: Applet class, processing events, abstract window toolkit, user interface, processing graphics, multithread programming.

INF 256 Computer Graphics

Introduction: raster, vector, and interactive graphics. Two-dim raster graphics: conversion of segments and circles, filling, outlining, and shaping. Geometric transforms. Projecting. Curve representations: polygonal nets, Hermite, Bezier, and B-spline curves and surfaces. Fractal models. Grammatical models. Solid modeling and visualization. Problems in image processing: FFT, filtrations. Graphical input-output devices: methods of presentation, controllers, scanners, interactive methods.

INF 257 Computer Systems Security

Programming security: incorrect data, incorrect program realization, typical sources of error, typical program failures, testing methods, viruses. Net security: methods of attack, protection services, net viruses. Data protection: protection policy, access control, access hierarchy, permission lists, data flow control. Conventional encryption: typical model, substitution and permutation cipher, multialphabet cipher. Public key cryptography: RSA algorithm, digital signatures, cryptography protocols. Mail security.

INF 258 Computer Simulation

Basic concepts: system, state variables, discrete and continuous models. Area and goals of computer simulation. Simulation languages. Monte Carlo simulation of stock management system. Dynamic production models: flowcharts, feedback. Result verification and hypothesis testing. Discrete event simulation, time representation. Sample models and simulation in manufacturing, finance, and marketing.

INF 259 Database Applications

Opening database, database window, database environment. Tables: data manipulation, ordering and filtering, intertables connections. Queries: construction, saving and execution. Forms: creating with creators, modifying. Reports: creating, modifying and printing, types of reports. Macros. Repairing faulty databases. Effectiveness and correctness analysis.

INF 351 Information Systems in Management

Introduces a conceptual framework and body of knowledge concerning contemporary information systems as they relate to management decisionmaking. It focuses on methods of data processing, storing, transmitting, and principles of obtaining, analysing and presenting information effectively. Introduces the most important issues in management of information systems to satisfy organisational needs. Its major objective is to prepare future managers to make informed decisions concerning the design and implementation of information systems in their organisations. In addition to reviewing their knowledge and skills gained during other computer courses, students will be able to test modelsoftware for business management. Forms of delivery: lectures, computer laboratory classes and individual work.

INF 352 Decision Support Systems

Areas of application and models of decision support systems construction. Methods built on pattern recognition: minimal distance methods, approximation and convergence, probabilistic methods. Artificial intelligence models: tree searching techniques, expert systems, semantic networks, neural networks, genetic algorithms, agent systems. Cluster analysis methods: variables and scaling, data measuring, hierarchical and nonhierarchical methods of cluster analysis, problems of interpreting results.

INF 353 Information Systems Analysis and Design

Structural techniques for information system modeling: data flowcharts, process specification, relational diagrams, state transition flowcharts. Structural model development: environment and behavioral methods. Object modeling principles: abstraction, hierarchization, modularization, and encapsulation methods. Other object oriented techniques: diagrams of objects, interactions, transitions, and classes. Object model construction process.

INF 354 Complex Software Development

A laboratory involving students in joint work on development of a complex software project from conception, through implementation and testing, to documentation.