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:
B.C. Mortimer

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 con- centrations
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 modeling)
- 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 honors bachelor's
degree, or equivalent, with at least high honors
standing, in mathematics, engineering, physics,
chemistry, computer science, operations
research, experimental psychology, econometrics, management science, or a related disci-pline.
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 appro-val of the
committee, students who have sub- stantial 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 Intro-
duction 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 manipu-lation, 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 I
70.302   Real Analysis II
70.310   Modern Algebra
70.350   Mathematical Statistics
70.403   Functional Analysis
70.451   Probability Theory
70.452   Sampling Theory and Methods I
70.453   Applied Multivariate Analysis
70.456   Non-Parametric Methods I
70.457   Statistical Inference
70.458   Stochastic Models
70.459   Stochastic Optimization
70.470   Partial Differential Equations I
70.471   Partial Differential Equations II
70.473   Qualitative Theory of Ordinary Differential Equations
70.482   Introduction to Mathematical Logic
70.483   Topics in Applied Logic
70.485   Theory of Automata
70.486   Numerical Analysis

70.487   Game Theory
70.496   Directed Studies

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:
94.301   Operating Systems
94.303   Real-Time Computing Systems
94.310   Systems Analysis
94.333   Advanced Real-time Programing
94.351   Communication Theory
94.361   Microprocessor Systems
94.405   Discrete Simulation and its Applications
94.445   Discrete Time Systems
94.457   Introduction to the 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 Modeling
94.504   Mathematical Programming for Engin-eer-ing 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
94.532   Systems Design
94.533   Digital Systems Engineering
94.535   Representations and Methods in Design Tools for Concurrent Systems
94.538   Computer Architecture and Parallel Processing
94.539   Advanced Topics in Digital Systems Design
94.540   Topics in Office Automation
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
94.562   Digital Signal Processing
94.563   Digital Signal Processing Hardware, Software and Applications
94.564   Advanced Topics in Digital Signal Processing: Speech Communications and Applications
94.565   Advanced Digital Communications
94.567   Source Coding and Data Compression
94.568   Mobile Communications Systems
94.569   Digital Television
94.571   Mini/Microcomputer Operating System Design
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 Comunications
94.583   Logic Programming
94.584   Advanced Topics in Communications Systems
94.585   Logic Programming: Techniques and Applications
94.589   Advanced Topics in Measurements and Models
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
95.404   System Software
95.405   First Course in Robotics and Computer Vision
95.407   Applied Artificial Intelligence

Graduate Courses:

95.501   Foundations of Programming 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
95.520   Cerebral Computations
95.522   Network Reliability
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 70/95.484 Design and Analysis of Algorithms due to overlap of course material with 93.582.