Information and Systems Science Committee

See the Department of Mathematics and Statistics; Department of Systems and Computer Engineering; or the School of Computer Science

The Committee

Chair of the Committee:
Frantisek Fiala

The program of graduate study and research leading to the degree of Master of Science in Information and Systems Science is offered by the Committee with cooperation of the Department of Systems and Computer Engineering, the Department of Mathematics and Statistics, and the School of Computer Science.

The purpose of the program is to provide training in the use and application of computers to those who have not studied extensively in this field at the undergraduate level. The process of using the computer in problem-solving is stressed. The program is flexible, though individual concentrations are usually in one of three broad areas:
- computer applications in a particular field (e.g. communications, energy systems)
- algorithms and methodologies for solution of complex problems by computer (e.g. graph theory, operations research, optimization, simulation and modelling)
- computer methods and technologies (e.g. databases, software engineering, computer languages)

Close links are maintained with the scientific, industrial, and technological communities, and an effort is made to direct students to project work of current practical significance.

Qualifying-Year Program

Applicants who have a general (pass) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the general section of this calendar for regulations governing the qualifying year.

Master of Science

Admission Requirements
Applicants should have an honours bachelor's degree, or equivalent, with at least high honours standing, in mathematics, engineering, physics, chemistry, computer science, operations research, experimental psychology, econometrics, management science, or a related discipline. Undergraduate preparation should include at least two full courses in computing and a minimum of three full courses in mathematics, at least one of which is at the third-year level or higher. In addition, the student is required to have some knowledge of quantitative applications, such as numerical analysis, simulation, operations research, etc.

Admissions to the program will be made through one of the three participating departments. Since space and laboratory facilities will be provided by one of the departments, students should apply through the department with which they wish to be most closely associated.

Program Requirements

The normal program comprises eight half courses and a thesis having a weight of one and one half full courses; additional requirements may also be stipulated, depending upon the individual student's background. With the approval of the Committee, students who have substantial work experience may be permitted to substitute three additional half courses in place of the thesis, one of which must be a graduate project course.

Students must take at least two half courses from the department in which they are registered, and at least one half course from each of the other two participating departments. Students must also take course 93.582 Introduction to Information and Systems Science.

Each student should consult with his/her faculty adviser in the selection of a course pattern related to his/her principal area of interest.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of his/her thesis.

Course work may be completed on either a full-time or part-time basis. Thesis research normally requires full-time residence at the University; however, a candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the Committee.

Graduate Courses

• Information and Systems Science 93.582F1
Introduction to Information and Systems Science
An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization.
(Also listed as Mathematics 70.582, Engineering 94.582, Computer Science 95.582)

• Information and Systems Science 93.598F3, W3, S3
M.Sc. Thesis in Information and Systems Science
(Also listed as Mathematics 70.598, Engineering 94.598, Computer Science 95.598)

Department of Mathematics and Statistics

Undergraduate Courses
70.301	Real Analysis
70.302	Advanced Calculus
70.310	Modern Algebra
70.350	Mathematical Statistics
70.403	Functional Analysis
70.451	Probability Theory
70.452	Survey Sampling
70.453	Applied Multivariate Analysis
70.456	Non-Parametric Methods
70.457	Statistical Inference
70.458	Stochastic Models
70.459	Topics in Stochastic Optimization and Advanced Mathematical Modelling
70.470	Partial Differential Equations
70.471	Topics in Partial Differential Equations
70.473	Qualitative Theory of Ordinary Differential Equations
70.481	Topics in Combinatorics
70.482	Introduction to Mathematical Logic
70.483	Computable Functions
70.485	Theory of Automata
70.486	Numerical Linear Algebra
70.487	Game Theory
70.488	Graph Theory and Algorithms
70.496	Directed Studies

Graduate Courses:
70.507	Real Analysis I (Measure Theory and Integration)
70.508	Real Analysis II (Functional Analysis)
70.517	Algebra I
70.519	Algebra II
70.552	Sampling Theory and Methods
70.553	Linear Models
70.554	Stochastic Processes and Time Series Analysis
70.555	Design of Experiments
70.556	Robust Statistical Inference
70.557	Advanced Statistical Inference
70.558	Topics in Stochastic Processes
70.559	Multivariate Analysis
70.561	Stochastic Optimization
70.565	Theory of Automata
70.567	Game Theory
70.569	Topics in Combinatorial Mathematics
70.571	Stochastic Models
70.581	Linear Optimization
70.583	Nonlinear Optimization
70.584	Topics in Operations Research
70.585	Topics in Algorithm Design
70.586	Numerical Analysis
70/95.587	Formal Language and Syntax Analysis
70.588	Combinatorial Optimization
70.589	Combinatorial Optimization
70.590	Seminar
70.591	Directed Studies
70.593	Project

Department of Systems and Computer Engineering

Undergraduate Courses:
94.303	Introduction to Real-Time Systems
94.310	Systems Analysis
94.333	Real-Time Concurrent Systems
94.351	Communication Theory
94.361	Microprocessor Systems
94.401	Operating Systems
94.405	Discrete Simulation and its Applications
94.445	Discrete Time Systems
94.457	Architecture of Computer Systems
94.460	Digital Communications
94.462	Introduction to Computer Communications
94.480	Software Engineering
94.481	Software Engineering Project
94.485	Computer Systems Design Laboratory

Graduate Courses
94.501	Simulation and Modelling
94.504	Mathematical Programing for Engineering Applications
94.505	Optimization Theory and Methods
94/95.507	Expert Systems
94.511	Computer System Design for Performance
94.517	Queuing Systems
94.518	Topics in Information Systems
94.519	Teletraffic Engineering
94.521	Computer Communication
94.527	Distributed Processing Systems
94.531	System Design with Ada

94.535	Representations, Methods and Tools for Concurrent Systems
94.538	Computer Architecture and Parallel Processing
94.541	Adaptive Control
94.542	Advanced Dynamics with Applications to Robotics
94.552	Advanced Linear Systems
94.553	Stochastic Processes
94.554	Principles of Digital Communication
94.557	Fundamentals of Discrete Systems
94.558	Digital Systems Architecture
94.560	Adaptive Signal Processing
94.561	Neural Signal Processing
94.562	Digital Signal Processing
94.563	Digital Signal Processing Microprocessors, Software and Applications
94.564	Advanced Topics in Digital Signal Processing: Speech Communications and Applications
94.565	Advanced Digital Communication
94.566	Introduction to Mobile Communications
94.567	Source Coding and Data Compression
94.568	Wireless Communication Systems Engineering
94.569	Digital Television
94.571	Operating System Methods for Real-time Applications
94.573	Integrated Database Systems
94.574	Elements of Computer Systems
94.576	Analytical Performance Models of Computer Systems
94.577	Teleprocessing Software Design
94.579	Advanced Topics in Software Engineering
94.581	Advanced Topics in Computer Communications
94.583	Logic Programing
94.584	Advanced Topics in Communications Systems
94.585	Logic Programing: Techniques and Applications
94.596	Directed Studies

School of Computer Science

Undergraduate Courses

95.300	Operating Systems
95.304	Software Systems Design
95.305	Database Management Systems
95.401	Concurrent Programing
95.402	Computer Graphics
95.403	Transaction Processing Systems
95.405	A First Course in Robotics and Computer Vision
95.407	Applied Artificial Intelligence

| 95.408 | Performance Modelling |
| 95.409 | Introduction to Parallel and Systolic Computing |

Graduate Courses:

95.501	Foundations of Programing Languages
95.502	User Interface Facilities
95.503	Principles of Distributed Computing
95.504	Topics in Arithmetic Complexity
95.505	Automata Models of Learning Systems
95.506	Natural Language Understanding
94/95.507	Expert Systems
95.508	Computational Geometry
95.509	Associative Data Structures and Advanced Databases
95.510	Topics in Artificial Intelligence
95.511	Distributed Databases and Transaction Processing Systems
95.512	Distributed Operating Systems
95.513	Cryptography
95.514	Object-Oriented Systems
95.515	Parallel Processing Systems
95.516	Languages for Parallel Computing
95.520	Cerebral Computations
95.522	Network Reliability
95.573	Algorithm Analysis and Design
95.574	Parallel Algorithms and their VLSI Implementation

Due to the interdisciplinary nature of ISS, a student will in some cases benefit by taking an undergraduate course at the 300 or 400 level as part of his/her program. Where a 300 level course is to be taken, it will be extra to the degree requirements, or else arrangements will be made to enrich the subject matter, normally through a directed study course with the professor. Students may include two half courses at the 400 level in their program without penalty, with the approval of the department. The 300 and 400 level courses listed here are those most likely to interest ISS students; see the *Undergraduate Calendar* for a complete list. ISS students are prohibited from taking course 95.484 Design and Analysis of Algorithms due to overlap of course material with 93.582.