1995-1996

DEPAUL UNIVERSITY BULLETIN

SCHOOL OF COMPUTER SCIENCE,

TELECOMMUNICATIONS AND

INFORMATION SYSTEMS

GRADUATE PROGRAMS

MASTER OF SCIENCE IN COMPUTER SCIENCE

MASTER OF SCIENCE IN INFORMATION SYSTEMS

MASTER OF SCIENCE IN SOFTWARE ENGINEERING

MASTER OF SCIENCE IN TELECOMMUNICATIONS SYSTEMS

JOINT - M.S./M.I.S.

DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE

To obtain a 1995-96 Bulletin for the Kellstadt Graduate School of Business call (312) 362-8810, for the College of Law call (312) 362-8701, or for Graduate Programs call (312) 362-5367.

DePaul University Bulletin (USPS = 154-260), No. 5, July 1, 1995. Published monthly, March through July, five times per year by DePaul University, 1 East Jackson Boulevard, Chicago, Illinois, 60604. Second-class postage paid at Chicago, Illinois. POSTMASTER: Send address changes to DePaul University Bulletin, 1 East Jackson Boulevard, Chicago, Illinois 60604.

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Editor: Gwyn Friend
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INFORMATION SYSTEMS
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Dean
David P. Miller, Ph.D.
Associate Dean
Betty A. Baunoch
Director, Graduate Student Services
H. Eleni Vasilopoulous
Associate Director, Graduate Student Services

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FACULTY

PURPOSES

FACILITIES

PROGRAMS

Master of Science
Computer Science
Information Systems
Software Engineering
Telecommunication Systems
Management Information Systems

Doctor of Philosophy
Computer Science

COURSES
PHILOSOPHY

DePaul University, founded on Judeo-Christian principles, continues to assert the relevance of these principles through higher education to modern man and woman. The University expresses these principles especially by passing on the heritage of St. Vincent de Paul: individual perfection manifested through purposeful involvement with other persons, communities and institutions.

The School of Computer Science, Telecommunications and Information Systems assumes as its direct educational task to foster in its students those traditions of scholarliness central to advanced studies and research. The programs for the master's and doctoral degrees are designed to develop in graduate students a broad and deep knowledge of their chosen discipline, the research methodology of the discipline and the development of those competencies necessary for their personal advancement in their scholarly, professional or creative careers.

Through the steady flow of its graduates into the community, the School strives to assist contemporary society to meet its need for educated individuals willing to be of service to others.

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Associate Professor and Dean
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L. Edward Allemand, Ph.D.
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University of Louvain

Gary Andrus, Ph.D.
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Lecturer
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SCHOOL OF COMPUTER SCIENCE,
TELECOMMUNICATIONS AND INFORMATION SYSTEMS

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KAM-CHAN LO, PH.D.
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Associate Professor
Indiana University

PURPOSES

The School of Computer Science, Telecommunications and Information Systems offers graduate level, professional education in these areas: artificial intelligence, computer science, data analysis, database, data communications, information systems, project management, software engineering, telecommunication systems, visual computing, and management information systems. Students choose from a broad collection of courses to develop, in depth, the research habits and practical skills needed for research and professional practice. The School’s programs are designed to provide its graduates with the technical competence and the flexibility necessary to respond to both present and future opportunities in the computing professions.
FACILITIES

DePaul's University Planning and Information Technology (UPIT) division houses a large network of computers and allows students access to a rich computing environment. The configuration includes a Harris Nighthawk and several Sun SPARCCenters for student use. In addition, students have access to IBM PC laboratories and Macintosh laboratories at the Loop and Lincoln Park campuses. There are numerous dial-up phone numbers available for off-campus work. DePaul's suburban campuses in the Oak Brook, O'Hare and South areas also offer excellent student laboratory facilities. Permanent student Internet access accounts are available along with dial-in SLIP connections.

The School itself operates specialized laboratories for artificial intelligence, computer vision and graphics, software engineering, telecommunications, local area networks and computer telephony. One laboratory allows students to explore specialized software. The laboratories include both PCs and UNIX workstations. The school also operates an IBM ES 9000/9221.

Most of the UPIT and School computers are connected by Ethernet. All of the School's computers and laboratories form their own subnet using TCP/IP. A separate Starlan network connects the UPIT IBM PC laboratories. DePaul has external connection through Internet and BITNET.

PROGRAMS

The school offers graduate work leading to the Master of Science and Doctor of Philosophy degrees as well as non-degree programs in Professional Development. The M.S. is a terminal degree. A master's degree in computer science or a related field is required for consideration for the Doctor of Philosophy degree. The curricula cover theoretical foundations, state-of-the-art techniques and skills, and major trends. The school offers programs in the following areas:

PROFESSIONAL DEVELOPMENT

The School of Computer Science, Telecommunications and Information Systems established the Institute for Professional Development in 1985 to offer certificate programs designed to meet the needs of both individuals and businesses in the Chicagoland area. These non-degree offerings provide intensive training in a wide variety of areas, with each stand-alone certificate program addressing a different set of theoretical concepts and practical skills. Emphasis is placed on gaining practical experience through a combination of lectures and demonstrations complemented by laboratory exercises and homework assignments.

Each certificate program is taught by a team of instructors that includes full-time faculty with consulting experience and part-time instructors from industry. Each program requires a substantial commitment of time, as classes meet two nights per week and in the morning on half of the Saturdays during the program.

For application and registration information pertaining to the certificate programs offered by the Institute for Professional Development please call the Institute office at (312)362-6282.
MASTER OF SCIENCE IN COMPUTER SCIENCE

The Master’s degree program consists of three phases:

- Prerequisite Phase.
- Core Knowledge Phase.
- Advanced Phase.

The Prerequisite Phase guarantees that all students have a common background. Successful completion of the Prerequisite Phase constitutes part of the admission requirements for the master’s degree program.

The Core Knowledge and Advanced Phase constitute the degree program. The Core Knowledge Phase prepares students for their chosen concentration. In the Advanced Phase, students specialize in their concentration area. The concentration requirements are tailored to meet individual students’ needs. The student must pass an examination to move from one phase to another.

Students with a superior undergraduate academic record who have completed sufficient undergraduate coursework in Computer Science are eligible for the Distinguished Scholars Program (DSP) within the M.S. degree in Computer Science. DSP provides a more flexible and accelerated program of study than the regular program, has a research orientation, and requires a master’s thesis. The program is recommended for students with an interest in research and development work or in future doctoral study in Computer Science. Participants in this program may receive early admission to the Ph.D. program.

ADMISSION REQUIREMENTS

All applicants who satisfy general graduate school admission requirements initially receive conditional admittance and may then pursue a degree program. For full admission to a degree program, students must have the following:

- Bachelor’s degree (not necessarily in computer science).
- Counseling session with a graduate counselor.
- A grade of B- or better in the Prerequisite Phase courses.

At the time of admission, students with an undergraduate major in Computer Science or an allied field, who have successfully completed the GRE subject test, may petition the admissions committee to waive all Prerequisite Phase requirements. If the Prerequisite Phase requirements are not waived by the admissions committee, the requirements can be met by taking the courses at DePaul and receiving a grade of at least B-.

Alternatively, the Graduate Assessment Prerequisite Phase course requirements can be met by taking an equivalency exam, the Graduate Assessment Exam (GAE). Students with related course work or experience in calculus or statistics should consult a graduate advisor for possible waiver of the Quantitative Prerequisite Phase course requirements.

The GAE is offered at the beginning of each month. Applications for the exam must be received at least one week before the exam. Exam dates, application forms and a study guide are available from the school (phone 312/362-8714). For more information on this exam, contact a graduate advisor.
GRADUATE ASSESSMENT PREREQUISITE PHASE COURSES: COMPUTER SCIENCE

Sequence A:

CSC 215  Introduction to Programming Using C
CSC 310  Principles of Computer Science I. Prerequisites: MAT 140 and CSC 215.
CSC 415  Foundations of Computer Science II. Prerequisite: CSC 310.
CSC 416  Foundations of Computer Science II. Prerequisite: CSC 415.
CSC 417  Foundations of Computer Science III. Prerequisite: CSC 415.

OR

Sequence B (restricted to graduate students with programming experience):

CSC 225  C Language for Programmers
CSC 415  Foundations of Computer Science I. Prerequisites: MAT 140 and CSC 225.
CSC 416  Foundations of Computer Science II. Prerequisite: 415.
CSC 417  Foundations of Computer Science III. Prerequisite: 415.

All students must fulfill the following requirements:

CSC 343  Introduction to Operating Systems. Prerequisites: CSC 415
CSC 345  Computer Architecture. Prerequisites: CSC 415
MAT 140  Discrete Mathematics

QUANTITATIVE PREREQUISITE PHASE COURSES: COMPUTER SCIENCE

The following competencies are required as part of the Prerequisite Phase. Equivalency exams are not offered for the following courses. Students with related coursework and/or experience in these areas should consult with a graduate advisor.

MAT 145  Calculus for Information Systems OR MAT 150 and 151 Calculus I - II
CSC 323  Data Analysis and Statistical Software I

DEGREE REQUIREMENTS

Students must complete 13 courses (52 hours) beyond the Prerequisite Phase and after receiving full degree-seeking admission. Successful completion of the Master of Science in Computer Science consists of:

- Completion of Core Knowledge Phase courses.
- Passing the Core Knowledge examination.
- Completion of Advanced Phase courses.

The Advanced Phase courses are chosen from one of the following concentrations:

- Artificial Intelligence.
- Standard Computer Science.
- Data Communications.
- Data Analysis and Database.
- Visual Computing.

Conditionally admitted students may register for a maximum of three graduate courses prior to successful completion of the Prerequisite Phase with consent of their advisor. Fully admitted students may register for a maximum of four Advanced Phase courses prior to passing the Core Knowledge Examination.
CORE KNOWLEDGE PHASE COURSES: COMPUTER SCIENCE

CSC 447 Concepts of Programming Languages
CSC 491 Design and Analysis of Algorithms
SE 455 Software Development Methods

CORE KNOWLEDGE EXAMINATION: COMPUTER SCIENCE

The examination covers the subject matter of the Core Knowledge Phase courses. Students take this examination following successful completion of the Core Knowledge Phase course requirements. The exam is offered in the Autumn, Winter, and Spring quarters. Students are allowed no more than two attempts at this examination. Two failures result in dismissal from the graduate program. Call the school at (312) 362-8714 for further details on this examination.

Students who pass the Core Knowledge Examination with distinction and who maintain a 3.75 grade point average may graduate with distinction.

Note: The student must submit a written application three months before taking the Core Knowledge Examination. Only fully admitted students may take the examination.

ADVANCED PHASE COURSES: COMPUTER SCIENCE

Students must fulfill the course requirements of their concentration. Waiver of some of these courses is possible in individual cases with the approval of the director of graduate studies. Fully admitted students may register for a maximum of four Advanced Phase courses prior to passing the Core Knowledge Examination.

ARTIFICIAL INTELLIGENCE CONCENTRATION

CSC 456 Foundations of Intelligent Databases
CSC 457 Expert Systems
CSC 458 Symbolic Programming
CSC 556 Foundations of Artificial Intelligence

One two-course sequence chosen from Data Analysis and Database, Data Communications, Software Engineering, Standard Computer Science or Visual Computing. (See the Two-Course Sequence listed in each concentration.)

One of the following:
CSC 585 Knowledge Representation
CSC 578 Neural Networks I

Two of the following:
CSC 578 Neural Networks I
CSC 580 Artificial Intelligence Programming
CSC 582 Machine Learning
CSC 583 Natural Language Processing
CSC 585 Knowledge Representation
CSC 587 Cognitive Science

One elective course (see the Elective Course Restriction section below).

STANDARD COMPUTER SCIENCE CONCENTRATION

One two-course sequence chosen from the following:
CSC 445 Computer Architecture AND
CSC 545 Advanced Computer Organization
CSC 446 Computer Operating Systems AND
CSC 546 Operating Systems Design
CSC 448 Compiler Design AND
CSC 548 Advanced Compiler Design
CSC 493  Automata Theory and Formal Grammars **AND**
CSC 490  Theory of Computation
**OR**
Two of the following:
CSC 502  Genetic Algorithms
CSC 503  Parallel Algorithms
CSC 504  Parallel Processing
CSC 591  Advanced Topics in Algorithms
One two-course sequence chosen from Artificial Intelligence, Data Analysis and Database, Data Communications, Software Engineering or Visual Computing. (See the Two-Course Sequence listed in each concentration.)

Two of the following:
CSC 426  Values and Computer Technology
CSC 434  Object-Oriented Programming
CSC 445  Computer Architecture
CSC 446  Computer Operating Systems
CSC 448  Compiler Design
CSC 490  Theory of Computation
CSC 493  Automata Theory and Formal Grammars
CSC 495  Logic Design and Switching Theory
CSC 502  Genetic Algorithms
CSC 503  Parallel Algorithms
CSC 504  Parallel Processing
CSC 520  Advanced Discrete Structures
CSC 535  Formal Semantics of Programming Languages
CSC 545  Advanced Computer Organization
CSC 546  Operating Systems Design
CSC 548  Advanced Compiler Design
CSC 591  Topics in Algorithms
CSC 696  Master's Project
CSC 698  Master's Thesis
SE 431  Formal Software Specifications and Development I
SE 465  Software Engineering Principles
TDC 432  Computer and Information Systems Modeling
Four elective courses (see the Elective Course Restriction section below).

**DATA ANALYSIS AND DATABASE CONCENTRATION**
Two-course sequence:
CSC 423  Data Analysis and Regression **AND**
CSC 449  Database Systems
One two-course sequence chosen from Artificial Intelligence, Data Communications, Software Engineering, Standard Computer Science or Visual Computing **OR** one of the following advanced two-course sequences. (See the Two-Course Sequence section on page xx.)
CSC 424  Advanced Data Analysis **AND**
CSC 428  Data Analysis for Experimenters
CSC 451  Database Design **AND**
CSC 456  Foundations of Intelligent Databases
Five of the following:

CSC 424  Advanced Data Analysis
CSC 428  Data Analysis for Experimenters
CSC 436  Foundations of Visual Computing
CSC 437  User Interface Design
CSC 451  Database Design
CSC 452  Database Programming
CSC 456  Foundations of Intelligent Databases
CSC 457  Expert Systems
CSC 481  Pattern Recognition and Machine Perception
CSC 549  Advanced Database Technologies
CSC 550  Object Oriented Databases
CSC 556  Foundations of Artificial Intelligence
CSC 589  Topics in Database
CSC 598  Topics in Data Analysis
CSC 696  Master's Project
CSC 698  Master's Thesis
IS 427  Software Quality Management
SE 465  Software Engineering Principles
SE 467  Software Reliability
TDC 462  Data Communications
TDC 489  Queuing Theory with Computer Applications

One elective. Courses taken from the two-course sequences may also fulfill Advanced Phase course requirements, thus increasing the number of electives, up to three.

Data Communications Concentration
Two-course sequence:
TDC 462  Data Communications AND
TDC 561  Distributed Processing

One two-course sequence chosen from Artificial Intelligence, Data Analysis and Database, Software Engineering, Standard Computer Science or Visual Computing. (See the Two-Course Sequence section listed in each concentration.)

TDC 463  Computer Networks

Three of the following courses:
TDC 432  Computer and Information Systems Modeling
TDC 489  Queuing Theory with Computer Applications
TDC 513  Client/Server Technologies
TDC 562  Computer Communications Network Design and Analysis
TDC 563  Protocols and Techniques for Data Networks
TDC 564  Local Area Networks
TDC 565  Voice and Data Integration
TDC 566  Integrated Services Digital Networks
TDC 568  Network Management
TDC 696  Master's Project
TDC 698  Master's Thesis

Two elective courses (see the Elective Course Restrictions section below).

Visual Computing Concentration
CSC 436  Foundations of Visual Computing
One of the following two-course sequences:

**CSC 437** User Interface Design **AND**
**CSC 537** User Interface Evaluation
**CSC 469** Computer Graphics I **AND**
**CSC 539** Computer Graphics II
**CSC 481** Pattern Recognition and Image Processing **AND**
**CSC 584** Computer Vision

One of the following not previously applied above:

**CSC 437** User Interface Design
**CSC 469** Computer Graphics I
**CSC 481** Pattern Recognition and Image Processing

Three of the following courses, not previously applied above, including at least one of **CSC 590, 592 or 595**:

**CSC 437** User Interface Design
**CSC 456** Foundations of Intelligent Databases
**CSC 469** Computer Graphics I
**CSC 481** Pattern Recognition and Image Processing
**CSC 498** Digital Signal Processing
**CSC 536** Modelling for Computer Aided Design
**CSC 537** User Interface Evaluation
**CSC 538** Vision Systems
**CSC 539** Computer Graphics II
**CSC 570** Visualization
**CSC 578** Neural Networks I
**CSC 582** Machine Learning
**CSC 584** Computer Vision
**CSC 587** Cognitive Science
**CSC 590** Topics in User Interfaces
**CSC 592** Topics in Computer Vision and Pattern Recognition
**CSC 595** Topics in Graphics

Three elective courses (see the Elective Course Restrictions section below).

Visual Computing two-course sequence for non-Visual Computing students:

Two of the following:

**CSC 436** Foundations of Visual Computing
**CSC 437** User Interface Design
**CSC 469** Computer Graphics I
**CSC 470** Survey of Computer Graphics
**CSC 481** Pattern Recognition and Image Processing

**TWO-COURSE SEQUENCES**

One two-course sequence from the following list will fulfill the "Two-course sequence" requirement. The chosen sequence must be from an area other than the student's declared concentration. Consult individual concentration requirements for acceptable choices.

**Artificial Intelligence**

**CSC 456** Foundations of Intelligent Databases **AND**
**CSC 457** Expert Systems
Standard Computer Science
CSC 445    Computer Architecture AND
CSC 545    Advanced Computer Organization
CSC 446    Computer Operating Systems AND
CSC 546    Operating Systems Design
CSC 448    Compiler Design AND
CSC 548    Advanced Compiler Design
CSC 493    Automata Theory and Formal Grammars AND
CSC 490    Theory of Computation
OR
Two of the following:
CSC 502    Genetic Algorithms
CSC 503    Parallel Algorithms
CSC 504    Parallel Processing
CSC 591    Advanced Topics in Algorithms

Data Analysis and Database Concentration
CSC 423    Data Analysis and Regression AND
CSC 449    Database Systems

Data Communications Concentration
TDC 462    Data Communications AND
TDC 561    Distributed Processing

Software Engineering
SE 431    Formal Software Specification and Development I AND
SE 465    Software Engineering Principles

Visual Computing Concentration
Two of the following:
CSC 436    Foundations of Visual Computing
CSC 437    User Interface Design
CSC 469    Computer Graphics I
CSC 470    Survey of Computer Graphics
CSC 481    Pattern Recognition and Image Processing

PERSONALIZED CONCENTRATION
Students with superior results on the Core Knowledge Phase examination may be allowed to personalize their Advanced Phase requirements. After planning their personalized concentration with their advisor, they must submit the plan to the director of graduate studies for approval. Permission for the personalized concentration must be obtained prior to completion of most of the concentration courses.

DISTINGUISHED SCHOLARS PROGRAM
Students with a superior undergraduate academic record who have completed sufficient undergraduate coursework in Computer Science are eligible for the Distinguished Scholars Program (DSP) within the Master of Science degree in Computer Science.

ADVANCED PLACEMENT
Students may only apply for the Distinguished Scholars Program at the time they apply for admission to the graduate program in Computer Science. The following are minimal requirements for admission with advanced placement into the graduate degree programs in Computer Science:
• Bachelor's degree from an accredited institution.
• Completion of undergraduate courses equivalent to the following prior to application to the Graduate Program.

CSC 215  Introduction to Structured Programming Using C
CSC 310-311 Principles of Computer Science I-II
CSC 323  Introduction to Data Analysis
CSC 342  File Processing and Data Management
MAT 140-141 Discrete Mathematics I-II
MAT 150-151 Calculus I-II
MAT 220  Linear Algebra with Applications

Any five of the following courses:
CSC 321  Design and Analysis of Algorithms
CSC 324  Data Analysis and Regression
CSC 325  Advanced Topics in C and UNIX
CSC 334  Advanced Data Analysis
CSC 343  Introduction to Operating Systems
CSC 345  Computer Architecture
CSC 347  Concepts of Programming Languages
CSC 348  Introduction to Compiler Design
CSC 349  Data Bases and Data Management
CSC 365  Introduction to Software Engineering
CSC 373  Information Systems
CSC 380  Artificial Intelligence

DSP students are not required to take Graduate Assessment Examinations on prerequisite courses.
• A cumulative GPA of 3.50 or better on a 4.00 scale in undergraduate courses.
• Submission of three letters of recommendation.
• Prior to taking any graduate courses, meeting with an advisor to complete an application form for the DSP and propose a course of study to prepare for the Core Knowledge examination. DSP students are encouraged to take this examination after completing as few Core Knowledge courses as possible.
• Passing the Core Knowledge examination in Computer Science from the regular degree program prior to completion of at most five graduate courses. DSP students will normally take the examination for the first time without completing all Core Knowledge courses.

DEGREE REQUIREMENTS
Successful completion of the Master of Science degree in Computer Science through the Distinguished Scholars Program consists of:
• Completion of at least 13 graduate courses.
• Maintain a grade point average of at least a 3.50.
• Completion of at least 3 courses from one of the concentration areas of the Ph.D program as well as any necessary prerequisite courses.
• Completion of a master's thesis (CSC 698) in their area of concentration.

The remaining courses are elective courses. However, courses taken to prepare for the Core Knowledge examination reduce the number of elective courses.
ADMISSION TO THE PH.D. PROGRAM

Students in the Distinguished Scholars Program are eligible for consideration for early admission into the Ph.D. program in Computer Science. All admission requirements for the Ph.D. program must be met. However, the application will only be considered by the Ph.D. admissions committee after completion of the DSP Advanced Placement requirements. Ph.D. students are normally required to pass the doctoral candidacy examination in three areas. However, DSP students who are admitted to the doctoral program may have the examination in their concentration area waived at the discretion of their master’s thesis committee. A total of at least 112 hours of credit is required to complete the doctoral program, including 52 hours for the M.S. degree plus an additional 60 hours or more as part of the doctoral requirements.

ELECTIVE COURSE RESTRICTIONS

Elective courses are those courses in the range 420-599 and 690-699. Credit will be given for courses taken outside the school only if they are approved by the associate dean of the School of Computer Science, Telecommunications and Information Systems (consult the appropriate section on the transfer credit policies of the School) and the director of graduate studies. An application can be obtained from the school.

Courses suggested for the Prerequisite Phase never count for elective credit. (This includes CSC 411, 415, 416, 417 and 500-level GSB courses.) Courses required for the Core Knowledge Phase only count for elective credit if they are not required for the student’s own concentration.

Any course required for the student’s concentration but taken as part of the requirements of another degree earned by the student may be waived but cannot be used for elective credit. Conditionally admitted students may not receive elective credit for courses taken prior to passing the Graduate Assessment Examination. Fully admitted students will receive elective credit for courses taken before passing the Core Knowledge Examination only if the total number of advanced courses taken does not exceed four.

GRADE REQUIREMENTS

Fully admitted students must maintain an average of at least 3.50 (out of a maximum of 4.00). Students who do not maintain this average are dismissed from the program. The school will notify such students as soon as possible. However, students who take courses after their average falls below 3.50, but before official notification, will not receive any special tuition refunds.

In order to graduate, students must have an overall grade point average no less than 3.50 (out of a maximum of 4.00).

Incomplete grades are only given if the course instructor considers them justified and if the student obtains the approval of the associate dean. The director of graduate studies will provide the appropriate permission form. An incomplete must be completed within one year or the grade may be changed to an F.
MASTER OF SCIENCE IN INFORMATION SYSTEMS

The master's degree program consists of three phases:

• Prerequisite Phase
• Core Knowledge Phase
• Advanced Phase

The Prerequisite Phase guarantees that all students have a common background. Successful completion of the Prerequisite Phase constitutes part of the admission requirements for the master's degree program.

The Core Knowledge and Advanced Phase constitute the degree program. The Core Knowledge Phase prepares students for their chosen concentration. In the Advanced Phase, students specialize in their concentration area. The concentration requirements are tailored to meet individual student's needs. The student must pass an examination to move from one phase to another.

ADMISSION REQUIREMENTS

All applicants who satisfy general graduate school admission requirements initially receive conditional admittance and may then pursue a degree program.

For full admission to a degree program, students must have the following:

• Bachelor's degree (not necessarily in computer science).
• Counseling session with a graduate counselor.
• A grade of B- or better in the Prerequisite Phase courses.

The following courses are required as part of the Prerequisite Phase. Those students with extensive coursework and/or experience in the computer science field may take an equivalency exam, the Graduate Assessment Exam (GAE) for the courses listed as Graduate Assessment Courses. The exam is offered at the beginning of each month. Applications for the exam must be received at least one week before the exam. Exam dates, application forms and a study guide are available from the school (phone 312/362-8714). For more information on this exam, contact a graduate advisor.

GRADUATE ASSESSMENT PREREQUISITE PHASE COURSES

INFORMATION SYSTEMS

PROGRAMMING SKILLS IN TWO LANGUAGES.

A knowledge of two high-level languages is required. Suggested courses are:

CSC 203 COBOL Programming AND
CSC 215 Introduction to Programming Using C OR
CSC 225 C Language for Programmers

PRINCIPLES OF COMPUTER SCIENCE.

Suggested courses are:

Sequence A:
CSC 310 Principles of Computer Science I. **Prerequisite: CSC 215.**
CSC 415 Foundations of Computer Science I. **Prerequisite: CSC 310.**

Sequence B:
CSC 415 Foundations of Computer Science I. **Prerequisites: CSC 225 and MAT 140.**

Those students who fulfill the C Language requirement with CSC 215 must complete Sequence A. Students with programming experience and who have met the requirement for CSC 225 normally follow it with Sequence B.
FILE STRUCTURES AND FILE PROCESSING
Suggested courses are:
CSC 213  On-Line Processing in COBOL. **Prerequisite: CSC 203**
OR
CSC 342  File Processing and Data Management. **Prerequisite: CSC 415**.

SYSTEMS ANALYSIS
CSC 315  Systems Analysis and Design Techniques

DISCRETE MATHEMATICS
Suggested course is:
MAT 140  Discrete Mathematics

GRADUATE ASSESSMENT PREREQUISITE PHASE COURSES:
PROJECT MANAGEMENT

PROGRAMMING SKILLS
CSC 215  Introduction to Programming Using C AND
CSC 310  Principles of Computer Science I
OR
CSC 225  C Language for Programmers

PRINCIPLES OF COMPUTER SCIENCE
CSC 415  Foundations of Computer Science I. **Prerequisite: CSC 225 and MAT 140.**

SYSTEMS ANALYSIS AND DESIGN
CSC 315  Systems Analysis and Design Techniques

PERSONAL COMPUTING SKILLS
CSC 240  Personal Computing for Programmers
CSC 373  Information Systems

DISCRETE MATHEMATICS
MAT 140  Discrete Mathematics

OTHER PREREQUISITE PHASE COURSES
The following competencies are required as part of the Prerequisite Phase. Equivalency exams are not offered for the following courses. Students with related coursework and/or experience in these areas should consult with a graduate advisor.

QUANTITATIVE METHODS
The quantitative methods requirements are met by taking courses equivalent to the following:
MAT 145  Calculus OR MAT 150-151 (Required for Project Management concentration only.)
CSC 323  Data Analysis and Statistical Software I

The Computer Career Program (CCP) may fulfill part of the requirement for prerequisite phase courses.

DEGREE REQUIREMENTS
Students must complete 13 courses (52 hours) beyond the Prerequisite Phase and after receiving full degree-seeking admission.
Successful completion of the Master of Science in Information Systems consists of:
• Completion of Core Knowledge Phase courses.
• Passing the Core Knowledge examination.
• Completion of Advanced Phase courses.
The Advanced Phase courses are chosen from one of the following concentrations:
• Standard Information Systems.
• Project Management.

CORE KNOWLEDGE PHASE COURSES: INFORMATION SYSTEMS
Conditionally admitted students may register for a maximum of three graduate courses prior to successful completion of the Prerequisite Phase with consent of their advisor. The required courses are:

STANDARD INFORMATION SYSTEMS CONCENTRATION
CSC 449  Database Technologies
IS 475  Information Systems Analysis and Design OR SE 430 Object-Oriented Modeling
TDC 461  Basic Communications Systems

PROJECT MANAGEMENT CONCENTRATION
CSC 423  Data Analysis and Regression
CSC 449  Database Technologies
SE 430  Object-Oriented Modeling

CORE KNOWLEDGE EXAMINATION: INFORMATION SYSTEMS
The examination covers the subject matter of the Core Knowledge Phase courses required for the student's chosen concentration. Students take this examination as soon as they successfully complete their Core Knowledge Phase course requirements. The exam is offered in the Autumn, Winter, and Spring quarters. Students are allowed no more than two attempts at this examination. Two failures result in dismissal from the graduate program. Call the school at (312)362-8714 for further details on this examination.

Students who pass the Core Knowledge Examination with distinction and who maintain a 3.75 grade point average may graduate with distinction.

Note: The student must submit a written application three months before taking the Core Knowledge Examination. Only fully admitted students may take the examination.

ADVANCED PHASE COURSES: INFORMATION SYSTEMS
Students must fulfill the course requirements of their concentration. Waiver of some of these courses is possible in individual cases with the approval of the director of graduate studies.

Fully admitted students may register for a maximum of four Advanced Phase courses prior to passing the Core Knowledge Examination.

Students must complete the Advanced Phase courses required for their chosen concentration. The course requirements by concentration are listed below:

STANDARD INFORMATION SYSTEMS CONCENTRATION
IS 553  Advanced Topics for Systems Development
IS 574  Decision Support Systems and Expert Systems OR CSC 457 Expert Systems
IS 577  Management of Information Technology
SE 477  Software and Systems Project Management

Four of the following (at least one 500-level course):
CSC 423  Data Analysis and Regression
CSC 437  User Interface Design
CSC 451  Database Design
CSC 549  Advanced Database Technologies
CSC 556  Foundations of Artificial Intelligence
IS 427  Software Quality Management
MASTER OF SCIENCE IN INFORMATION SYSTEMS

IS 475      Information Systems Analysis and Design
IS 482      Legal Aspects of Data Processing
IS 483      Information Processing Management
IS 554      Information Engineering
IS 571      Software Maintenance
IS 572      Computer Security
IS 596      Topics in Information Systems
IS 690      Research Seminar
IS 696      Master's Project
IS 698      Master's Thesis
SE 430      Object-Oriented Modeling
SE 467      Software Reliability
SE 468      Software Measurement and Project Estimation
SE 558      Software Methodologies
TDC 462     Data Communications
TDC 463     Computer Networks and Data Systems
TDC 564     Local Area Networks

Two elective courses. (See Elective Course Restriction section below.)

PROJECT MANAGEMENT CONCENTRATION
IS 427      Software Quality Management
SE 477      Software and Systems Project Management

One of the following:
IS 483      Information Processing Management
IS 577      Management of Information Technology
SE 529      Software Risk Management

Four of the following:
CSC 424     Advanced Data Analysis
CSC 428     Data Analysis for Experimenter
CSC 434     Object-Oriented Programming
CSC 436     Foundations of Visual Computing
CSC 437     User Interface Design
CSC 447     Concepts of Programming Languages
CSC 451     Database Design
CSC 456     Foundations of Intelligent Databases
CSC 550     Object-Oriented Databases
IS 553      Advanced Topics for Systems Development
IS 571      Software Maintenance
MAT 458     Statistical Quality Control
MGT 510     Quality Control
SE 433      Software Quality Assurance
SE 455      Software Development Methods
SE 468      Software Measurement & Project Estimation
TDC 462     Data Communications

Three elective courses. (See Elective Course Restriction section below).
ELECTIVE COURSE RESTRICTIONS

Elective courses are those courses in the range 420-599 and 690-699. Credit will be given for courses taken outside the school only if they are approved by the associate dean of the School of Computer Science in Information Systems (consult the appropriate section on the transfer credit policies of the school) and the director of graduate studies. An application can be obtained from the school.

Courses suggested for the Prerequisite Phase never count for elective credit. (This includes CSC 411, 415, 416, 417 and 500-level GSB courses.) Courses required for the Core Knowledge Phase only count for elective credit if they are not required for the student's own concentration.

Any course required for the student's concentration but taken as part of the requirements of another degree earned by the student may be waived but cannot be used for elective credit. Conditionally admitted students may not receive elective credit for courses taken prior to passing the Graduate Assessment Examination. Fully admitted students will receive elective credit for courses taken before passing the Core Knowledge Examination only if the total number of advanced courses taken does not exceed three.

GRADE REQUIREMENTS

Fully admitted students must maintain an average of at least 2.50 (out of a maximum of 4.00). Students who do not maintain this average are dismissed from the program. The school will notify such students as soon as possible. However, students who take courses after their average falls below 2.50, but before official notification, will not receive any special tuition refunds.

In order to graduate, students must have an overall grade point average no less than 2.50 (out of a maximum of 4.00).

Incomplete grades are only given if the course instructor considers them justified and if the student obtains the associate dean's permission. The director of Graduate Studies will provide the appropriate permission form. An incomplete must be completed within one year or the grade may be changed to an F.
MASTER OF SCIENCE IN SOFTWARE ENGINEERING

The master's degree program consists of three phases:

- Prerequisite Phase.
- Core Knowledge Phase.
- Advanced Phase.

The Prerequisite Phase is required for students who need a more complete background in Computer Science. The Core Knowledge Phase covers materials required for all students, while the Advanced Phase provides for study of selected, more advanced topics in Software Engineering.

ADMISSION REQUIREMENTS

For full admission to the degree program, students must have the following:

- Bachelor of Science degree in Computer Science, Computer Engineering, or a closely related field. Applicants with degrees in other fields, but with a strong background in mathematics and/or extensive programming experience will be considered for either full admission or conditional admission. Individuals with little or no experience in computing should acquire a stronger background before applying.
- Counseling session with a Software Engineering counselor.
- Completion of courses equivalent to the Prerequisite Phase courses. Applicants may be fully admitted with a limited number of Prerequisite Phase courses. These courses must be completed with a grade of B- or better before enrolling in any Core Knowledge Phase courses that require them as prerequisites.

Applicants who have a strong academic background but who have not completed a sufficient number of Prerequisite Phase courses may be admitted conditionally. They must complete the full Prerequisite Phase requirements as listed below.

GRADUATE ASSESSMENT PREREQUISITE PHASE COURSES: SOFTWARE ENGINEERING

The following courses are required as part of the Prerequisite Phase. Those students with appropriate coursework and/or computing experience may take an equivalency exam, the Graduate Assessment Exam (GAE), for the courses listed as Graduate Assessment Courses. The Exam is offered at the beginning of each month. Applications for the exam must be received at least one week before the exam. Exam dates, application forms and a study guide are available from the department (phone 312/362-8714). For more information on this exam, contact a graduate advisor. A grade of B- or better is required in the Prerequisite Phase courses.

CSC 225  C Language for Programmers
CSC 315  Analysis and Design Techniques
CSC 343  Introduction to Operating Systems. **Prerequisite: CSC 415**
CSC 415  Foundations of Computer Science I. **Prerequisites: CSC 140 and CSC 225.**
CSC 416  Foundations of Computer Science II. **Prerequisites: CSC 415.**
CSC 417  Foundations of Computer Science III. **Preequalities: CSC 415.**
MAT 140  Discrete Mathematics.

QUANTITATIVE PREREQUISITE PHASE COURSES: SOFTWARE ENGINEERING

The following competencies are required as part of the Prerequisite Phase. Equivalency exams are not offered for the following courses. Students with related coursework and/or experience in these areas should consult with a graduate advisor.
CSC 323  Data Analysis and Statistical Software I
MAT 150  Calculus I
MAT 151  Calculus II
MAT 220  Linear Algebra with Applications

DEGREE REQUIREMENTS
Students must complete 14 courses (56 hours) beyond the Prerequisite Phase and after receiving full degree-seeking admission. Successful completion of the Software Engineering Program consists of:

- Completion of Core Knowledge Phase courses with a grade of B or better. Students with prior coursework equivalent to any of the Core Knowledge Phase courses may be allowed by a Software Engineering counselor to take other related advanced courses as substitutes.
- Completion of Advanced Phase courses.
- Successful defense of the thesis. Students should choose a thesis advisor before the end of the first quarter following completion of the Core Knowledge Phase. They should form a thesis committee, consisting of three faculty members, including their thesis advisor, by the end of the next quarter. They must complete the course CSC 690 Research Seminar, write a thesis proposal, and obtain approval of the thesis proposal from their thesis committee before enrolling in the course CSC 698 Master’s Thesis.

CORE KNOWLEDGE PHASE COURSES: SOFTWARE ENGINEERING
Students may register for graduate courses only if they have met all prerequisite requirements before enrolling in those courses. Students complete six required courses.

BACKGROUND COURSES
CSC 423  Data Analysis and Regression
CSC 447  Concepts of Programming Languages

SOFTWARE ENGINEERING COURSES
SE 430  Object-Oriented Modeling
SE 431  Formal Software Specifications and Development I
SE 455  Software Development Methods
SE 465  Software Engineering Principles

ADVANCED PHASE COURSES: SOFTWARE ENGINEERING
Conditionally admitted students receive credit for Advanced Phase courses only after successful completion of the Prerequisite Phase.
SE 690  Research Seminar
SE 698  Master’s Thesis

Four of the following:
CSC 426  Values and Computer Technology
CSC 428  Data Analysis for Experimenters
CSC 434  Object-Oriented Programming
CSC 437  User Interface Design
CSC 449  Database Technologies
CSC 456  Foundations of Intelligent Databases
IS 427  Software Quality Management
IS 553  Advanced Topics for System Development
IS 571  Software Maintenance
SE 433  Software Quality Assurance
SE 466  Software Engineering Projects
SE 467  Software Reliability
SE 468  Software Measurement and Project Estimation
SE 477  Software and System Project Management
SE 529  Software Risk Management
SE 531  Formal Software Specifications and Development II
SE 533  Software Validation and Verification
SE 558  Software Methodologies
SE 690  Research Seminar

Two elective courses (See Elective Course Restrictions below).

Software Engineering two course sequence for non-Software Engineering students:
SE 465  Software Engineering Principles AND
SE 431  Formal Software Specification and Development I

SOFTWARE MANAGEMENT PROGRAM

Students admitted to the Software Engineering M.S. degree program are eligible to participate in the Software Management Program which provides early consideration for entry into the Ph.D. program. To be admitted to this program a student must have completed all prerequisite and core courses for M.S. in Software Engineering, must pass the Doctoral Candidacy examination in Software Engineering, and apply and be admitted to the Ph.D. program.

To complete this program, admitted students must meet all doctoral requirements, and qualify in the Software Management concentration area.

A total of at least 116 hours of credit is required to complete the Software Management program, including at least 56 hours for the M.S. degree plus an additional 60 hours or more as part of the doctoral requirements.

ELECTIVE COURSE RESTRICTIONS

Elective courses are those courses in the range 420-599 and 690-699. Credit will be given for courses taken outside the school only if they are approved by the associate dean of the School of Science, Telecommunications and Information Systems (consult the appropriate section on the transfer credit policies of the School) and the director of graduate studies. An application can be obtained from the school.

Courses suggested for the Prerequisite Phase never count for elective credit (including CSC 411, 415, 416, 417 and 500-level GSB courses).

Any required course taken as part of the requirements of another degree earned by the student may be waived but cannot be used for elective credit. Conditionally admitted students may not receive elective credit for courses taken prior to passing the Graduate Assessment Examination.

GRADE REQUIREMENTS

Fully admitted students must maintain an average of at least 2.50 (out of a maximum of 4.00). Students who do not maintain this average are dismissed from the program. The school will notify such students as soon as possible. However, students who take courses after their average falls below 2.50, but before official notification, will not receive any special tuition refunds.

In order to graduate, students must have an overall grade point average no less than 2.50 (out of a maximum of 4.00).

Incomplete grades are only given if the course instructor considers them justified and if the student obtains the associate dean's permission. The director of graduate studies will provide the appropriate permission form. An incomplete must be completed within one year or the grade may be changed to an F.
MASTER OF SCIENCE IN TELECOMMUNICATION SYSTEMS

The master's degree program consists of three phases:

- Prerequisite Phase.
- Core Knowledge Phase.
- Advanced Phase.

The Prerequisite Phase guarantees that all students have a common background. Successful completion of the Prerequisite Phase constitutes part of the admission requirements for the master's degree program.

The Core Knowledge and Advanced Phase constitute the degree program. The Core Knowledge Phase prepares students for their chosen concentration. In the Advanced Phase, students specialize in their concentration area. The concentration requirements are tailored to meet individual student's needs. The student must pass an examination to move from one phase to another.

Two concentrations are offered: the Standard Concentration provides a standard set of courses emphasizing telecommunications systems management. The Computer Science Concentration requires more technical background and places more emphasis on systems development and analysis.

ADMISSION REQUIREMENTS

All applicants who satisfy general graduate school admission requirements initially receive conditional admittance and may then pursue a degree program.

For full admission to a degree program, students must have the following:

- Bachelor's degree (not necessarily in computer science).
- Counseling session with a graduate counselor.
- A grade of B- or better in the Prerequisite Phase courses.

The following courses are required as part of the Prerequisite Phase. Those students with extensive coursework and/or experience in the computer science field may take an equivalency exam, the Graduate Assessment Exam (GAE) for the courses listed as Graduate Assessment Courses. The exam is offered at the beginning of each month. Applications for the exam must be received at least one week before the exam. Exam dates, application forms and a study guide are available from the department (phone 312/362-8714). For more information on this exam, contact a graduate advisor.

GRADUATE ASSESSMENT PREREQUISITE PHASE COURSES: TELECOMMUNICATION SYSTEMS

PROGRAMMING SKILLS

CSC 215 Introduction to Programming Using C OR
CSC 225 C Language for Programmers

PRINCIPLES OF COMPUTER SCIENCE (Required for Computer Science Concentration only)

Sequence A:
CSC 310 Principles of Computer Science I. **Prerequisite:** CSC 215
CSC 415 Foundations of Computer Science I. **Prerequisite:** CSC 310

Sequence B: (restricted to graduate students with programming experience)
CSC 415 Foundations of Computer Science I. **Prerequisite:** CSC 225

Those students who fulfill the C Language requirement with CSC 215 must complete Sequence A. Students with programming experience and who have met the requirement for CSC 225 normally follow it with Sequence B.
MASTER OF SCIENCE IN
TELECOMMUNICATION SYSTEMS

SYSTEMS FUNDAMENTALS
CSC 343  Introduction to Operating Systems. **Prerequisite: CSC 415 AND**
CSC 345  Computer Architecture. **Prerequisite: CSC 415**
OR
CSC 411  Computers in Information Systems and Telecommunications

OTHER PREREQUISITE PHASE COURSES: TELECOMMUNICATION SYSTEMS
   The following competencies are required as part of the Prerequisite Phase. Equivalency exams are not offered for the following courses. Students with related coursework and/or experience in these areas should consult with a graduate advisor.

PHYSICS
PHY 405  Physical Principles of Communication Systems

QUANTITATIVE METHODS
CSC 323  Data Analysis and Statistical Software I
MAT 145  Calculus for Information Systems

DEGREE REQUIREMENTS
   Students must complete 13 courses (52 hours) beyond the Prerequisite Phase and after receiving full degree-seeking admission.
   Successful completion of the Master of Science in Telecommunication Systems consists of:
   • Completion of Core Knowledge Phase courses.
   • Passing the Core Knowledge examination.
   • Completion of Advanced Phase courses.
   The Core Knowledge and Advanced Phase courses are chosen from one of the following concentrations:
   • Standard Telecommunication Systems.
   • Computer Science.

CORE KNOWLEDGE PHASE COURSES: TELECOMMUNICATION SYSTEMS
   Conditionally admitted students may register for a maximum of three graduate courses prior to successful completion of the Prerequisite Phase.

STANDARD TELECOMMUNICATIONS CONCENTRATION
TDC 461  Basic Communication Systems
TDC 462  Data Communications
TDC 463  Computer Networks and Data Systems

COMPUTER SCIENCE CONCENTRATION
TDC 461  Basic Communication Systems
TDC 462  Data Communications
TDC 463  Computer Networks and Data Systems

CORE KNOWLEDGE EXAMINATION: TELECOMMUNICATION SYSTEMS
   Students may take this examination as soon as they have successfully completed these three courses. The exam is offered in the Autumn, Winter, and Spring quarters. Students are allowed no more than two attempts at this examination. Two failures result in dismissal from the graduate program. Call the school at (312)362-8714 for further details on this examination.
Students who pass the Core Knowledge Examination with distinction and who maintain a 3.75 grade point average may graduate with distinction.

Note: The student must submit a written application three months before taking the Core Knowledge Examination. Only fully admitted students may take the examination.

ADVANCED PHASE COURSES: TELECOMMUNICATION SYSTEMS

Students must fulfill the course requirements of their concentration. Waiver of some of these courses is possible in individual cases with the approval of the director of graduate studies.

Conditionally admitted students receive credit for Advanced Phase courses only after successful completion of the Prerequisite Phase. Fully admitted students may register for a maximum of four Advanced Phase courses prior to passing the Core Knowledge Examination.

STANDARD TELECOMMUNICATIONS CONCENTRATION

TDC 464 Voice Communication Networks
TDC 476 Economics of Telecommunications Systems
TDC 511 Telecommunications Practicum
TDC 512 Cellular and Wireless Telecommunications
TDC 567 Telecommunications System Design and Management
TDC 569 Telecommunications Regulation, Policy and Law

Two of the following:
IS 577 Management of Information Technology
TDC 514 Computer Telephony
TDC 563 Protocols and Techniques for Data Networks
TDC 564 Local Area Networks
TDC 565 Voice and Data Integration
TDC 566 Integrated Services Digital Networks
TDC 568 Network Management

Two elective course. (See Elective Course Restriction section below.)

COMPUTER SCIENCE CONCENTRATION

TDC 511 Telecommunications Practicum
TDC 561 Distributed Computing

Four of the following:
CSC 446 Operating Systems
TDC 432 Computer and Information System Modeling
TDC 464 Voice Communications Networks
TDC 513 Client/Server Technologies
TDC 562 Computer Communication Network Design and Analysis
TDC 563 Protocols and Techniques for Data Networks
TDC 564 Local Area Networks
TDC 565 Voice and Data Integration
TDC 566 Integrated Services Digital Networks
TDC 568 Network Management

Four elective courses. (See Elective Course Restriction section below.)

ELECTIVE COURSE RESTRICTIONS

Elective courses are those courses in the range 420-599 and 690-699. Credit will be given for courses taken outside the school only if they are approved by the associate dean of the School of Computer Science, Telecommunications and Information Systems (consult the appropriate section on the transfer credit policies of the school) and the director of graduate studies. An application can be obtained from the school.
Courses suggested for the Prerequisite Phase never count for elective credit. (This includes CSC 411, 415, 416, 417 and 500-level GSB courses.) Courses required for the Core Knowledge Phase only count for elective credit if they are not required for the student’s own concentration.

Any course required for the student’s concentration but taken as part of the requirements of another degree earned by the student may be waived but cannot be used for elective credit. Conditionally admitted students may not receive elective credit for courses taken prior to passing the Graduate Assessment Examination. Fully admitted students will receive elective credit for courses taken before passing the Core Knowledge Examination only if the total number of advanced courses taken does not exceed three.

**GRADE REQUIREMENTS**

Fully admitted students must maintain an average of at least 2.50 (out of a maximum of 4.00). Students who do not maintain this average are dismissed from the program. The school will notify such students as soon as possible. However, students who take courses after their average falls below 2.50, but before official notification, will not receive any special tuition refunds.

In order to graduate, students must have an overall grade point average no less than 2.50 (out of a maximum of 4.00).

Incomplete grades are only given if the course instructor considers them justified and if the student obtains the associate dean’s permission. The director of graduate studies will provide the appropriate permission form. An incomplete must be completed within one year or the grade may be changed to an F.
MASTER OF SCIENCE IN MANAGEMENT INFORMATION SYSTEMS

The master's degree program consists of three phases:

- Prerequisite Phase.
- Core Knowledge Phase.
- Advanced Phase.

The Prerequisite Phase guarantees that all students have a common background. Successful completion of the Prerequisite Phase constitutes part of the admission requirements for the master's degree program.

The Core Knowledge and Advanced Phase constitute the degree program. The Core Knowledge Phase prepares students for their chosen concentration. In the Advanced Phase, students specialize in their concentration area. The concentration requirements are tailored to meet individual student's needs. The student must pass an examination to move from one phase to another.

ADMISSION REQUIREMENTS

All applicants who satisfy general graduate school admission requirements initially receive conditional admittance and may then pursue a degree program.

For full admission to a degree program, students must have the following:

- Bachelor's degree completed.
- Satisfactory completion of GMAT.
- Counseling session with a graduate counselor.
- A passing score on the Graduate Assessment Examination or a grade of B- or better in the corresponding Prerequisite Phase courses.

PREREQUISITE PHASE: MANAGEMENT INFORMATION SYSTEMS

The purpose of the Prerequisite Phase is to ensure a common background of knowledge in general business administration, software development, and quantitative methods. Successful completion of the Prerequisite Phase is required to move from the Prerequisite Phase to the Core Knowledge Phase and become fully admitted. To complete this phase, students either pass the DePaul courses listed below or pass the corresponding written examinations. A grade of B- or better is required in the software development courses and MAT 140. The exam is offered at the beginning of each month. Applications for the exam must be received at least one week before the exam. Exam dates, application forms and a detailed study guide are available from the school (phone 312/362-8714). For more information on this exam, contact a graduate advisor. The MIS Prerequisite Phase covers the following topics:

INTERNAL ENVIRONMENT OF ORGANIZATIONS

ACC 500  Financial Accounting
GSB 499  Effective Analysis and Communication
MGT 500  Managing People I
MGT 502  Operations Management

EXTERNAL ENVIRONMENT OF ORGANIZATIONS

BLW 500  Legal and Ethical Environment
ECO 509  Business Conditions Analysis
ECO 500  Money and Banking
FIN 500  Financial Institutions and Markets
IB 500  Global Economy
SOFTWARE DEVELOPMENT
CSC 203 COBOL Programming
CSC 213 On-line Processing in COBOL
CSC 215 Introduction to Structured Programming Using C OR
CSC 225 Programming in C
CSC 310 Principles of Computer Science I (Required for those students who fulfill the C Language requirement by taking CSC 215)
CSC 415 Foundations of Computer Science I

QUANTITATIVE METHODS
CSC 323 Data Analysis and Statistical Software I
MAT 145 Calculus for Information Systems
MAT 140 Discrete Mathematics

DEGREE REQUIREMENTS
The requirements for the Core Knowledge and Advanced Phases are presented below in their entirety. Students complete 13 graduate courses. At least six of these courses are chosen from the Computer Science offerings and at least six of them from the Management Information Systems offerings. The remaining course is chosen from either of the two groups of courses.

CORE KNOWLEDGE PHASE COURSES: MANAGEMENT INFORMATION SYSTEMS
These consist of three Computer Science courses and three Management Information Systems courses for a total of six courses. Most students complete the courses listed below. However, waiver of some of these courses is possible for students with related course work or experience but requires permission of their advisor. Students are still responsible for the content of these courses on the Core Knowledge Examination. The course requirements are:

MANAGEMENT INFORMATION SYSTEMS
MIS 674 Systems Analysis and Design: Concepts, Tools and Techniques
MIS 676 Management Information Systems: Planning, Design and Implementation
MIS 677 Information Systems Project Management

COMPUTER SCIENCE
CSC 449 Database Technologies
SE 430 Object-Oriented Modeling
TDC 461 Basic Communication Systems

CORE KNOWLEDGE EXAMINATION: MANAGEMENT INFORMATION SYSTEMS
This examination covers the subject matter of the three computer science Core Knowledge Phase courses listed above. Students take this examination as soon as they successfully complete their Core Knowledge Phase courses. A B or better is required for the MIS courses in the Core Knowledge Phase. If a student receives a C+ or lower in one of these courses they have two options: 1) Re-take the course and receive a B or 2) Take the corresponding comprehensive exam and receive a passing grade.

Students who have related coursework or experience may earn a waiver of some of these courses by passing the Core Knowledge Examination but require the permission of their advisor to attempt this. Students earn a waiver only if they pass the associated Core Knowledge Examination material in one attempt. Waived Management Information Systems courses are replaced by Management Systems electives. Waived Computer Science courses are replaced by Computer Science electives.

Students must pass this examination in two attempts or they will not be allowed to continue in the program.
Students who pass the Core Knowledge Examination with distinction and who maintain a 3.75 grade point average may graduate with distinction.

**Note:** Students must submit a written application three months before taking the Core Knowledge Examination.

**ADVANCED PHASE COURSES: MANAGEMENT INFORMATION SYSTEMS**

The Advanced Phase consists of seven graduate level courses. Students must fulfill the course requirements in both Management Information Systems and Computer Science. Three of these courses must be selected from the Advanced Phase Management Information Systems courses and three from the Advanced Phase Computer Science courses. The seventh course must be chosen from MIS 686 Introduction to Telecommunications Management or from CSC 461 Basic Communication Systems. Waiver of some of these courses is possible in individual cases but requires the approval of the student's advisor.

**MANAGEMENT INFORMATION SYSTEMS**

Students must take at least two courses from Group A and one from Group B. Waiver of these requirements is possible in individual cases but requires the permission of the student's advisor.

**Group A:**
- MIS 675 Advanced Systems Techniques
- MIS 678 Problems in Systems Design
- MIS 689 Decision Support Systems and Expert Systems

**Group B:**
- MIS 683 Information Processing Management
- MIS 684 Computers in Society
- MIS 685 Security, Accuracy and Privacy in Computer Systems

Students who have extra Management Information Systems electives due to waivers of required courses choose from the following courses or from courses in the above groups. With the permission of the MIS program director, they may also take other graduate courses offered by the College of Commerce.

**ACC 535** Accounting Systems
**ACC 526** Microcomputer Uses in Decision-Making
**ACC 527** Design and Construction of Decision Models
**ACC 588** Management Consulting
**MGT 510** Quality Control
**MGT 580** Operations Research
**MGT 590** Management of Innovation and Technological Change
**MIS 679** Graduate Seminar in Information Systems
**MIS 798** Special Topics
**MKT 585** Marketing Information Systems for Decision Support

**COMPUTER SCIENCE**

Students must take three Advanced Phase Computer Science courses chosen from the following two groups. Waiver of these requirements is possible in individual cases but requires the permission of the student's advisor.

One of the following:
- **CSC 423** Data Analysis and Regression
- **SE 467** Software Reliability
- **SE 468** Software Measurement and Project Estimation
- **TDC 432** Computer and Information Systems Modeling
Two of the following:

CSC 556  Foundations of Artificial Intelligence
IS 572  Computer Security
IS 574  Decision Support Systems and Expert Systems
SE 558  Software Methodologies
TDC 462  Data Communications

Students who choose their elective course from the Computer Science courses or who have extra Management Information Systems electives due to waivers of required courses choose from the following courses or from courses in the above two groups. With the permission of Dr. Martin Kalin, program administrator for CSC, they may also take other graduate courses offered by the School of Computer Science, Telecommunications and Information Systems.

ECO 512  Applied Time Series and Forecasting
CSC 549  Advanced Database Technologies
TDC 489  Queuing Theory with Computer Applications
TDC 565  Voice and Digital Systems
DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE

ADMISSION REQUIREMENTS
In order to be considered for admission to the doctoral program, students minimally must:

- Hold a master's degree in Computer Science or an allied field.

  Students are eligible for early admission to the Ph.D. program through the Distinguished Scholars Program within the M.S. degree in Computer Science or through the Software Management Program within the M.S. degree in Software Engineering.

- Submit three letters of recommendation.

- Show definite promise for completing the program.

- Submit a written statement describing their accomplishments, goals and interests.

- Submit a completed application form.

  In addition, applicants educated outside of the United States must demonstrate English proficiency with a TOEFL score of 580 or greater.

COMPLETENESS OF CREDENTIALS

  When important pieces of information, such as transcripts, are lacking, the school is compelled by University regulations to reject the application.

  The Ph.D. Admission Committee (PAC) determines which applicants will be admitted to the program. Meeting the minimum admission standards does not guarantee acceptance, since the number of applicants who can be admitted is limited.

DEGREE REQUIREMENTS
The following steps are needed to complete the requirements for the degree. The student must:

- Complete advanced coursework.

- Be admitted to candidacy.

- Complete the dissertation.

  These steps are described in detail below.

COURSE REQUIREMENTS

- Doctoral students must complete at least 60 credit hours (15 courses) of graduate coursework beyond the master's degree. This includes a required 12 hours of CSC 699 Research.

- All students must complete the course CSC 426 Values and Computer Technology. Students need the approval of PAC in writing before registering to apply courses taught outside the department towards the doctoral program's course requirements.

- All students must complete at least 12 credit hours (three courses) in each of three of the following concentration areas for a total of 36 credit hours. Courses taken at DePaul University as part of a master's degree program may be applied toward these requirements.

  Students take the Doctoral Candidacy exam covering their three concentration areas after completing these courses. See below for further information on this examination and the time limit for taking it.

  The courses in each area are listed below:

ARTIFICIAL INTELLIGENCE

  CSC 456  Foundations of Intelligent Databases
  CSC 457  Expert Systems
  CSC 458  Symbolic Programming
  CSC 502  Genetic Algorithms
DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE

CSC 556  Foundations of Artificial Intelligence
CSC 578  Neural Networks I
CSC 579  Neural Networks II
CSC 580  Artificial Intelligence Programming
CSC 582  Machine Learning
CSC 583  Natural Language Processing
CSC 585  Knowledge Representation
CSC 587  Cognitive Science
CSC 594  Topics in Artificial Intelligence

COMMUNICATIONS
TDC 462  Data Communications
TDC 463  Computer Networks and Data Systems
TDC 489  Queuing Theory with Computer Applications
TDC 513  Client/Server Technologies
TDC 561  Distributed Processing
TDC 562  Computer Communication Network Design and Analysis
TDC 563  Protocols and Techniques for Data Networks
TDC 564  Local Area Networks
TDC 566  Integrated Services Digital Networks
TDC 568  Network Management
TDC 593  Topics in Telecommunications
TDC 597  Topics in Data Communications

THEORETICAL COMPUTER SCIENCE
CSC 490  Theory of Computation
CSC 493  Automata Theory and Formal Grammars
CSC 497  Information Theory
CSC 503  Parallel Algorithms
CSC 591  Topics in Algorithms
CSC 599  Topics in Computer Science

COMPUTER INFORMATION SYSTEMS
IS 554   Information Engineering
IS 574   Decision Support Systems and Expert Systems
IS 577   Management of Information Technology
IS 596   Topics in Information Systems
SE 477   Software and Systems Project Management
SE 553   Advanced Topics for Systems Development
SE 558   Software Methodologies

DATA ANALYSIS
CSC 423  Data Analysis and Regression
CSC 424  Advanced Data Analysis
CSC 428  Data Analysis for Experimenters
CSC 598  Topics in Data Analysis

DATABASE SYSTEMS
CSC 451  Database Design
CSC 452  Database Programming
CSC 456  Foundations of Intelligent Databases
CSC 457  Expert Systems
CSC 481  Pattern Recognition and Machine Perception
CSC 549  Advanced Database Technologies
CSC 550  Object-Oriented Databases
CSC 589  Topics in Database

OPERATING SYSTEMS
CSC 460  Topics in Operating Systems
CSC 489  Queuing Theory with Computer Applications
CSC 504  Parallel Processing
CSC 546  Operating System Design
IS 572  Computer Security

VISUAL COMPUTING
One of the following two course sequences:
CSC 437  User Interface Design
CSC 537  User Interface Evaluation
CSC 469  Computer Graphics I
CSC 539  Computer Graphics II
CSC 481  Pattern Recognition and Image Processing
CSC 584  Computer Vision

One of the following not previously applied above:
CSC 437  User Interface Design
CSC 438  Vision Systems
CSC 469  Computer Graphics I
CSC 481  Pattern Recognition and Image Processing
CSC 498  Digital Signal Processing
CSC 536  Modeling for Computer Aided Design
CSC 537  User Interface Evaluation
CSC 539  Computer Graphics II
CSC 584  Computer Vision

PROGRAMMING LANGUAGES AND ENVIRONMENTS
CSC 434  Object-Oriented Programming
CSC 437  Graphical User Interfaces
CSC 504  Parallel Processing
CSC 535  Formal Semantics of Programming Languages
CSC 548  Advanced Compiler Design
CSC 599  Topics in Computer Science

SOFTWARE ENGINEERING
IS 571  Software Maintenance
SE 430  Object-Oriented Modeling
SE 431  Formal Software Specifications and Development I
SE 465  Software Engineering Principles
SE 467  Software Reliability
SE 531  Formal Software Specifications and Development II
SE 533  Software Verification and Validation
SE 558  Software Methodologies
SE 690  Research Seminar
SOFTWARE MANAGEMENT
CSC 428  Data Analysis for Experimenters
CSC 433  Software Quality Assurance
IS 427   Software Quality Management
IS 483   Information Systems Management
IS 577   Management of Information Technology
SE 468   Software Measurement and Project Estimation
SE 477   Software and System Project Management
SE 529   Software Risk Management

- Students must maintain a grade point average of 3.0 or better to remain in good standing in the program. A course grade below 2.0 is unsatisfactory and will not be counted toward degree requirements. PAC will ask students to withdraw from the doctoral program if the members judge that those students are not progressing satisfactorily toward the degree.

ADMISSION TO CANDIDACY
To be admitted to candidacy, doctoral students must complete the following:

Residency. Three quarters of full-time study at DePaul University beyond the master's level. Full-time study is defined as registration for a minimum of eight credit hours (two courses) in a quarter. With prior approval of PAC, students may satisfy residency requirements by course work, by participation in seminars, or by research performed off campus.

Allied Courses. Complete the course CSC 426 Values and Computer Technology.

Doctoral Candidacy Examination. Students need to complete at least three courses in each of their three concentration areas before applying to take this examination. The doctoral candidacy examination consists of three area examinations taken on material from the three concentration areas. The material covered by each area examination is described in the study guides available in the school office. A student is allowed no more than two attempts at passing a candidacy examination in any area. Any student who fails more than three candidacy examination attempts will be asked to leave the program. Refer to the section on program time limitations below.

CANDIDACY CONTINUATION
Once admitted to candidacy, the doctoral candidate must maintain registration in the University in each of the quarters of the academic year until the degree requirements have been completed. This may be accomplished by registering for one or more four-credit-hour graduate courses or for one of the non-credit courses CSC 701 Resident Candidacy Continuation and CSC 702 Non-Resident Candidacy Continuation. Failure to comply with this policy governing registration in the University in each of the quarters of the academic year until the degree requirements have been completed may result in dismissal from the doctoral program. Students who have been dismissed from the program for this reason need to follow the readmission procedures to be considered for reinstatement in the program.

THE DISSERTATION
A student who has been admitted to candidacy must complete the following steps prior to beginning work on their dissertation topic:

- Select a dissertation area.
- Pass an oral qualifying examination on the dissertation area.
- Select a dissertation topic and a dissertation advisor.
- Prepare a written dissertation proposal and present it at a meeting.

After completing these steps, a dissertation committee will be formed subject to the approval of the Ph.D. committee. The committee will consist of three full-time faculty members and will be chaired by the candidate's dissertation advisor.
PUBLIC DISSERTATION DEFENSE

To complete the degree, the candidate must present a dissertation comprising original and significant research and defend it before the dissertation committee. As part of the dissertation defense, the student will present the results of the dissertation in a departmental seminar. Consult the beginning of this bulletin for information on submitting the dissertation and an abstract of it to the School. Refer to the section on program time limitations below.

GRADUATION

Doctoral candidates who have passed the dissertation defense and who have submitted their dissertations to the School become eligible for degree conferral. Consult the Handbook for Graduate Studies at the back of this bulletin for procedures and fees related to graduation.

PROGRAM TIME LIMITATIONS

- There is a time limit of four years between admission to the doctoral program and admission to candidacy.
- There is a time limit of two years between admission to candidacy and passing the oral qualifying examination.
- There is a time limit of not less than eight months and not more than five years between admission to candidacy and the dissertation defense.
- Consult the Handbook for Graduate Studies at the back of this bulletin for graduation application deadlines and the deadline for submitting completed dissertations.
COURSES
All courses carry four hours of credit unless otherwise indicated.

UNDERGRADUATE COURSES
These courses count only for Prerequisite Phase requirements.

CSC 203  COBOL Programming. An introduction to programming in the business oriented language COBOL. The emphasis will be on business problems involving the processing of large quantities of data.

CSC 213  On-Line Processing in COBOL. Conversational and pseudoconversational programming in COBOL, including subprogramming. Relative and indexed file organizations supporting on-line access. Concepts of interactive screen design, and programming with use of Customer Information Control Systems (CICS) on IBM mainframes. Prerequisite: CSC 203.

CSC 215  Introduction to Structured Programming Using C. An introduction to structured computer programming using ANSI C. Topics include: simple data types, control structures, character string processing, array processing, functions and structures. (Recommended: Students should have completed or be concurrently enrolled in MAT 140.)

CSC 225  Programming in C. Introduction to the programming language ANSI C. Data types, pointers, structures, Function and block structures. Preprocessors. Input and output. UNIX operating system. Prerequisite: Experience in at least one high level programming language.

CSC 240  Personal Computing for Programmers. Introduction to relational database concepts using PC databases; data access methods; structured query language (SQL); query by example; networks and the use of networks to share data; spreadsheets and macro languages. Prerequisite: 110 or 150.

CSC 310  Principles of Computer Science I. Conceptual models of a computer, machine and assembly language. Internal data representation, programming methods, recursion, stacks, queues. Prerequisite: CSC 215.

CSC 315  Analysis and Design Techniques. Analyzing a problem requiring a computer-based solution, designing a solution, prototyping the solution in a 4th generation language, testing the prototype. Structured analysis and design techniques, data flow and control flow programming, the data/project dictionary, processing narratives, architectural design, detailed design, transform and transaction flow, program design language, technical reviews, inspections and walkthroughs. Comparison of structured techniques to alternative approaches. A team project will be required to motivate these topics. Prerequisite: CSC 310.

CSC 323  Data Analysis and Statistical Software I. Programming in the statistical language SAS. Introduction to data analysis, elementary statistical inference. Regression and correlation. Prerequisites: CSC 310 or CSC 415, and MAT 140.

CSC 342  File Processing and Data Management. File processing environment and file manipulation techniques using C. Algorithms and techniques for implementing stream files, sequential files, direct files, indexed sequential files. Inverted lists, multilists and database structures will be discussed. Implementation of data management systems. Prerequisite: CSC 415.
CSC 343 *Introduction to Operating Systems.* A brief history of operating systems development; the four basic components—file systems, processor scheduling, memory management, and device scheduling; deadlock; concurrency; protection; distributed systems. **Prerequisite:** CSC 415.

CSC 345 *Computer Architecture.* Introduction to digital logic; microprogramming; further topics. **Prerequisite:** CSC 415.

CSC 373 *Information Systems.* Development of information system applications at the strategic, tactical and operational levels. Systems theory and concepts, quality decision-making, the organizational role of information technology, and roles of people using, developing and managing systems. **Prerequisite:** 240.

CSC 415 *Foundations of Computer Science I.* Iteration, induction and recursion; asymptotic analysis; analysis of algorithms; trees, binary trees, binary search trees, priority queues, heapsort; linked lists; stacks; queues; abstract data types. **Prerequisites:** MAT 140 and CSC 225 or 310.

CSC 416 *Foundations of Computer Science II.* Sets, hashing, relations, and functions; relational data model; graphs. **Prerequisites:** CSC 415.

CSC 417 *Foundations of Computer Science III.* Grammars and languages; propositional logic; digital logic. **Prerequisites:** CSC 415.

MAT 140 *Discrete Mathematics I.* Boolean Algebra, graph theory, and combinatorial analysis with computer applications. **Prerequisite:** 131 or three years of high school mathematics.

MAT 145 *Calculus for Information Systems.* Limits, continuity, the derivative and rules of differentiation, applications of the derivative, exponential and logarithm functions, the definite integral and some methods of integration, improper integrals. **Prerequisite:** MAT 141.

MAT 150 *Calculus I.* Limits and derivatives, extrema, curve sketching, convexity, inverse functions, continuity. **Prerequisite:** MAT 131 or three years of high school mathematics.

MAT 151 *Calculus II.* Definite and indefinite integral; volume; arc length; trigonometric functions; logarithmic and exponential functions. **Prerequisite:** MAT 150.

MAT 220 *Linear Algebra with Applications.* (For non-mathematics majors.) Systems of linear equations, matrices and matrix algebra, determinants, applications to linear programming, graph theory, etc. **Prerequisite:** MAT 151.

PHY 405 *Physical Principles of Telecommunications.* The course intended for non-majors treats the basic concepts of physics on which communications are based, such as basic electricity, circuit elements, transmission lines, and fibers. Included will be a discussion of combinational and sequential digital circuits. The format consists of lecture and laboratory exercises. **Prerequisite:** Mathematics 151 or equivalent.

**GRADUATE COURSES**

**COMPUTER SCIENCE COURSE OFFERINGS**

Completion of the Prerequisite Phase is required for all courses not listing specific prerequisites.

CSC 423 *Data Analysis and Regression.* Multiple regression and correlation, residual analysis, analysis of variance, and robustness. These topics will be studied from a data analytic perspective, supported by an investigation of available statistical software. **Prerequisite:** CSC 323 or consent. (Crosslisted with 324)
CSC 424 Advanced Data Analysis. Topics chosen from among multivariate statistical methods, discriminant analysis, principal components analysis, factor analysis, discrete multivariate analysis, and non-parametric statistics. Prerequisite: CSC 423 or consent.

CSC 426 Values and Computer Technology. The impact of computerized technologies on society with particular attention paid to the ethical issues raised by these social effects. The course will require of all Ph.D. students research leading to a paper of publishable quality. Techniques for this type of research and writing will be discussed. An oral presentation of the research of that paper will also be required.

CSC 428 Data Analysis for Experimenters. The analysis of experiments in the computing science with special emphasis on the use of statistical software and interpretation of generated output. Prerequisite: CSC 423.

CSC 434 Object-Oriented Programming. An introduction to object-oriented concepts and programming. Object-oriented applications, object-oriented database systems, architectural issues in object-oriented systems, and areas of research in object-oriented systems will be examined.

CSC 435 Multimedia. Multimedia interface design. Underlying technological issues including synchronization and coordination of multiple media, file formats for images, animations, sound and text. Hypertext. Information organization. Survey of multimedia authoring software. Long distance multimedia (World Wide Web). Students will critique existing applications and create several multimedia applications. Prerequisite: CSC 311 or CSC 415.

CSC 436 Foundations of Visual Computing. Mathematical and physical notions that underpin computer vision graphics. Topics will include approximation, interpolation, linear shift invariant systems, transforms for signal and analysis, radiant sources, photometry.


CSC 445 Computer Architecture. Design and evaluation of modern digital computers. Virtual machines, sequential circuits, instruction formats and addressing modes, basic ALU operations, control design and microprogramming, high-speed memory technology, bus architecture. Prerequisite: CSC 345 or PHY 405.

CSC 446 Computer Operating Systems. A survey course examining in depth a number of modern operating systems. Topics will include synchronization and resource management of multiple processor and distributed systems. Prerequisite: CSC 343 or equivalent.


CSC 448 Compiler Design. Design and structure of high level languages. Lexical scan, top down and bottom up syntactic analysis. Syntax directed translation and LR(k) grammars. Prerequisite: CSC 447 or consent.
CSC 449  **Database Technologies.** An introduction to database technology and systems including: database architecture, data models, query languages, integrity, security, functional dependency and normalization. **Prerequisite:** CSC 311 or 415.

CSC 451  **Database Design.** Design methodologies. Requirement formulation and analysis, conceptual design, implementation design, physical design. Emphasis will be on data modeling techniques. Class team projects include the design of a complete database structure and implementations of design tools. **Prerequisites:** CSC 449, a programming language.

CSC 452  **Database Programming.** Programming in large-scale relational database environment using host languages such as C. Design and implementation of online applications and report generations. Micro-computer Database System programming. Concepts such as database integrity, transactions, transaction recovery, concurrency and record locking will be covered. **Prerequisites:** CSC 449, 215. **Not valid for A52.**

CSC 456  **Foundations of Intelligent Databases.** An introduction to the use of logic and deduction in databases and artificial intelligence. Topics will include propositional logic, first order predicate calculus, resolution theorem proving, deductive retrieval and deductive databases, inference engines, logic programming, and truth maintenance systems.

CSC 457  **Expert Systems.** A detailed study of the development of artificial intelligence-based expert systems applications. Students will use commercial expert systems packages to develop example applications programs. Topics will include frames and other knowledge-representation techniques, rule-based and case-based systems, inference, and model-based reasoning.

CSC 458  **Symbolic Programming.** Basic concepts of symbolic programming as embodied in the language LISP. Techniques for prototyping and building conceptually advanced systems in an environment that encourages procedural and data abstraction. Topics include basic programming techniques, symbolic expressions, recursion, advanced data and control structures, object-oriented programming in CLOS, and symbolic control of TCP/IP connections, MIDI sequencing, text-to-speech, and speech recognition. Assignments will focus on basic AI techniques, but the class is intended for anyone who will need to rapidly develop large complex systems.

CSC 459  **File Management and Organization.** The hardware and software involved in the creation and manipulation of files. Issues in the design, implementation, selection and use of computer files for the external storage of data. Types of file organizations covered include: sequential, indexed-sequential (static index), B-tree (dynamic index), hash, and multiring. **Prerequisite:** CSC 449.


CSC 470  **Survey of Computer Graphics.** Overview of selected 2D techniques including compositing, and morphing, and a survey of basic 3D techniques, including interaction of light and color. Multimedia. Virtual Reality. Students write parts of a raytracer, and create an animation. **Prerequisite:** CSC 415.
CSC 481  
**Pattern Recognition and Image Processing.** Image processing, edge detection, segmentation, feature extraction, decision boundaries, Bayesian classifiers, nearest neighbor classifiers, clustering, neural nets. **Prerequisite:** one statistics course.

CSC 485  
**Numerical Analysis.** Use of a digital computer for numerical computation. Error analysis, Gaussian elimination and Gauss-Seidel method, solution of nonlinear equations, function evaluation, approximation of integrals and derivatives, Monte Carlo methods. **Prerequisites:** MAT 220 and a programming course.

CSC 486  

CSC 487  
**Operations Research I.** Linear Programming. The Linear Programming problem and its dual; the simplex method; transportation and warehouse problems; computer algorithms and applications to various fields. **Prerequisites:** MAT 220 and any introductory programming course.

CSC 488  
**Operations Research II.** Optimization Theory. Integer programming; nonlinear programming; dynamic programming; game theory. **Prerequisite:** CSC 487.

CSC 490  
**Theory of Computation.** An introduction to the mathematical foundations of computation. Random access and Turing machines, recursive functions, algorithms, computability and computational complexity, intractable problems, NP-complete problems. **Prerequisite:** CSC 493.

CSC 491  
**Design and Analysis of Algorithms.** Methods of designing algorithms including divide-and-conquer, the greedy method, dynamic programming, and backtracking. Emphasis on efficiency issues.

CSC 493  
**Automata Theory and Formal Grammars.** An introduction to the most important abstract models of computation and their applications: finite state machines and pushdown automata. The relationship between formal grammars and automata.

CSC 496  
**Microprocessors.** An introduction to the hardware and software aspects of microprocessors. Digital electronics, microprocessors, programming, interfacing. Laboratory work will involve hands-on work with microprocessor systems. **Prerequisite:** one assembler course.

CSC 497  
**Information Theory.** An introduction to the basic concepts of information theory and coding theory. Measure of information, the fundamental theorem, Hamming, BCH, and other cyclic codes.

CSC 498  
**Digital Signal Processing.** Elements of circuit and signal theory, theory of modulation, mathematical basis of sampling and coding, principles of digital filtering. Applications to communications, process control, image and voice recognition, voice synthesis.

CSC 502  
**Genetic Algorithms.** The basics of genetic algorithms, the schema theory of John Holland, advanced operators and genetic search, as well as applications, e.g. genetic-based machine learning, parsing, expert system, etc. Students will work on a variety of projects based on the applications discussed in class. **Prerequisite:** CSC 491.
CSC 503  **Parallel Algorithms.** Development, implementation, and applications of parallel algorithms. Models of parallel computation. Parallel sorting, searching and graph algorithms, as well as other parallel algorithms, will be studied and implemented on both simulated and actual parallel machines. **Prerequisite:** CSC 491.

CSC 504  **Parallel Processing.** Specific multiprocessor architectures and how to implement various algorithms on each machine. Students will implement a fairly large project on a multiprocessor. The course will also introduce some compilation techniques, for a better understanding of the issues. **Prerequisite:** CSC 491.


CSC 536  **Modeling for Computer-Aided Design.** Review of Bezier curves. Splines. NURBS. Catmull-Rom splines. Integer and adaptive methods of curve generation. Surfaces. User interface considerations for CAD systems. GIS support issues. **Prerequisites:** CSC 436 and 469; or consent of instructor.

CSC 537  **User Interface Evaluation.** Techniques of heuristic evaluation, usability testing and formal experimentation. Students take a prototype interface from a first implementation through evaluation. **Prerequisite:** CSC 437, 323 or a basic statistics course.

CSC 538  **Vision Systems.** A survey of working vision systems such as bar code readers, handwriting readers, robotic navigation systems, target acquisition and tracking systems. **Prerequisite:** CSC 481 or CSC 584.


CSC 545  **Advanced Computer Organization.** Parallel, array and pipeline processors and other topics of current interest. **Prerequisite:** CSC 445.

CSC 546  **Operating Systems Design.** A project/seminar oriented course examining the details of the design of operating systems. The ideas from CSC 446 will be extended and incorporated into the design details. **Prerequisite:** CSC 446.

CSC 548  **Advanced Compiler Design.** Emphasis on practical problems in implementing compilers, data flow analysis, code optimization, error analysis. Discussion of compiler generators. As a class project, students will write a compiler. **Prerequisite:** CSC 448.

CSC 549  **Advanced Database Technologies.** Failure and recovery in database systems, concurrency control, distributed databases, object-oriented databases and logic databases. **Prerequisite:** CSC 449.

CSC 550  **Object-Oriented Databases.** Introduction to object-oriented concepts: abstract data typing, inheritance, object identity. Architecture, modeling and design for object-oriented databases. Query languages, integrity, long-duration transactions, concurrency, recovery and versioning in object-oriented databases. Brief survey of commercial and research prototypes of object-oriented database management systems. **Prerequisite:** CSC 449.
CSC 556  **Foundations of Artificial Intelligence.** A survey of the fundamental techniques used in artificial intelligence. Heuristic search, game playing, means-ends analysis and classical planning, constraint propagation, natural language understanding, and systems that learn. An introduction to intelligent interfaces, intelligent agents, and modeling human cognition with AI systems. **Prerequisite:** CSC 456, CSC 457 or CSC 458 or consent.

CSC 570  **Visualization.** Reconstruction techniques. Voxel classification and isosurface generation. Spatial set operations. Projections of higher-dimensional data sets. Data feature enhancement. False color mapping. Survey of applications in science, engineering and medicine. **Prerequisites:** CSC 469 and CSC 436.

CSC 578  **Neural Networks I.** A study of the basic structure of neural networks, activation and weights computation, learning, and various models: competition, pattern association, supervised and unsupervised learning units, single and multi layer models, Hopfield nets, Boltzman machines, and others. Some current applications are explored.

CSC 579  **Neural Networks II.** Advanced neural network architectures: Kohonen Networks, Counter Propagation Networks, Bi-directional Associative Memories as well as Art1 and Art2 Networks. Professional Neural Network development tools will be used throughout the course. There will be a project. **Prerequisite:** CSC 578.

CSC 580  **Artificial Intelligence Programming.** System implementation, using the powerful procedures and structures of modern AI such as: slot and filler databases, unification pattern matching, heuristic search, deductive information retrieval, procedures as data, case-based reasoning, natural language understanding, logic programming, discrete networks, and constraint satisfaction. **Prerequisite:** CSC 458.

CSC 582  **Machine Learning.** An introduction to computer systems that learn. Classification methods, decision-tree Induction methods, learning concepts from examples, learning heuristics, learning by analogy, explanation-based and case-based learning. Cognitive models. **Prerequisite:** CSC 456.

CSC 583  **Natural Language Processing.** Introduction to computer understanding of natural (human) languages. Topics include knowledge representation, syntactic analysis and grammars, parsing, semantic interpretation, discourse analysis, text generation, and machine translation. An overview of several existing natural language processing systems. **Prerequisite:** 417 or consent of instructor.

CSC 584  **Computer Vision.** An introduction to computer vision, including image representation, segmentation, stereo, color, texture perception, motion, knowledge representation, and neural nets. **Recommended:** CSC 436 or CSC 481.

CSC 585  **Knowledge Representation.** Techniques for symbolic representation of knowledge in artificial intelligence and knowledge-based systems. Topics will include propositional logic, predicate calculus, nonmonotonic logics, semantic networks and frames, conceptual dependencies and scripts, truth maintenance systems, and qualitative reasoning. **Prerequisite:** CSC 456.

CSC 587  **Cognitive Science.** Introduction to the principles and methods of cognitive psychology, and the relation between psychology and artificial intelligence; in particular, the use of AI systems to model human cognition. An overview of AI systems that have been intended as cognitive models, such as ACT* and SOAR. Emphasis on information processing. Applications to human/computer interaction.
CSC 589  Topics in Database. Prerequisite: consent of the instructor. Independent study form required.

CSC 590  Topics in User Interfaces. Prerequisite: completion of the corresponding visual computing core sequence or consent of instructor. May be repeated for credit.

CSC 591  Topics in Algorithms. An in-depth discussion of one or more of the following topics: algorithms for integer operations, polynomial arithmetic including applications of the fast Fourier transform, matrix operations, pattern matching algorithms, proving lower bounds on the complexity of algorithms, parallel algorithms, approximation algorithms. Prerequisite: CSC 491.

CSC 592  Topics in Computer Vision and Pattern Recognition. Prerequisite: completion of the corresponding visual computing core sequence or consent of instructor. May be repeated for credit.

CSC 594  Topics in Artificial Intelligence. Prerequisite: consent of instructor. Independent Study form required.

CSC 595  Topics in Graphics. Prerequisite: completion of the corresponding visual computing core sequence or consent of instructor. May be repeated for credit.

CSC 598  Topics in Data Analysis. Prerequisite: consent of instructor. Independent Study form required.

CSC 599  Topics in Computer Science. Prerequisite: consent of instructor. Independent Study form required.

CSC 610  Computer Science 1. An introduction to structured programming using PASCAL. Topics include: elementary data types, program control structures, character strings, array processing, procedures and functions, and an introduction to user-defined data types.

CSC 611  Computer Science 2. Conceptual models of a computer, machine and assembly language. Internal data representation, programming methods, recursion. Basic data structures, stacks, queues, linked lists. Trees, tree searches and string processing. Prerequisite: CSC 610.


CSC 640  Teaching Computer Science. A study of different programming languages used in high schools: PASCAL, BASIC, LOGO etc. A survey of computer topics covered in high school courses. Motivation and objectives in computer education. Prerequisite: CSC 611.

CSC 670  Computer-Assisted Instruction. Study and analysis of the use of the computer as an aid in instruction. Use of CAI languages such as PILOT. Prerequisite: CSC 630.

CSC 671  Quantitative Computing Workshop. Quantitative computing background needed for graduate study complemented with application to useful problems using appropriate software tools.

CSC 672  Data Analysis Workshop. Statistical background needed for graduate study complemented with experience in data analysis using SAS. Prerequisite: CSC 671 or equivalent.

CSC 680  Programming with LOGO. An introduction to LOGO, a powerful yet easy-to-learn language that both adults and children can use to express ideas.
COURSE DESCRIPTIONS

CSC 690  Research Seminar. Readings and discussion on current research topics. Students may register for this course no more than twice. Prerequisite: consent of the instructor.

CSC 696  Master's Project. Four credit hours. Students may register for this course only after their advisor has approved a written proposal for their project. Prerequisite: consent of advisor. Independent study form required.

CSC 698  Master's Thesis. Two credit hours. Students may register for this course only after their advisor has approved a written proposal for their thesis. Students must continue to register for this course every quarter after their first registration in it until they complete their project or thesis to the satisfaction of their advisor. They earn two hours of credit for each such registration but only four hours of credit will apply for degree credit. Prerequisite: consent of advisor. Independent study form required.

CSC 699  Research. Prerequisite: One to 12 hours per quarter. A total of 12 hours is required. Prerequisite: Pass Candidacy Examination in three concentration areas.

CSC 701  Resident Candidacy Continuation. Non-credit. Students admitted to candidacy for the doctoral degree who have completed all course and dissertation registration requirements and who are regularly using the facilities of the University for study and research are required to be registered each quarter of the academic year until the dissertation and final examination have been completed. Prerequisite: Admission to Candidacy Independent Study form required.

CSC 702  Non-Resident Candidacy Continuation. Non-credit. This registration provides for doctoral candidates who have been admitted to candidacy who are not in residence and need only occasional use of University facilities, including the libraries. Prerequisite: Admission to Candidacy Independent Study form required.

INFORMATION SYSTEMS COURSE OFFERINGS

Completion of the Prerequisite Phase is required for all courses not listing specific prerequisites.

IS 427  Software Quality Management. Quality management principles, tools, and methods applied to the software development process. Selected techniques for continuous and incremental improvements in product and process such as defect analysis, control charts, risk assessment, quality control, quality improvement programs, quality function deployment, the capability maturity model, cleanroom engineering, and benchmarking. Prerequisite: CSC 323.

IS 475  Information Systems Analysis and Design. Information systems development emphasizing the application of structured techniques in a CASE and 4GL environment. Topics and team project tasks include CASE tools, entity-relationship diagramming, data-flow diagramming, structure chart, action diagram, joint application design, prototyping, design of relational database, and testing. Prerequisite: CSC 315.

IS 482  Legal Aspects of Data Processing. A practical survey of computer and data processing law arising in a high-tech environment. Areas covered include: contracts, copyrights, patents, trade secrets, trademarks, crime, unfair competition and international treaties.

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<th>Course Title</th>
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<tr>
<td>IS 484</td>
<td><strong>Computerized Accounting Systems.</strong> Responsibility accounting systems. Profitability accounting systems. Customer invoicing, cash receipts and accounts receivable information processing. Customer order entry, finished goods inventory, purchasing and receiving information processing. Accounts payable, fixed assets and employee payroll systems. General ledger, budget and profit planning, sales analysis and market planning systems. <strong>Prerequisite:</strong> GSB 504 or ACC 103.</td>
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<td>IS 553</td>
<td><strong>Advanced Topics for Systems Development.</strong> Rapid application development approach to information systems development emphasizing integrated use of CASE products. The integration of tools, methodology, management, and project and user teams. Topics include evaluation and implementation of CASE products, object-oriented modeling, and methods for real-time systems. Case studies and systems project. <strong>Prerequisite:</strong> IS 475 or SE 465.</td>
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<td>IS 554</td>
<td><strong>Information Engineering.</strong> Application of structured techniques on enterprise-wide data models, information architecture, and cross-functional models. Stages for information strategy planning, business area analysis, joint requirements planning, and I.E. methodology. Automated tools, organizational strategies and economics of financial justification. Case studies. <strong>Prerequisite:</strong> IS 553.</td>
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<td>IS 571</td>
<td><strong>Software Maintenance.</strong> Maintenance characteristics, tasks, side effects, issues and techniques. Management considerations. Productivity in the maintenance environment. Structured technologies and maintenance.</td>
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<td>IS 572</td>
<td><strong>Computer Security.</strong> Security issues and problems specific to the computer environment. Software and hardware protection mechanisms including encryption and authorization schemes. Special security problems in distributed and teleprocessing environments. <strong>Prerequisite:</strong> CSC 446 or consent.</td>
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<td>IS 574</td>
<td><strong>Decision Support Systems and Expert Systems.</strong> Analysis, design and implementation of systems for decision support and strategic planning, including decision support systems (DSS), group decision support systems (GDSS), expert systems (ES), executive information systems (EIS), and other applications of artificial intelligence. Case studies, projects on applications, and evaluation of software. <strong>Prerequisite:</strong> IS 475 or SE 465.</td>
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<tr>
<td>IS 575</td>
<td><strong>Information Retrieval.</strong> Introduction to the design and analysis of computer-based information storage and retrieval systems. Retrieval systems using natural language, question-answering techniques. Storage and retrieval of unstructured and well-structured data. On-line inventory systems and bibliographic search systems. <strong>Prerequisite:</strong> CSC 459 or consent.</td>
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<tr>
<td>IS 577</td>
<td><strong>Management of Information Technology.</strong> Information technology and resource management. Assessment of information technology trends, application of portfolio resources, managing application development and end-user computing, information resource and asset control, strategic applications, and strategic information technology planning. Diffusion theories and stage models. Case studies. <strong>Prerequisite:</strong> IS 475 or SE 465 or completion of Core Knowledge phase in Telecommunications.</td>
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<tr>
<td>IS 596</td>
<td><strong>Topics in Information Systems.</strong> <strong>Prerequisite:</strong> consent of instructor. Independent Study form required.</td>
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<tr>
<td>IS 690</td>
<td><strong>Research Seminar.</strong> Readings and discussion on current research topics. Students may register for this course no more than twice. <strong>Prerequisite:</strong> consent of the instructor.</td>
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IS 696  Master's Project. Four credit hours. Students may register for this course only after their advisor has approved a written proposal for their project. Prerequisite: consent of advisor. Independent study form required.

IS 698  Master's Thesis. Two credit hours. Students may register for this course only after their advisor has approved a written proposal for their thesis. Students must continue to register for this course every quarter after their first registration in it until they complete their project or thesis to the satisfaction of their advisor. They earn two hours of credit for each such registration but only four hours of credit will apply for degree credit. Prerequisite: consent of advisor. Independent study form required.

SOFTWARE ENGINEERING COURSE OFFERINGS

Completion of the Prerequisite Phase is required for all courses not listing specific prerequisites.

SE 430  Object-Oriented Modeling. Object-oriented modeling techniques for analysis and design. Emphasis on one approach and a survey of several alternative approaches, for example, Codd and Yourdon, Booch, Rumbaugh, and Shlaer and Mellor. Relationship between these modeling techniques and the features of object-oriented languages including C++. Team project. Prerequisite: CSC 315.

SE 431  Formal Software Specifications and Development I. This course will focus on practical applications of formal software specification and design techniques. Topics include a survey of formal specification approaches and languages, model-oriented specifications, design refinement, and supporting tools for formal software development. Prerequisite: SE 465.


SE 455  Software Development Methods. Techniques for designing, implementing and testing large-scale software systems, as well as principles and methods for developing high quality software systems. Object-oriented technology and its applications. Topics include: object-oriented design methods and notations, object-oriented programming and testing, formal specifications, and programming methodologies. Prerequisite: CSC 447 or SE 430.


SE 466  Software Engineering Projects. Emphasize on team work, application of development and management techniques and use of CASE tools. The projects involve requirements analysis, requirements validation and inspection, object-oriented design, implementation, testing, integration, demonstration, and presentation. Prerequisite: SE 465.


SE 529  Software Risk Management. Identification, estimation, evaluation, planning, controlling, and monitoring of risk involved in the development, maintenance, operation and evolution of systems. Prerequisites: CSC 323, SE 465 or IS 475.


SE 533  Software Validation and Verification. Techniques, methods and tools for software inspection and testing. Theory and applications of formal verification of programs. Techniques and tools for automated analysis of programs. Prerequisite SE 465 or IS 475.

SE 558  Software Methodologies. Recently developed techniques for software requirements analysis, specification, and design. Prerequisite: SE 465 or IS 475.

SE 690  Research Seminar. Readings and discussion on current research topics. Students may register for this course no more than three times. Prerequisite: consent of the instructor.

SE 696  Master's Project. Four credit hours. Students may register for this course only after their advisor has approved a written proposal for their project. Prerequisite: consent of advisor. Independent study form required.

SE 698  Master's Thesis. Four credit hours. Students may register for this course only after their advisor has approved a written proposal for their thesis. Prerequisite: consent of advisor. Independent study form required.

TELECOMMUNICATIONS AND DATA COMMUNICATIONS COURSE OFFERINGS

Completion of the Prerequisite Phase is required for all courses not listing specific prerequisites.

TDC 411  Computers in Information Systems and Telecommunications. An introduction to computer organizations and operating systems. Computer components and functions, logic circuits, internal processing, multiprogramming, timesharing, memory management, file management, interrupts and I/O peripheral devices. Prerequisite: CSC 215.

TDC 432  Computer and Information Systems Modeling. Simulation, analytic modeling, and measurement of computer and information systems. Operational analysis. Introduction to queuing theory. Prerequisites: CSC 415 and either 343 or 411.

TDC 461  Basic Communication Systems. A history of telecommunications and regulatory and regulatory agencies. The basic communication model and its application to different communication systems, communication models. The telephone architecture, a typical data communication system, common carrier services, mediums and their characteristics. Prerequisites: PHY 405 is recommended.
TDC 462 **Data Communications.** Theory and components of data communication systems, modes, codes, and error detection techniques for data transmission, network protocols and line control procedures, communication carrier facilities and system planning. **Prerequisite:** TDC 411 and TDC 461.

TDC 463 **Computer Networks and Data Systems.** A detailed discussion of the seven layers of the ISO reference model. The design of interfaces and protocols. Network protocol organization will be discussed using TCP/IP and OSI protocols as examples. **Prerequisite:** TDC 462 or consent.

TDC 464 **Voice Communication Networks.** Basic structure of the public voice network. Principles of voice digitization. Digital and analog transmission, signaling and switching methods. Basic traffic analysis and engineering. **Prerequisite:** TDC 461 or consent; PHY 405 is recommended.

TDC 476 **Economics of Telecommunication Systems.** Inventory concepts, asset amortization. Liabilities. Consolidated statements, cost accounting. Capital budgeting, investment decisions. **Prerequisite:** TDC 461.

TDC 489 **Queuing Theory with Computer Applications.** An overview of queuing theory. Queuing systems, related random processes, classification of queues. Priority queueing. Computer time sharing and multi-access systems. **Prerequisite:** TDC 432 or consent.

TDC 511 **Telecommunications Practicum.** Introduction to the functionality and management of voice and data communications equipment in the Telecommunications and Local Area Networks laboratories. Emphasis will be on practical understanding and experience through laboratory exercises. **Prerequisite:** TDC 463.

TDC 512 **Cellular and Wireless Telecommunications.** An overview of cellular telephony including regulatory framework, RF design and frequency reuse, signaling and wireline interconnection issues. Personal Communications Systems (PCS), mobile radio, satellite and paging systems will also be considered. **Prerequisite:** TDC 464.

TDC 513 **Client/Server Technologies.** Design issues in the deployment of client/server systems. Robust server operations, Fault tolerance and distributed processing. Middleware and applications interfaces. **Prerequisites:** CSC 452 and TDC 561

TDC 514 **Computer Telephony.** A study of enabling technologies allowing the integration of voice communications services with personal computers, LANs and mainframes. Telephony programming interfaces, call management software, intelligent fax/data retrieval and interactive voice response systems will be considered. **Prerequisites:** TDC 463 and TDC 464.

TDC 561 **Distributed Processing.** A high-level understanding of network architectures and distributed applications; client/server models; remote procedure call; examples of applications such as electronic mail and file transfer; network programming. **Prerequisite:** TDC 462.

TDC 562 **Computer-Communication Network Design and Analysis.** Quantitative approaches to the design of data communications networks. Practical examples of networks. Statistical multiplexing and buffering at communication concentrators. Topics in overall network design. **Prerequisites:** TDC 432, TDC 462, or consent.
TDC 563  Protocols and Techniques for Data Networks. Packet communications; transport protocols; terminal, file transfer, and remote job protocols; packet broadcast protocols; security; database management in distributed networks. Prerequisite: TDC 463 or consent.

TDC 564  Local Area Networks. A detailed discussion of the current standards and technology. Medium access techniques, topologies, network operating systems, applications, and an introduction to several commercial and research networks. Prerequisite: TDC 463.


TDC 567  Telecommunication Systems Design and Management. The theory and practice of Telecommunication system design. Ongoing systems management. Telecommunication management including selection of vendors/systems, structuring an RFP systems proposal analysis, computer aided telecommunications management. Telecommunication management strategies from a business perspective. Prerequisite: TDC 464. TDC 565 is recommended.

TDC 568  Network Management. Data network management systems. Fault, accounting, configuration, performance and security management using SNMP and other protocols. Prerequisite: TDC 463. TDC 561 is recommended.


TDC 593  Topics in Telecommunications. Prerequisite: consent of instructor. Independent study form required.

TDC 597  Topics in Data Communications. Prerequisite: consent of instructor. Independent Study form required.

TDC 690  Research Seminar. Readings and discussion on current research topics. Students may register for this course no more than twice. Prerequisite: consent of the instructor.

TDC 696  Master's Project. Four credit hours. Students may register for this course only after their advisor has approved a written proposal for their project. Prerequisite: consent of advisor. Independent study form required.
TDC 698  **Master's Thesis.** Two credit hours. Students may register for this course only after their advisor has approved a written proposal for their thesis. Students must continue to register for this course every quarter after their first registration in it until they complete their project or thesis to the satisfaction of their advisor. They earn two hours of credit for each such registration but only four hours of credit will apply for degree credit. **Prerequisite: consent of advisor. Independent study form required.**

**INSTITUTE FOR PROFESSIONAL DEVELOPMENT OFFERINGS**

Application and registration information for the following programs may be obtained by calling the Institute office at 312-362-6282. Students should consult with their advisor prior to registering for an IPD program to determine how it may apply to their degree program.

**IPD 378  Executive Personal Computing Program.** A ten-week integrated certificate program in microcomputing and computer technology for business professionals. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 379  Client/Server Technology Program.** A twelve-week intensive program providing an in-depth introduction to client/server computing for programmers and managers. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 383  C++ Program.** A ten-week comprehensive certificate program covering object-oriented programming using C++ for programmers. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 384  Windows Software Development Program.** An eleven-week intensive certificate program in the fundamentals of MS Windows and client/server technology for programmers. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 391  DB2 Program.** A ten-week intensive certificate program covering relational database technology using DB2 for programmers. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 392  Telecommunications Program.** A twelve-week integrated certificate program in telecommunications technology, systems and management. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 393  Local Area Networks Program.** A ten-week intensive certificate program in the fundamentals of local area networks, wide area networks and data communications for LAN managers and data processing professionals. Program offered through the Institute for Professional Development; enrollment is restricted.

**IPD 397  Computer Career Program.** A thirty-week accelerated certificate program designed for those considering a change into the computer field. Program offered through the Institute for Professional Development; enrollment is restricted.

**COURSES FROM OTHER DEPARTMENTS**

**MAT 458  Statistical Quality Control.** Consult the Department of Mathematics section of the Graduate Programs Bulletin for the description of this course.
Courses Related to the MIS Degree

**GSB 499 Effective Communication.** The introductory course for the Kellstadt Graduate School of Business draws on factors that make DePaul University distinctive: its Vincentian values, pragmatism and strong relationship with the Chicago business community. The course gives students the opportunity to develop knowledge and skills in communication necessary to effectively influence business and social decision-making. Students are encouraged to examine their personal role in the corporate environment through self-management, and forming and maintaining business relationships. The course examines the dynamics of communication in interpersonal transactions and in decision-making for business and society while exposing the student to specific skills necessary for success in DePaul's graduate programs and today's challenging global business environment. **Prerequisite: graduate standing.**

**BLW 500 Legal and Ethical Environment.** This is an introduction to the nature and sources of law, including an analysis of ethical perspectives present in the judicial process. Students will learn how legal and ethical issues influence the decision-making process of managers. Students will examine utilitarianism, the rights and justice perspective, and professional obligations as they are represented in the law. Students will explore the relationship between personal values and business decisions, and whether there exists a social responsibility of managers. This course will cover legal concepts relevant to business including basic concepts of public law (constitutional and administrative law) and private laws (sales and product liability). Students will examine business organizations and issues in employment law. **Prerequisite: graduate standing.**

**ECO 500 Money and Banking.** Two credit hours. This course examines the role of money in the economy from both a functional and macroeconomic perspective. The role of the Federal Reserve as a monetary policy-maker will be examined in detail. Students completing this course will be able to make informed judgments of the impact of monetary and fiscal policy on inflation, interest and exchange rates, and the general level of economic activity. **Prerequisite: mathematics workshop, or equivalent.**

**ECO 509 Business Conditions Analysis.** This course teaches students how to use available economic data to assess business conditions. This is done by: (1) evaluating the sources and usefulness of data periodically released by government and private sources and (2) developing a macro-economic framework that the student can use to analyze business conditions. Completion of this course will allow students to understand economic news and relate it to their business or job. **Prerequisites: mathematics and statistics workshops, or equivalent.**

**FIN 500 Financial Institutions and Markets.** Two credit hours. This course covers the structure and functions of the most important financial institutions and financial markets. Coverage includes the banking system, saving institutions, other financial institutions, money markets, capital markets, and markets for derivative securities. **Prerequisite: mathematics workshop, or equivalent.**

55
IB 500  Global Economy. This course is designed to be an introduction to the economic environment in which businesses operate. With the increasing interdependence of national economies and the growing role of global enterprises, the understanding of international economic issues is vital to decision-makers. The material covered will include both socio-cultural aspects and economic and financial dimensions of global business. Students should obtain a grasp of the basic theory as well as a knowledge of the major current issues in the global economy. **Prerequisite: graduate standing.**

Accounting 500  Financial Accounting. This introduction to financial accounting provides both a theoretical foundation and an opportunity to apply accounting logic in increasingly complex situations. The accounting model and information processing cycle are developed. The content of the Income statement, balance sheet, and statement of cash flows are studied in detail and analyzed. **Prerequisite: graduate standing.**

526  Microcomputer Uses in Decision-Making. Hands-on use of microcomputers as tools for solving business problems. Students will learn to apply existing software and to construct their own worksheets. Emphasis will be on problem formulation, input preparation and solution analysis. Problems are selected from areas such as allocation of scarce resources, capital budgeting, inventory planning and control, pricing and performance evaluation. Offered Autumn, Spring. **Prerequisites: basic knowledge of Lotus 1-2-3, GSB 502 and either Accounting 542A or GSB 511 and permission of instructor.**

527  Design and Construction of Decision Models. This course covers the art of decision model construction and the application of existing decision models to managerial planning, control and decision-making. Existing models covered include linear programming and sensitivity analysis, learning curves, correlation analysis, inventory control models, PERT, and CPM. Students will learn to apply probability and utility theory to decision-making under uncertainty, as well as to apply the concepts of game theory to conflict situations in a business setting. If time permits, the application of Markov processes and simulation to managerial planning and decision situations will be covered. Extensive microcomputer applications will be used in this course. Offered variably. **Prerequisite: Completion of Phase I or equivalent.**

535  Accounting Systems. Today's business person requires a fundamental knowledge of computer-based information systems and their role in accounting functions and financial decision-making. This course will enable the student to interface with accounting systems, to participate in their design and audit, and to use microcomputers effectively in financial planning, control and analysis. Topics include: advance data processing concepts; computer security and controls; systems analysis, design and implementation; hardware/software evaluation and selection; database systems; data communications; and office automation. Students will gain substantial hands-on experience on microcomputers using Lotus 1-2-3 and Lotus Symphony.
Management Consulting in the Accounting Profession. This course provides an overview of the scope and practice of management consulting and management advisory services (MAS) in the accounting profession. The process of management consulting is examined including: problem identification, proposal development, fact-finding, solution analysis and implementation of recommendations. Case studies will be used in the course to demonstrate the process of management consulting in various areas. The course reviews the professional standards and ethics of management consulting practice. In addition, the course includes the marketing and engagement management aspects of management consulting. Offered: variably. Prerequisite: completion of Phase 1 or equivalent.

Management Information Systems

Systems Analysis and Design: Concepts, Tools and Techniques. This course is designed as the first of two courses. It focuses on the early phases of the information systems development life cycle and covers primarily process-oriented techniques, methods and methodologies. This course prepares students for the case study-oriented MIS 676 course where learned techniques are applied. Laboratory exercises include the use of a computer-aided software engineering (CASE) tool. Offered Autumn, Winter, Summer. Prerequisites: completion of Phase 1 and MIS 670 or equivalent.

Advanced Systems Techniques. This course assumes a familiarity with basic systems techniques and tools such as data gathering, recording and analysis, flow charting, decision tables, system implementation, etc. Topics to be covered include systems concepts and philosophy, project management, advanced tools of systems analysis and design, the human element in systems, and the like. Prerequisite: MIS 676 or equivalent or permission.

Management Information Systems: Planning, Design and Implementation. The second of a two-course sequence for MIS majors. It summarizes and extends the concepts of functionally oriented, structured, and data-oriented methodologies and CASE tools and focuses on applying them. It covers other topics of interest to the systems developers and systems manager, such as: methodologies for systems development without programmers (prototyping, 4th generation languages, end user computing), management of information services including information center concepts, and analysis and design of decision support and expert systems. Offered Winter, Spring. Prerequisites: MIS 671 and MIS 674 or equivalent.

Information Systems Project Management. Projects are often late, over-budget, technically inoperable, operationally infeasible, and in some cases never finished. One of the roots of this problem has been the lack of experienced management. What is needed are appropriate managerial procedures of planning, scheduling and control that are responsive to the needs of the environment. This course will define the essential components of good project management. Although the emphasis will be on management of systems and data processing projects, the concepts and techniques presented will be general enough to be of value of those involved with the design and implementation of any project. Offered Winter, Summer. Prerequisite: MIS 674 or equivalent or permission.
Problems in Systems Design. Problems in systems design, analysis, implementation and management are presented, discussed and analyzed. The emphasis in this course is on developing an analytical ability for dealing with systems problems and a professional capability in planning and managing systems. Offered Spring. **Prerequisite: MIS 676 or equivalent or permission.**

Graduate Seminar in Information Systems. Formal aspects of the course will provide a framework for integrating the various areas and disciplines studied in other courses. Readings, classroom discussion and group participation will be required of all students. Offered Winter and Spring. **Prerequisite: MIS 674 or permission.**

Information Processing Management (cross-listed as CSC 483). The organization of the Information Systems Department. Staffing, documentation and performance standards. The budget process. Design and layout of data processing facilities. Hardware/software specifications and selection. Offered variably. **Prerequisite: MIS 676 or equivalent.**

Computers in Society. The computer has had a profound effect on individuals, organizations and society as a whole. Its effects have been both positive and negative. Computer-based systems are currently implemented in virtually every field of endeavor and in the future will, in all likelihood, have an even greater impact than they have now. Developments within this field have occurred very rapidly over a relatively short period of time, so that we must now consider the implications of this revolution on the individual, on organizations, and on society as a whole. This course will examine the historical perspective, the computer industry, implications for the individual, effects on organizational practice, privacy and the quality of life, professionalism and ethics, and future trends. Offered variably. **Prerequisite: MIS 670 or equivalent.**

Security, Accuracy and Privacy in Computer Systems. Management decisions are increasingly being made on the basis of information provided to managers by the data processing system rather than on the basis of experience and intuition alone. In order for this information to be reliable, it must be accurate and its integrity must be maintained. Data and records are vital assets to an enterprise and therefore must be guarded against unauthorized access and manipulation just as other, more tangible, assets are guarded. Just as data and records are important to an enterprise and therefore must be accurate and secure, so are an individual's data and records important to him/her. Therefore, the issues of privacy—who is authorized to examine an individual's records—and accuracy—the completeness and correctness of the records—are critical. The three subjects are related in their technical solutions and hence should be considered together in the planning of computer installations. Offered variably. **Prerequisite: MIS 676 or equivalent.**

Decision Support Systems and Expert Systems. A seminar on the planning, design and implementation of decision support systems (DSS) and expert systems (ES). The emphasis of the course is on developing and building decision support systems. Consideration will also be given to end user computing and the evaluation and selection of DSS generators and ES skills. Students will gain hands-on experience in using DSS generators such as IFPS, prototyping languages such as FOCUS, and expert system skills. The course will include readings, a research paper and presentations. Offered Spring. **Prerequisite: MIS 676 or equivalent or permission.**
**Course Descriptions**

**798 Special Topics.** Content and format of this course are variable. An in-depth study of current issues in management information systems. Subject matter will be indicated in class schedule. Offered variably. **Prerequisite: as indicated in class schedule.**

**Management**

**500 Managing People I.** Students will critically examine and creatively solve problems of managing individuals and teams within organizations. Fundamental principles of perception, attribution, motivation and learning will be applied as participants engage in the study of leadership, empowerment, team development, managing innovation and change, decision processes, business ethics, and power and politics. **Prerequisite: graduate standing.**

**502 Operations Management.** This course provides an introduction and overview of the field of operations management. Students will learn how the operations function of a firm is responsible for the creation and distribution of goods and services. Major problems and ethical issues concerning the management of domestic and international operations are addressed. Quantitative and qualitative concepts of quality and continuous improvement are applied to both the manufacturing and service sectors. **Prerequisites: mathematics and statistics workshops, or equivalent.**

**510 Quality Control.** This course offers a treatment of several specific production and operations management functional areas including: statistical process control, total quality control, just in time, enhanced scheduling technologies, and productivity measurement. The interrelationship of these topics is identified and applications are discussed in various manufacturing and service environments. Offered Autumn, Spring. **Prerequisite: completion of Phase I or equivalent.**

**580 Operations Research.** This course focuses on a scientific approach to problem solving and model building. Topics covered include mathematical programming, integer programming, Markov processes, game theory and simulation. Emphasis is placed on application models, computer implementation and solutions. **Prerequisite: MGT 501.**

**590 Management of Innovation and Technological Change.** This course provides a foundation for managing technology in a competitive environment with global implications. Managing technology, whether in R&D or the finance department, requires the manager to understand, utilize and support technology. Technology is discussed as a critical component, along with people and skills, in adding value to products and services. Other topics discussed include entrepreneurship, a technology foundation, deployment of technology, and the industry evolution process. Selected emerging technologies and their future evolutions are studied. Offered Winter. **Prerequisite: completion of the internal and external environment courses or equivalent.**

**Marketing**

**585 Marketing Information Systems for Decision Support.** Course explores the development of a systems approach to the collection, analysis and distribution of marketing information within the organization. Topics include expert systems, data-base development and maintenance, and planning and control systems for marketing decision-making. Offered variably. **Prerequisite: MIS 500, ACC 555, MKT 555, and MKT 525 or equivalent.**
HANDBOOK FOR GRADUATE STUDIES
THE UNIVERSITY

CAMPUSES

dePaul University has five locations. The Lincoln Park Campus is situated about three miles north of the Chicago Loop in the vicinity of Webster (2200 N), Halsted (800 W) and Racine (1200 W). The College of Liberal Arts and Sciences, The School of Music, The School of Education and The Theatre School are located on the 30-acre campus.

The Loop Campus, between State Street and Wabash Avenue at Jackson Boulevard, houses the general administration of the University, the College of Law, the College of Commerce and the School for New Learning.

The O'Hare Campus is located near O'Hare Airport at 3166 River Road, DesPlaines—just north of the intersection of River Road and Devon. The Oak Brook Campus is located at Two Westbrook Corporate Center, Suite 200, in Westchester—on 22nd Street, just east of the I-294 Tollway. The South Campus is located at South Suburban Community College's University and College Center, 16333 South Kilbourn Avenue, Oak Forest—at I-57 and 167th Street. The College of Commerce, the College of Liberal Arts and Sciences and the School for New Learning offer courses at a number of these sites.

UNIVERSITY LIBRARIES

The DePaul Libraries provide resources and services to students, faculty and staff through six different units: The Lincoln Park Library, the Loop Campus Library, the Law Library, the Oak Brook Library, O'Hare Campus Library and the South Campus Library. The delivery of information and materials is increasingly linked to computer technologies. Access to materials in all the DePaul Libraries is provided through ILLINET Online, the Libraries’ online catalog and circulation system. From the same terminal, students and faculty can identify and check out books from 41 other colleges and universities in Illinois, including the University of Illinois. A second component of ILLINET Online allows users to search the catalogs of over 800 libraries around the state. Furthermore, materials from libraries across the United States can be located and obtained through other computer networks. Electronic networked access to periodical articles and other information resources in the social sciences, business, humanities and sciences is readily available through online and compact disc (CD-ROM) data bases at all campuses.

The combined collection of the DePaul University Libraries includes over 659,000 volumes, 298,000 microform volumes, over 8,800 current serial subscriptions, and a varied microcomputer software and audiovisual collection. Information, brochures and bibliographies are available in all six locations. The Library Research Workbook which freshmen complete in English 104 provides an introduction to library services and resources.

The Lincoln Park Campus Library supports programs in the College of Liberal Arts and Sciences, the School of Education, the School of Music and The Theatre School. Areas of particular strength are religion, philosophy and Irish studies. Facilities include a media area for using audiovisual materials and the Education Resource Center with curriculum materials for elementary and secondary school teaching, a slide library, a Career Information Center and a collection of music recordings and scores. Rare book collections include the Napoleon Collection, the Dickens Collection and the Sporting Collection, as well as numerous titles dealing with 19th-century literature and book illustration. The University Archives focuses on various materials documenting the growth and development of DePaul.

The Loop Campus Library primarily focuses on business materials to support the programs of the College of Commerce but also has core collections of materials in other subjects. A Career Information Center provides resources on career choice, job search techniques and company information. Other useful collections include the industry file and the corporate annual report file.
The library of the College of Law has an extensive collection of Anglo-American legal materials, and provides both basic and advanced resources needed for study and research in the law school curriculum. The collection includes reports of American federal and state courts; court reports of Great Britain; the codes, constitutions and statutes of all fifty states and American territories; materials on tax law; and legal periodicals. Designated an official depository for government publications, the Law Library provides a selective collection of federal documents.

The Oak Brook, O'Hare, and South Campus Libraries offer an innovative approach to library service by providing access to information using computers and telecommunications. There is no permanent book collection; electronic access to DePaul and other libraries' holdings is provided through complete access to all the library's networked information resources, including ILLINET Online and CD-ROM databases. Books and other journal articles needed by students and faculty are delivered by a daily intra-university shuttle service.

ACADEMIC COMPUTING FACILITIES

University Planning and Information Technology (UPIT) provides facilities and resources to support instruction and research at DePaul University. DePaul's campus-wide network connects the various Microcenters, Computer-based Classrooms and faculty offices on its five campuses to the research computing facilities. These facilities consist of a set of 3 Sun SparcCenter 1000 Unix minicomputers and an IBM 9221 mainframe. The Microcenters offer Window and Macintosh workstations, and are connected to the DePaul Network. They also offer access to the Internet through a variety of client applications. The Computer-based Classrooms have a computer for each student, and accommodate classes of 22 to 40 students. There are approximately 600 workstations in the Microcenters and Computer-based Classrooms throughout DePaul. Starting in fall, 1995, dial-in access will be available through

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<tr>
<th>LOOP CAMPUS</th>
<th>LINCOLN PARK CAMPUS</th>
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<tr>
<td><strong>Microcenter:</strong></td>
<td><strong>Microcenter and Classroom:</strong></td>
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<tr>
<td>Administration Center 400</td>
<td>Schmitt Academic Center</td>
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<tr>
<td>(312) 362-8336</td>
<td>(312) 325-1097</td>
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<tr>
<td>40 Windows Workstations</td>
<td>160 Windows Workstations</td>
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<tr>
<td><strong>Microcenter:</strong></td>
<td><strong>Microcenter and Classroom:</strong></td>
</tr>
<tr>
<td>Lewis Center 14th Floor</td>
<td>Bryne Hall 358</td>
</tr>
<tr>
<td>(312) 362-8342</td>
<td>(312) 325-1088</td>
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<tr>
<td>32 Windows Workstations</td>
<td>22 Windows Workstations</td>
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<tr>
<td>14 Macintosh Workstations</td>
<td><strong>Microcenter and Classroom:</strong></td>
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<tr>
<td><strong>Computer-based Classrooms:</strong></td>
<td>McGaw Hall 145</td>
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<tr>
<td>Lewis Center 13th Floor</td>
<td>3 Classrooms</td>
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<tr>
<td>25 East Jackson Street</td>
<td>100 Windows Workstations</td>
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<tr>
<td>(312) 362-8177</td>
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<td>3 Classrooms</td>
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<td>100 Windows Workstations</td>
<td><strong>Microcenter and Classroom:</strong></td>
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<tr>
<td><strong>OAK BROOK CAMPUS</strong></td>
<td>802 West Belden</td>
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<tr>
<td><strong>Microcenter and Classroom:</strong></td>
<td>(312) 325-1088</td>
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<tr>
<td>2 Westbrook Corporate Center</td>
<td>38 Windows Workstations</td>
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<tr>
<td>(708) 562-2020</td>
<td><strong>ACADEMIC TECHNOLOGY DEVELOPMENT</strong></td>
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<tr>
<td>38 Windows Workstations</td>
<td><strong>Microcenter and Classroom:</strong></td>
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<tr>
<td><strong>SOUTH SUBURBAN CAMPUS</strong></td>
<td>Main Offices</td>
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<tr>
<td><strong>Microcenter and Classroom:</strong></td>
<td>25 East Jackson Street</td>
</tr>
<tr>
<td>16333 South Kilbourn Road</td>
<td><strong>Microcenter and Classroom:</strong></td>
</tr>
<tr>
<td>(708) 633-9093</td>
<td>20 Windows Workstations</td>
</tr>
<tr>
<td>20 Windows Workstations</td>
<td><strong>Microcenter and Classroom:</strong></td>
</tr>
</tbody>
</table>

64
all five campuses. These facilities will be v.34, SLIP-based modem pools offering full Internet access to students.

Students, faculty and staff have access to a variety of application, services and peripherals in the Microcenters, and these services are used extensively throughout the DePaul curriculum. UPIT also offers seminars and workshops on various topics. Brochures listing the workshops and hours of operation are available at all of the above sites.

CAREER DEVELOPMENT CENTER
The University has two offices offering career planning and placement services to graduate students and alumni, providing resources for those exploring career options as well as for those actively involved in a targeted job search. Appointments are available at either the Loop Campus, 9th floor, DePaul Center, or at the Lincoln Park Campus, first floor of the Schmitt Academic Center.

DePaul's Career Development Center professionals are committed to helping the student develop skills in identifying career opportunities, and seeking out and securing satisfying employment. The tools utilized by the staff include career and job search seminars, mock interviews, career libraries on both campuses, vocational interest inventories, and individual counseling.

Both full- and part-time job leads are available through the Center. Leads for immediate openings are continually listed and updated, and an active on-campus interview program gives students and alumni access to career opportunities.

The Center has recently developed an innovative program for the registration of full-time job seekers. A computerized database allows candidate information to be matched to an employer's job specifications. Rapid turnaround time has dramatically improved the consideration given candidates referred from DePaul. A job fair is offered once a year to assist graduate students who have work experience in securing employment.

RESIDENCE LIFE
The University does not currently have housing for graduate students. The Residence Life Office, however, provides an off-campus housing listing service for DePaul faculty, staff and students. This service lists available apartments in the Lincoln Park area. The Residence Life Office is located on the third floor of Stuart Center, 2311 N. Clifton Ave. (312/362-8020). Office hours are Monday through Friday, 9:00 a.m. to 5:00 p.m.

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THE NATIONAL LEAGUE OF NURSING
THE NORTH CENTRAL ASSOCIATION OF COLLEGES AND SCholaRS
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THE STATE APPROVING AGENCY FOR VETERANS TRAINING

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THE AMERICAN ASSOCIATION OF THEATRE FOR YOUTH
THE AMERICAN ASSOCIATION OF UNIVERSITY WOMEN
THE AMERICAN COUNCIL ON EDUCATION
THE ASSOCIATION OF CATHOLIC COLLEGES AND UNIVERSITIES
THE ASSOCIATION OF GOVERNING BOARDS OF UNIVERSITIES AND COLLEGES
THE CHICAGOLAND ADVOCATES FOR SIGNED THEATRE
THE CONSORTIUM OF CONSERVATORY PROGRAMS
THE COUNCIL FOR ADULT AND EXPERIENTIAL LEARNING
THE COUNCIL OF GRADUATE SCHOOLS
THE FEDERATION OF INDEPENDENT ILLINOIS COLLEGES AND UNIVERSITIES
THE ILLINOIS ARTS ALLIANCE
THE ILLINOIS LEAGUE FOR NURSING
THE INTERNATIONAL ASSOCIATION OF THEATRE FOR CHILDREN AND YOUNG PEOPLE
THE LEAGUE OF CHICAGO THEATRES
THE MIDWEST ALLIANCE IN NURSING
THE NATIONAL ASSOCIATION OF INDEPENDENT COLLEGES AND UNIVERSITIES
THE NATIONAL CATHOLIC EDUCATION ASSOCIATION
THE NATIONAL COUNCIL ON REHABILITATION EDUCATION

HONOR SOCIETIES
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BETA ALPHA PSI
BETA GAMMA SIGMA
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DELTA SIGMA PI
GOLDEN KEY NATIONAL HONOR SOCIETY
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PHI SIGMA ALPHACON
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SIGMA DELTA PI
SIGMA PI SIGMA
SIGMA THETA TAU
SIGMA XI
THETA ALPHA KAPPA
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ADMISSION CLASSIFICATIONS

Applicants are admitted to the School of Computer Science, Telecommunications and Information Systems on the basis of their ability to complete programs of study and research prescribed for the master's and doctoral degrees. Specifically, admission qualifications are measured by academic criteria.

In accord with these criteria, applicants are admitted in one of three major categories: degree-seeking, non-degree-seeking, and student-at-large.

DEGREE-SEEKING STUDENTS

Applicants are admitted as degree-seeking students in either of two ways: full or conditional.

FULL DEGREE-SEEKING STATUS

The minimum requirements for this status are:

- Bachelor's degree conferred by a regionally accredited institution.
- Scholastic achievement in undergraduate studies satisfying all requirements for entering a specific graduate program.
- Unconditional approval by the program director of the applicant's proposed course of graduate study.
- Submission to the School of all required supporting credentials.

Please note these are minimum requirements for full admission. The program section of this Bulletin provide additional, more specific and selective, criteria for admission to specific programs.

CONDITIONAL DEGREE-SEEKING STATUS

The minimum requirements for this status are:

- Bachelor's degree conferred by a regionally accredited institution.
- Scholastic achievement in undergraduate studies indicating a capacity to pursue successfully a specific program of graduate study.
- Conditional approval by the program director of the applicant's proposed course of graduate study.
- Submission to the School of all required supporting credentials.

A conditionally admitted applicant is eligible for reclassification to full, degree-seeking status when the conditions of admission have been satisfied.

NON-DEGREE-SEEKING STUDENTS

At the Dean's discretion, applicants who do not wish to pursue an advanced degree may be admitted. Non-degree-seeking students may, at some future date, make application for reclassification to degree-seeking status.

NON-DEGREE-SEEKING STATUS

The minimum requirements for this status are:

- Bachelor's degree conferred by a regionally accredited institution.
- Scholastic achievement in undergraduate studies indicating a capacity to pursue successfully graduate course work.
- Approval by the dean.
- Submission to the School of all required supporting credentials, including a letter of intent addressed to the dean.
When such students file for reclassification, the program director may recommend, in writing, to the dean that a maximum of three courses (12 quarter hours) completed by the student under the non-degree-seeking status be counted toward fulfillment of the advanced degree requirements.

**STUDENT-AT-LARGE**

The School of Computer Science, Telecommunications and Information Systems may admit as a student-at-large a graduate student currently enrolled in a graduate program in another accredited institution upon the recommendation, in writing, of the student's own graduate dean.

A student-at-large must submit the application for admission to the School office. The only supporting credential required is a letter from the dean of the graduate school where the student is in good standing. This letter should state in general terms the course or courses the student is authorized to take.

Under no circumstances does this classification constitute admission to a degree program at DePaul University.

**DEPAUL SENIORS**

Seniors in any of the undergraduate colleges or schools of DePaul University are eligible to apply for admission to the School of Computer Science, Telecommunications and Information Systems while completing their undergraduate program.

**ADMISSION PROCEDURES**

**GENERAL PROCEDURES**

Procedures for admission to the School of Computer Science, Telecommunications and Information Systems involve a completed application form, supporting credentials, admission fee, deadlines and the dean's admission letter.

**Application Form:** You can obtain a graduate application form either by mailing your request to the School of Computer Science, Telecommunications and Information Systems Graduate Office, DePaul University, 243 South Wabash, Chicago, Illinois, 60604 or by calling (312) 325-8381. Please include your proposed program of study in your request because the composition of the application packet varies according to the degree.

**Note:** An undergraduate DePaul senior is eligible to submit an application to the graduate program before completing the undergraduate program.

**Supporting Credentials:** Official transcripts of your academic records at all universities, colleges and junior colleges attended are required. Please direct the registrar(s) to mail these official transcripts directly to the School of Computer Science, Telecommunications and Information Systems Office, DePaul University. Since there is frequently a delay in the forwarding of transcripts, you are advised to make your request as early as possible.

**Note:** Several programs require additional supporting credentials. Please consult the specific programs listed in this Bulletin to determine what additional materials are required for admission to the specific course of graduate study.

An undergraduate DePaul senior, making application, should request the registrar to forward an official transcript to the School office. A written recommendation for admission from the student's current chairperson or program director should also be provided.

**Admission Fee:** A check or money order payable to DePaul University in the amount of $25.00 must accompany the completed application form. Any application form received without the fee will be returned unprocessed. The fee is nonrefundable.

**Dean's Admission Letter:** The dean will notify you by letter of your admission status. It is the policy not to review, evaluate or act upon any application for admission without having the completed application form, all the supporting credentials, and the application fee.

*If you do not enroll at the University within one year of the date of your letter of admission, you must complete an application for readmission.*
GRADUATE CREDIT TRANSFER

Credit transfer in degree programs leading to the master's or doctoral degree ordinarily is not allowed. However, the dean may authorize an exception to this policy when, in the judgment of the dean and the program director, the circumstances justify the exception.

INTERNATIONAL STUDENT ADMISSION

Applicants educated outside of the United States must obtain, the application for international admission by writing to the Graduate Admission Office. Candidates must meet academic requirements and demonstrate English proficiency with a TOEFL score of 550 or greater (580 or greater for Ph.D. applicants). Those requesting student visas (I-20) must demonstrate adequate financial support. The letter of admission and the visa form I-20 are issued only after admission.

Application deadlines for international students are:

<table>
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<tr>
<th>Initial Enrollment</th>
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<tr>
<td>Autumn quarter</td>
<td>June 4</td>
</tr>
<tr>
<td>Winter quarter</td>
<td>October 1</td>
</tr>
<tr>
<td>Spring quarter</td>
<td>January 2</td>
</tr>
<tr>
<td>Summer quarter</td>
<td>March 4</td>
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</table>

International applicants are strongly urged to make application as early as possible. Usually there are long delays in the forwarding of all supporting credentials.

READMISSION PROCEDURES

If you were previously enrolled in a graduate program in the School of Computer Science, Telecommunications and Information Systems but have not been in attendance for a period of one calendar year or longer, but not more than four calendar years, you must file a readmission form with the School office. (If more than four years have elapsed since you have been in attendance, you must file a new application.) The form must be submitted at least two weeks prior to the day of registration for the term in which you expect to resume your studies. There is a $5.00 service fee for processing a readmission form.

An official copy of transcripts recording scholastic work completed since the last enrollment at DePaul University must be submitted. As a general rule, students are held to the degree requirements that are in force at the time of readmission.

RECLASSIFICATION PROCEDURES

Should you desire a change in your major or admission status, you must file a reclassification application with the School office.

MASTER'S PROGRAM REQUIREMENTS

For the master's degree, all programs involve the following: 1) credit hours, 2) thesis, or comprehensive examination, and 3) program time limitation.

Credit Hours. For the master's degree, most programs for graduate students require fifty-two quarter hours of course work.

Specific degree requirements are listed in the program sections of this Bulletin.

Thesis. The University offers the master's degree both with and without the thesis; however, the thesis is required by some areas. The thesis is limited to the student's field of specialization and should offer satisfactory evidence of the candidate's potential for scholarly research.

The student is advised to consult the School office for information regarding the required form and type of paper to be used for the thesis. Responsibility for fulfilling these requirements lies with the student, not the typist.
The student, after completing the thesis, will submit it to the director of his or her thesis committee for consideration, or the student will not be permitted to graduate until a subsequent convocation. When the thesis is accepted, the student must file the designated number of typewritten copies in the School office. The binding fee is $10.00 per copy, to be submitted along with the copies of the thesis. The date for filing is published in the current Bulletin and the class schedule or may be obtained directly from the School office. The responsibility for meeting this deadline lies with the student.

Comprehensive Examination. The type and the subject matter of the examination follow the regulations established in the various programs. If the student does not pass the examination, the school or program may grant permission for another examination. The examination may not be taken more than twice.

Program Time Limitation. Graduate students in master's programs are expected to complete their program degree requirements within a six-year period from the first registration date for a course in the program. When a graduate student fails to finish before the end of the sixth year, the program director may recommend, on receipt of the student's petition, in writing, to the dean, an extension of time with or without additional courses, examinations or other conditions.

DOCTORAL PROGRAM REQUIREMENTS

The Doctor of Philosophy, the highest academic degree that DePaul University confers, is offered by the School of Computer Science Telecommunications and Information Systems. The degree shows that the recipient has demonstrated proficiency in a broad area of learning, as well as the potential to explore and advance that field of knowledge by independent research.

Following are the minimum general requirements for all candidates for the Doctor of Philosophy degree in the areas of 1) credit hours, 2) academic achievement, 3) residence, 4) admission to candidacy, 5) dissertation, 6) final examination and 7) program time limitations. Additional requirements are stated in the program section of this Bulletin.

Credit Hours. For the doctoral degree the graduate student will complete no less than 60 quarter hours of credit beyond the master's degree.

Academic Achievement. A student will be advised to withdraw from the doctoral program when the School judges that the student is not maintaining satisfactory progress toward the degree. Students are required to maintain at least a 3.0 average. A course grade below 2.0 is unsatisfactory and will not be counted toward completing degree requirements. The determination of satisfactory progress is not limited to grades and grade point average, but includes all factors in the student's performance.

Residence. At least three quarters beyond the master's level must be spent in full-time study at DePaul University. Full-time study is defined as registration for a minimum of eight quarter hours in a quarter. With prior approval of the school, the student may satisfy residency by course work, by participation in seminars, or by research performed off campus.

To reflect the diversity of graduate study for the Ph.D. degree at stages other than the residency stage, doctoral candidates are full-time students who are registered for Reading and Research (four quarter hours); for Thesis Research (four quarter hours); or for Candidacy Continuation (zero hours credit).

Admission to Candidacy. Admission to candidacy implies that the faculty is satisfied the doctoral candidate is sufficiently knowledgeable in the student's area of specialization and in the use of research tools to be able to prepare an acceptable dissertation.

For admission to candidacy the doctoral candidate shall complete three quarters of full-time study beyond the master's level. Other requirements include a comprehensive examination and allied field study.
The School office will issue to each doctoral candidate a letter to authenticate admission to candidacy. Admission to candidacy will be entered on the doctoral candidate's scholastic record.

There is a time limit of four years between admission to the School of Computer Science, Telecommunications and Information Systems and admission to candidacy. Once admitted to candidacy, the doctoral candidate must maintain registration in the University in each of the quarters of the academic year until the degree requirements have been completed. Among other courses, the following are appropriate to maintain registration: Independent Study (four quarter hours); Resident Candidacy Continuation (non-credit); or Non-Resident Candidacy Continuation (non-credit). Failure to comply with the policy governing registration in the University, in each of the quarters of the academic year until the degree requirements have been completed, may result in dismissal from the doctorate program. Candidacy status may be reinstated only after the student has applied for readmission (see Readmission Procedures).

**Dissertation.** The doctoral candidate will prepare a dissertation based on the student’s research. The purpose of the dissertation is to evidence both one’s scholarship and ability to carry on such independent research as definitely contributes to the advancement of knowledge. The topic of the dissertation should be submitted to the dissertation advisor who will assist the student in forming a dissertation committee to approve the topic and to assist the doctoral candidate through all stages in the preparation of the dissertation. The chairperson of this committee is the dissertation advisor.

All doctoral dissertations are to be microfilmed. After all requirements have been completed, the doctoral candidate submits to the School office the designated number of typewritten, unbound, final copies of the dissertation. (The first copy is to be in satisfactory condition for microfilming.) The candidate also prepares and submits a 350-word abstract of the dissertation. The abstract will be published in Dissertation Abstracts and will include an announcement that the dissertation is available in film form. One microfilm copy will be deposited in the University Library and will be available for interlibrary loan.

To defray the costs of microfilming and publication, a fee of $75.00 is collected when dissertation copies are submitted.

Microfilming is considered by the University to be a form of publication. Publication by microfilm, however, does not preclude the printing of the dissertation in whole or in part in a journal or monograph.

**Final Examination.** The dissertation is the principal basis of the final examination. After completing the dissertation, and at least eight months after admission to candidacy, candidates should submit a petition for the final examination to the School. After the examination, the chair of the committee sends a report of the results, signed by all committee members, to the School office.

When these steps have been completed, the doctoral candidate becomes eligible for degree conferment at the next convocation.

**Program Time Limitations.** For graduate students in a doctoral program, the time limits to complete the requirements for the Doctor of Philosophy degree are 1) between admission to the doctoral program and admission to candidacy: not more than four years; and 2) between admission to candidacy and the final examination: not less than eight months, and not more than five years.
ACADEMIC INFORMATION AND REGULATIONS

This bulletin is the official statement of the requirements, rules and regulations for the Graduate Programs offered by the School of Computer Science, Telecommunications and Information Systems. This bulletin does not constitute a contract between the student and the University. Every effort has been made to provide accurate and firm information. The University reserves the right to revise the content of its Bulletins and Schedules, and to change policies, programs, requirements, rules, regulations, procedures, calendars and schedule of tuition and fees; to establish and modify admission and registration criteria; to cancel or change courses or programs and their content and prerequisites; to limit and restrict enrollment; to cancel, divide or change time or location or staffing of classes; or to make any other necessary changes.

A student upon admission to a graduate program is to follow the bulletin requirements in effect at the time of entrance. A student who is readmitted or who changes his or her program or enrollment status is subject to the terms of the bulletin in effect at the time of readmission or status change.

As a graduate student you assume the responsibility to know and meet both the general and particular regulations, procedures, policies, and deadlines set forth in this bulletin. All students are expected to adhere to the Student Code of Responsibility found in the Student Handbook. The University follows the requirements outlined in the Family Educational Rights and Privacy Act of 1974 which outlines the rights of students to review their educational records. The procedures for such review and the rights of students in this regard are set forth in the Student Handbook.

Certain student information, known as “Directory Information,” may be disclosed by the institution to outside parties, unless the student has specifically requested that this information not be released. DePaul University considers the following to be Directory Information: name, address, telephone number, college of enrollment, class, major field of study, dates of attendance, degrees and awards received, the most recent educational agency or institution attended by the student, and participation in officially recognized activities and sports. Students who do not want Directory Information released should make a written request to the Office of the Registrar to withhold this information.

ACADEMIC COUNSELING

Academic counseling helps to insure successful completion of graduate studies. If you are a degree-seeking student, contact your faculty advisor. If you are a non-degree seeking student or a student-at-large, contact either your graduate division office, or the appropriate department or program director.

COURSES AND CREDIT

No one is permitted to attend a class for which he or she has not been properly registered. Credit is accumulated on the basis of quarter hours. The unit of credit is one quarter hour granted for 45 minutes of classroom work a week. The normal class extends over a ten-week period (or an accelerated five-week period in the summer). All courses carry four quarter hours of credit (2 2/3 semester hours), unless otherwise noted.

Students enrolled for eight or more quarter hours of credit are considered full-time. Those enrolled for less are considered part-time. For students fully employed, registration for two courses in a term is the suggested maximum.

Courses numbered 300 through 399 are advanced undergraduate courses. If listed in this Bulletin, they may be accepted for graduate credit within the limitations stipulated by the specific departmental chair or program director.
GRADERS
Following is the key to the system of evaluating the academic achievement by the student of the educational objectives specified by the instructor in the course syllabus. These definitions apply to the straight letter grade. A plus grade represents slightly higher achievement than the straight letter grade. A minus grade represents slightly lower achievement than the straight letter grade.

A  The instructor judged the student to have accomplished the stated objectives of the course in an EXCELLENT manner.

B  The instructor judged the student to have accomplished the stated objectives of the course in a VERY GOOD manner.

C  The instructor judged the student to have accomplished the stated objectives of the course in a SATISFACTORY manner.

D  The instructor judged the student to have accomplished the stated objectives of the course in a POOR manner.

F  The instructor judged the student NOT to have accomplished the stated objectives of the course.

IN Temporary grade indicating that the student has a satisfactory record in work completed, but for unusual or unforeseeable circumstances not encountered by other students in the class and acceptable to the instructor is prevented from completing the course requirements by the end of the term. An incomplete grade may not be assigned unless the student has formally requested it from the instructor, and the instructor has given his or her permission for the student's receiving an incomplete grade.

R  Student is making satisfactory progress in a course that extends beyond the end of the term or in a project extending over more than one quarter.

W  Automatically recorded when the student's withdrawal is processed on or before the date designated in the academic calendar for such a withdrawal.

FX Student stopped attending course. This is an apparent withdrawal. The grade can be changed to a "W" grade by the college administration without consulting the instructor if it is determined that the student attempted to withdraw but followed incorrect procedures, or on other administrative grounds. If not administratively removed, it is scored in the grade point average the same as an "F." Students are advised to contact their college office to initiate the request to correct an FX grade. An FX grade may not be changed if it has remained on the student's record beyond twelve months except in extraordinary circumstances.

QUALITY POINTS
Quality points are awarded to a student in relation to the grade given and the number of quarter hours of credit attempted in the course. Quality points are awarded according to the following schedule:

A  4 times as many quality points as the credit hours assigned to the course.
A−  3.7 times the number of credit hours.
B+  3.3 times the number of credit hours.
B   3 times the number of credit hours.
B−  2.7 times the number of credit hours.
C+  2.3 times the number of credit hours.
C   2 times the number of credit hours.
C−  1.7 times the number of credit hours.
D+  1.3 times the number of credit hours.
D   1 quality point for each credit hour in the course.
Illustration

<table>
<thead>
<tr>
<th>Grade</th>
<th>Quality Points Per Credit Hour</th>
<th>Credit Hours Attempted</th>
<th>Quality Points Merited</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>x</td>
<td>4</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td>x</td>
<td>4</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
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<td>4</td>
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<td>B</td>
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<td>B-</td>
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<td>D+</td>
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<td>4</td>
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<td>D</td>
<td>1</td>
<td>x</td>
<td>4</td>
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<tr>
<td>F, FX</td>
<td>0</td>
<td>x</td>
<td>4</td>
</tr>
</tbody>
</table>

W, IN, R Quality Points not assigned.

GRADE REQUIREMENTS
You must earn a grade of B- or higher to receive graduate credit for any upper-level undergraduate course (300 level) that has been accepted for graduate credit.
You must achieve a minimal grade point average of 2.500 to graduate. A grade of D+ or D is unacceptable for graduate credit, and if earned in a required course, the course must be repeated or substituted as directed by the chair of the area of concentration. D+ or D grades remain on the academic record and are calculated into the cumulative grade point average.

PROBATION AND DISMISSAL
A student is subject to Probation as soon as his/her graduate GPA falls below 2.500. The student remains on Probation until four more courses are taken, at which time another evaluation is made. If, at that time, the student has failed to raise his/her GPA to the required level of 2.500 the student may be dismissed for poor scholarship, and prohibited from registering for additional course work.
A student who has been dismissed may, after a period of time, petition for reinstatement. The petition, addressed to dean of the respective graduate division, would provide information that would demonstrate a change in the student's circumstances to an extent that would support successful completion of the student's degree program. The dean's decision, based upon the merits of the petition and the recommendation of the faculty of the student's department, may, if favorable, stipulate conditions of reinstatement.

PLAGIARISM
Plagiarism is a major form of academic dishonesty involving the presentation of the work of another as one's own. Plagiarism includes but is not limited to the following:
The direct copying of any source such as written and verbal material, computer files, audio disks, video programs or musical scores, whether published or unpublished, in whole or in part, without proper acknowledgement that it is someone else's.
Copying of any source in whole or in part with only minor changes in wording or syntax even with acknowledgement.
Submitting as one's own work a report, examination paper, computer file, lab report or other assignment which has been prepared by someone else. This includes research papers purchased from any other person or agency.
The paraphrasing of another's work or ideas without proper acknowledgement.
Plagiarism, like other forms of academic dishonesty, is always a serious matter. If an instructor finds that a student has plagiarized, the appropriate penalty is at the instructor’s discretion. Actions taken by the instructor do not preclude the college or the University taking further punitive action including dismissal from the University.

For further information about the University’s policies on academic integrity please consult the Student Handbook.

REGISTRATION PROCEDURES
Students enrolled at any time during the previous calendar year are eligible to register. Continuing students register by telephone using DePaul’s NROL telephone registration system. Complete instructions will be mailed to all continuing, new and re-admitted students.

REGISTRATION IN COURSES IN OTHER COLLEGES OR SCHOOLS
Graduate students may be permitted to register for courses offered in other colleges or schools of the University. This registration requires the written permission of both their advisor and the college in which the course(s) will be taken.

RESIDENCE REGISTRATION
Whether in residence or not, all admitted graduate students, master’s and doctoral levels who will use the facilities of the University (library, laboratory, etc.) or who will consult with faculty members regarding theses, dissertations or examinations, must be registered in each quarter.

GRADUATION PROCEDURES

DEGREE REQUIREMENTS
You must have successfully completed all of the general and specific degree requirements as listed in departmental or program sections of the bulletin under which you were admitted. Completed degree requirements can include the submitting of the dissertation or thesis or the research paper, examination scores, and, if necessary, grade changes. Students need to achieve a minimum grade point average of 2.500 to graduate.

GRADUATION WITH DISTINCTION
Conferred upon a student who has maintained a 3.75 grade point average in the degree program, and passes with distinction the final oral, written examination or master’s papers with distinction, where applicable.

COMMENCEMENT
Graduation ceremonies are held in June of each year. If you wish to graduate “in absentia,” you must request permission in writing from your dean. If you cancel or are ineligible to graduate, you must reapply for the next convocation.

DIPLOMA
Graduation ceremonies are symbolic. Your diploma will be mailed shortly after the convocation.

DEADLINES
Specific dates are established for submission to your graduate office of the completed graduation application and for completion of graduation requirements.

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Completed Thesis or Dissertation
October Degree Conferal
February Degree Conferal
June Commencement

Deadline
August 25
January 5
May 17

TUITION AND FEES
DePaul University is a not-for-profit corporation. No student pays the actual cost of his or her education. Tuition and fees are held at their present level through gifts of alumni, foundations, corporations, the Vincentian priests and brothers and friends of the University. All policies are under continual review. Therefore, the Board of Trustees reserves the right to change its charges as conditions require.

Tuition and fees for services and materials are for the academic year 1995-96 are applicable only to graduate students.

GRADUATE STUDENT TUITION, PER QUARTER HOUR
Computer Science, Telecommunications and Information Systems
100-200 series, per hour..................................................$247.00
300-600 series, per hour..................................................307.00

GENERAL FEES
Fees are not refundable
Graduate Application Fee ..............................................$25.00
Readmission Fee ..........................................................5.00
Registration Fee .........................................................10.00
Delinquency Fee ..........................................................100.00
Deferred Examination Fee
On Designated Dates .....................................................10.00
At Times Not Designated ..............................................20.00
Doctoral Dissertation Fee ..............................................75.00
Thesis Binding (Per Copy) .............................................10.00
Each Transcript of Credit Fee .........................................5.00
Each Returned Check Fee .............................................*25.00

* If a student gives the University a check that is returned by the bank upon which it is drawn marked “Not Sufficient Funds,” “Payment Stopped,” or “Account Closed,” a $25.00 charge will be assessed for each such occurrence.

COMPUTER FEES
Students enrolling in courses that require computer resources may be assessed one or more computing fees. Revenues from these fees support the maintenance and upgrade of academic computing systems and facilities. Courses requiring these fees are noted in the class schedule. For some courses, instructors may require computer fees that are not shown in the schedule. These fees will be billed to the student’s tuition account, as appropriate.

Student Internet Fee. DePaul students can purchase Internet access accounts for a non-refundable charge of $25.00 per term or $90.00 per year. Only active DePaul students are eligible to participate in this service. Faculty may require students to have Internet access for their courses. Students can sign up for Internet access through Academic Technology Development, 126 Richardson Library and 1300 Lewis Center. The Internet fee will be billed directly to the student’s tuition account.

Student Computing Fee. Student enrolled in courses requiring student accounts on the UNIX or IBM system will be assessed a $25.00 fee per course.

PC Classroom Fee. Students enrolled in courses that meet for five or more sessions in one of the PC classrooms will be assessed a $25.00 fee per course.
MATERIAL FEES
See individual course descriptions for specific material fees.

TUITION PAYMENT POLICY
All tuition and fees are due DePaul University at the time of registration. All charges must be paid in-full by the payment date. The payment dates for each term of the 95-96 academic year are:

Friday, September 1, 1995—Fall Quarter
Friday, December 15, 1995—Winter Quarter
Friday, March 22, 1996—Spring Quarter

Tuition charges for any course registrations after the payment date must be paid in-full at the time of registration.

Tuition is due by the payment date whether or not a bill has been received. If you have not received a bill, you may contact the Student Financial Services Office at (312) 362-8379 or (312) 362-6628 any time during business hours to determine the amount you are required to pay.

Payment must be received in the Cashier’s Office or one of its depositories by the payment dates as indicated. Students may pay by check, money order or credit card (Visa, Master Card or Discover). Payments may be made to the Cashier’s Office by mail or in person, or if paying by credit card, by phone (312) 362-6744. (Please note: if paying by mail, the University does not accept responsibility for delays in the U.S. Postal Service.)

Students whose accounts show a balance due after the date payment is required will be assessed a $100 delinquency fee and prohibited from future registration and receiving transcripts. Any requests appealing assessment of delinquency fees must be submitted in writing to the Student Accounts department.

BILLING
Bills will be printed and mailed when a registration is recorded. Payment must be made by the published payment date to avoid delinquency-fee assessment regardless of whether or not a bill is received. If a bill is not received, students may contact the Accounts Receivable Office at (312) 362-8379 for information relative to charges due. Revised bills will be issued for enrollment changes made after the initial registration.

For registrations and enrollment changes made after the payment date for a term, payment is due immediately. Although bills will be issued, to make timely payment students should contact Accounts Receivable for information regarding tuition charges.

If a student loses or misplaces his or her bill and needs a copy of the tuition account for records or for employer reimbursement, a printed copy of the account may be obtained from the Student Accounts department.

WITHDRAWAL
Students who must withdraw either from a course or from the University may do so in person at their home college, by letter addressed to the college, or by using the University’s telephone registration system when appropriate. Withdrawals processed via NROL or in person are effective the day on which they are made. Withdrawals processed as a result of a letter are effective at the discretion of the college office. Simply ceasing to attend, or notifying the faculty, or nonpayment of tuition does not constitute a withdrawal of record and will result in academic as well as financial penalty.

Upon processing of the withdrawal request, the tuition charge for courses during the regular academic year will be reduced according to the following schedule; where the effective date is:

Prior to or at the end of the second full week of classes ........................................ 100%
After the second week ........................................ 0%
For courses of four weeks or less but more than two weeks duration no reduction will be granted after the first week of the term. For workshops or courses of two weeks or less duration, no refunds will be granted after the workshop or sessions begin.

For the Summer sessions, consult the schedule of tuition, fees and refunds listed in the Summer classes booklet.

Fees are not refundable.

**NOTE:** Students receiving financial aid are advised to contact a Financial Counselor to discuss the consequences of a withdrawal affecting academic progress and eligibility at DePaul University or any other school to which they may transfer.

**REFUNDS**

Should an account result in a credit balance which is refundable to the student, the student has the option of leaving the credit on the account to be applied toward future term expenses, or may apply for a refund through the Cashier's Office.

Application for a refund may be made to the Cashier's Office by a telephone request or in person. Refund checks will be made payable to the student and mailed to the address the student has on file with the University.

Loan checks, such as the Perkins and FFELP loans, must first be applied to the balance due on the student's account. If a credit balance is created after application of the loan check, the student may apply for a refund of the credit balance.

Please note: Financial aid awards (grants and scholarships) cannot be considered for refunds until the course add/refundable drop period is closed, that is, after the second full week of the term.

**GENERAL NOTES**

1. Registration cannot be accepted from a student with an unpaid balance from a prior term. Registration attempted under these circumstances is subject to cancellation.
2. Tuition and fees for courses audited are charged at the regular tuition rates. These must be paid at the time of registration and are not refundable.
3. The Guaranteed Loan Program is administered by the Loan Commission and the student's bank. DePaul University assists the student in applying for these funds and does not delay the application process. The process may take as long as twelve weeks. Because the loan is a personal matter between the student and bank, the University does not recognize payment until the loan check is endorsed by the student and applied to his or her account. DELINQUENCY FEES APPLY.
4. If a student gives the University a check that is returned by the bank upon which it was drawn, marked "Not Sufficient Funds," "Payment Stopped," "Refer to Maker," or "Account Closed," a $25.00 charge will be assessed for each such occurrence. The University reserves the right to refuse acceptance of a personal check without prior notice.
5. Any foreign checks must be made payable in United States dollars or they will not be accepted by the University.
6. A student adding a class will receive a revised confirmation.

**FINANCIAL ASSISTANCE**

Several types of financial aid are available to graduate students through programs administered by the University graduate school departments. These include DePaul University graduate assistantships as well as special awards funded by foundations and corporations.

In addition, the DePaul Office of Student Financial Services administers a variety of loan programs for which graduate students are eligible to apply.
LOANS

DIRECT LOAN PROGRAM. Federal Direct Stafford Loans (Direct Loans) are a new way for students to borrow money from the federal government to pay for university expenses. Under this program, the U.S. Department of Education makes loans, through schools, directly to students.

There are two types of Direct Loans—subsidized and unsubsidized. Eligibility for subsidized Direct Loans is based on federal methodology. Repayment is deferred until six months after you graduate or cease to be enrolled at least half-time, and the interest is paid by the government while you are enrolled in school. Eligibility for unsubsidized Direct Loans is not based on financial need. You may borrow the cost of education minus all other financial aid you receive, up to the Direct Loan maximum. However, the interest must be either paid by you while you are enrolled, or be accrued and capitalized to the principal. Repayment of the principal is deferred until after you graduate or cease to be enrolled at least half-time.

The interest rate on the Direct Loan is variable and presently is 7.43 percent. It is adjusted annually on July 1. However, the interest rate cannot exceed 8.25 percent. In addition, there is an origination fee of 4 percent charged to the borrower and deducted from the loan proceeds before disbursement.

Direct Loan maximums vary according to academic level and dependency status.

GRADUATE STUDENTS
Subsidized Direct Loan Maximum
$8,500

Total Direct Loan Maximum
$18,500

Graduate students may borrow the subsidized Direct Loan up to the maximum indicated above, and may supplement this amount with the unsubsidized Direct Loan. The total combined subsidized and unsubsidized Direct Loan may not exceed $18,500.

ALTERNATIVE FINANCING

DEPAUL UNIVERSITY

The DePaul University Payment Plan (DePUPP) is a budget payment option which allows students to pay their tuition, fees, and room and board in monthly installments over a nine month period. This service is available to all DePaul University students. It is not a loan program, there are no interest or finance changes, or credit or financial-needs requirements.

The student determines the budget amount for the plan. DePUPP requires a minimum budget amount of $750.00. The budgeted amount is the student’s total estimated annual charges (tuition, fees, room and board) less the total estimated financial aid awards (annual scholarships, grants, loans). Books and personal expenses are not covered by this budget. The total amount budgeted under the plan will be divided equally over the number of months in the plan at the time you apply.

The plan period is from July to March with payments due the 15th of each month. The student may pay by check, money order, credit card (VISA, Master Card or Discover) or Electronic Funds Transfer.

Monthly billing statements will be sent to the student in advance of each payment due date. The statement will reflect charges and any payments or credits received since the last bill, the payment plan amount due by the 15th, and the current outstanding balance.

Students are urged to apply early. To participate in the nine month program, applications must be received by the Accounts Receivable Office no later than June 1. Applications made after this date must be accompanied by any past due payments to catch up to the regular schedule.
Applications received after September 1st but prior to October 1st will be processed for Winter/Spring term registrations only. Payments for the budgeted amount will be over a six-month period with the first payment due October 15th, and the last payment due March 15th.

Students who wish to participate in DePUPP should complete and submit a plan application to the Accounts Receivable Office with the application fee by the appropriate due date. An annual non-refundable fee of $30.00 is required for each application.

The application is valid for one academic year only. For each year a student wishes to participate in this program a new application must be submitted.

More detailed information regarding this program and plan applications are available from the Students Accounts Department and the Financial Aid Office.

Any questions regarding DePUPP should be directed to the Accounts Receivable Office (312) 362-8379, or you may write to: Accounts Receivable Office. DePaul University, 1 E. Jackson Blvd., Chicago, IL 60604.

**The DePaul Payment Plan for Employer Reimbursement** is a payment option for students who receive tuition reimbursement from their employers. It is administered through the Student Accounts office of Student Financial Services. The payment plan is designed to view coverage by an employer tuition reimbursement program as pending payment. Since employer reimbursement is generally issued at the end of a term, this payment plan allows the students covered by such an employer reimbursement plan to receive an extended payment due date for their tuition charges. Regardless of when the employer reimburses the student, the tuition due dates are not negotiable. Bills and grades will be issued to the students only and not to the employers. **It is the responsibility of the student to provide their employers with copies of any documents their employer may require.**

**Eligibility Requirements.** Students must submit the application and related fee by the application deadline. If there is a doubtful account history, past due balance, or insufficient employer documentation, the student will not be accepted into the program. If at any time the student falls delinquent in payment, the payment plan privilege is no longer available.

**Eligible Courses.** To be eligible to participate in this program, students must be enrolled in the traditional quarterly courses which are 10 weeks in duration (5-week Summer courses). Special seminars, extended courses, workshops, courses which require prepayment, audits and zero credit courses are not covered in this program.

**Financial Aid.** Students cannot apply for this program if they have also applied for financial aid. This program is designed to assist students who do not receive financial aid. There are no exceptions to this policy.

**Payment.** Regardless of when the employer reimburses the student, it is the student's responsibility to pay the balance in full on or before the tuition due date. Students who experience this delay from their employers typically pay tuition using a credit card. Students are responsible for paying their tuition accounts in full by the date whether they have completed the work for their courses whether or not they have received reimbursement from their employer. Tuition due dates are not negotiable and delinquent fees will apply to students who do not meet the tuition due date deadlines. Failure to meet the application agreement will jeopardize future participation in the program and may prevent future enrollment.

**How to apply.** Applications are available in the Student Financial Services Offices of Student Accounts and Student Aid, the college offices and suburban campuses. Submit the completed application and fee to the Payment Center by the required deadline. You will be notified only if your application has been denied. Do not return the application and fee to the college—this will delay processing and acceptance into the program.
FEES/APPLICATIONS

Term                  Fee                  Application Information
Fall, Winter and Spring terms $100.00  One time application for 3 quarters
Fall term only         40.00               Quarterly application
Winter term only       40.00               Quarterly application
Spring term only       40.00               Quarterly application
Summer Session I term  40.00               Quarterly application
Summer Session II term 40.00               Quarterly application

All fees are non-refundable.

Term                          Application Deadline Date            Extended Payment Due Date
Fall, Winter, Spring (one time application) Friday, August 25, 1995
Fall quarter                  Friday, August 25, 1995             January 15, 1996
Winter quarter                Friday, December 8, 1995             April 15, 1996
Spring quarter                Friday, March 15, 1996              July 15, 1996
Summer Session I              Friday, June 7, 1996                September 15, 1996*
Summer Session II             Friday, July 12, 1996               October 15, 1996

*Please note: The Payment Center is not open for walk-in business on weekends.
If mailing the applications, remember to include the fee. The University does not accept responsibility for delays in the U.S. Postal System.
For information about the Payment Plan for Employer Reimbursement, call the Student Accounts office (312) 362-6628.

PRIVATE AGENCIES

Other sources of loan funding are made available through private agencies for those who feel their needs have not been met sufficiently or those who are determined to be ineligible for other types of financial aid.
There are long term loan programs available such as The Educational Credit Corporation (ECC), EXCEL, and Option IV.
For more information about these and other alternative financing programs, contact the Office of Financial Aid.

PART-TIME EMPLOYMENT

Student Service employment takes the form of on-campus work with the full salary paid by DePaul. Any student wishing to work on campus may be eligible under this program as long as they are not receiving other need-based aid that would be affected by such earnings. If you would like to work on campus, check with the Human Resource Office to see if you are eligible.

HOW TO APPLY

For more information about financial aid programs, contact DePaul University's Office of Student Financial Services, 1 E. Jackson Blvd., Chicago, IL 60604. Telephone (312) 362-8091.
To be considered for 1995-96 federal financial aid programs, you may apply through April 30, 1995.

ASSISTANTSHIPS

The following programs are administered by individual departments and programs. Application should be made to the School of Computer Science, Telecommunications and Information Systems.
New applicants must have all their credentials (completed application form, admission fee, duplicate copies of transcripts and letters of recommendation) on file in the appropriate graduate office no later than the February 15 prior to Autumn quarter admission.
Announcement of Graduate Assistantships is generally made by June 1. Assistantships must be accepted or declined, in writing, by July 1.

**University Assistantships**

The University provides a number of teaching, research and administrative assistantships to applicants accepted as degree-seeking, fully-admitted graduate students. Last year over 80 assistantships were awarded (both full and partial). The stipends are $5,000. Students may be offered a tuition waiver.

Recipients will be assigned by their program directors or departments to activities appropriate for a teaching, research or administrative assistant.
AUTUMN QUARTER
AUGUST 25  Friday. Final date for submitting thesis or dissertation for October degree conferral.
SEPTEMBER 1  Friday. Autumn tuition payment date.
SEPTEMBER 4  Monday. Labor Day.
SEPTEMBER 6  Wednesday. Autumn quarter evening classes begin.
OCTOBER 6  Friday. Last day to file for February degree conferral.
OCTOBER 5-11  Thursday-Wednesday. Mid-term week (optional).
OCTOBER 27  Friday. Last day to withdraw from classes.
NOVEMBER 14  Tuesday. Last day of Autumn quarter evening classes.
NOVEMBER 15-21  Wednesday-Tuesday. Final Examinations for Autumn quarter evening classes.
NOVEMBER 22  Wednesday. End of Autumn quarter.
NOVEMBER 22-27  Wednesday evening-Monday. Thanksgiving holiday.
DECEMBER 15  Friday. Winter tuition payment date.

WINTER QUARTER
JANUARY 3  Wednesday. Winter quarter evening classes begin.
JANUARY 5  Friday. Final date for submitting thesis or dissertation for February degree conferral.
JANUARY 26  Friday. Last day to file for June commencement.
JANUARY 31-
FEBRUARY 6  Wednesday-Tuesday. Mid-term week (optional).
FEBRUARY 23  Friday. Last day to withdraw from classes.
MARCH 12  Tuesday. Last day of Winter quarter evening classes.
MARCH 22  Friday. Spring tuition payment date.
MARCH 13-19  Wednesday-Tuesday. Final Examinations for Winter quarter classes.
MARCH 21  Thursday. End of Winter quarter.

SPRING QUARTER
APRIL 1  Monday. Spring quarter classes begin.
APRIL 5-7  Friday-Sunday. Easter. Holiday—no classes.
APRIL 29-MAY 4  Monday-Saturday. Mid-term week (optional).
MAY 17  Friday. Last day to withdraw from class. Final date for submitting thesis or dissertation for June commencement.
MAY 27  Monday. Memorial Day. Holiday—no classes.
JUNE 1  Friday. Last day of Spring quarter classes.
JUNE 8-14  Saturday-Friday. Final Examinations for Spring quarter classes.
JUNE 14  Friday. Spring quarter ends. Summer I tuition payment date.
JUNE 15-16  Saturday-Sunday. Commencement.

SUMMER SESSIONS
JUNE 20  Thursday. First Summer Session begins.
JULY 19  Friday. Summer II tuition payment date.
JULY 25  Thursday. First Summer Session ends.
JULY 29  Monday. Second Summer Session begins.
AUGUST 30  Friday. Second Summer Session ends.
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THE VINCENTIAN CHARACTER OF DEPAUL UNIVERSITY

DePaul, a Catholic university, takes its name from St. Vincent dePaul. The religious community founded by Vincent, commonly known as ‘Vincentians’, opened the university and endowed it with a distinctive spirit: to foster in higher education a deep respect for the God-given dignity of all persons, especially the materially, culturally, and spiritually deprived; to instill in educated persons a dedication to the service of others. In each succeeding generation the women and men of DePaul have pursued learning in this spirit of Vincent dePaul.