



**SCHOOL OF COMPUTER**

**SCIENCE, TELECOMMUNICATIONS**

**AND INFORMATION SYSTEMS**



# SCHOOL OF COMPUTER SCIENCE, TELECOMMUNICATIONS AND INFORMATION SYSTEMS

## ADMINISTRATION

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GREGORY BREWSTER, PH.D.

Associate Dean

MARTIN KALIN, PH.D.

Associate Dean

LINDA V. KNIGHT, PH.D.

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## **PHILOSOPHY**

### **FACULTY**

### **PURPOSES**

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### **PROGRAMS**

DOCTOR OF PHILOSOPHY

Computer Science

MASTER OF ARTS

Information Technology

MASTER OF FINE ARTS

Digital Cinema

MASTER OF SCIENCE

Applied Technology

Business Information Technology

Computational Finance

Computer Graphics and Animation

Computer, Information and Network Security

Computer Science

Digital Cinema

Distributed Systems

E-Commerce Technology

Human-Computer Interaction

Information Systems

Instructional Technology Systems

Software Engineering

Telecommunication Systems

JURIS DOCTORATE AND MASTER OF ARTS

JURIS DOCTORATE AND MASTER OF SCIENCE

CONTINUING EDUCATION PROGRAMS

Advanced Software Development Professional









I-PING CHU, PH.D.,  
Associate Professor  
State University of New York at Stony Brook

ANTHONY CHUNG, PH.D.,  
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University of Maryland Baltimore County

LUCIA DETTORI, PH.D.,  
Assistant Professor  
University of Paris XI

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Assistant Professor  
University of Southampton, UK

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Associate Professor  
University of Reno

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Professor  
Northwestern University

SCOTT ERLINDER, MFA  
Assistant Professor  
Columbia College

XIAOWEN FANG, PH.D.,  
Assistant Professor  
Purdue University

ROBERT FISHER, PH.D.,  
Associate Professor  
Harvard University

JACOB FURST, PH.D.,  
Associate Professor  
University of North Carolina at Chapel Hill

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University of California, Berkeley

DANA HODGDON, M.A.,  
Visiting Professor  
Northwestern University

JANE HUANG, PH.D.,  
Assistant Professor  
University of Illinois at Chicago

LOUIS IBARRA, PH.D.,  
Assistant Professor  
University of Victoria

MATT IRVINE, MFA,

Assistant Professor  
Columbia College

RADHA JAGADEESAN, PH.D.,  
Professor  
Cornell University

ALAN JEFFREY, PH.D.,  
Associate Professor  
University of Oxford

XIAOPING JIA, PH.D.,  
Professor  
Northwestern University

STEVE JOST, PH.D.,  
Associate Professor  
Northwestern University

MARTIN KALIN, PH.D.,  
Professor and Associate Dean  
Northwestern University

IYAD KANJ, PH.D.,  
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Texas A & M University

LOUIS KLEINMAN, B.A.,  
Visiting Associate Professor  
Oberlin

LINDA KNIGHT, PH.D.,  
Associate Professor and Associate Dean  
DePaul University

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Illinois Institute of Technology

GLENN LANCASTER, PH.D.,  
Associate Professor  
University of California, Irvine

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Professor  
Miami University

EVELYN LULIS, M.S.,  
Assistant Professor  
Illinois Institute of Technology

STEVEN LYTINEN, PH.D.,  
Professor  
Yale University

WILFREDO MARRERO, PH.D.,  
Assistant Professor  
Carnegie Mellon University

JOHN MCDONALD, PH.D.,  
Assistant Professor



Northwestern University

CRAIG MILLER, PH.D.,  
Associate Professor  
University of Michigan

DANIEL MITTLEMAN, PH.D.,  
Associate Professor  
The University of Arizona

BAMSHAD MOBASHER, PH.D.,  
Associate Professor  
Iowa State University

JAMI MONTGOMERY, PH.D.,  
Assistant Professor  
Illinois Institute of Technology

ASHLEY MORRIS, PH.D.,  
Associate Professor  
Tulane University

THOMAS MUSCARELLO, PH.D.,  
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MAKOTO NAKAYAMA, PH.D.,  
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University of California, Los Angeles

GARY NOVAK, MFA  
Assistant Professor  
American Film Institute

LJUBOMIR PERKOVIĆ, PH.D.,  
Associate Professor  
Carnegie Mellon University

JOSEPH PHILLIPS, PH.D.,  
Assistant Professor  
University of Michigan

CORIN PITCHER, PH.D. ,  
Assistant Professor  
University of Oxford

DANIELA RAICU, PH.D.,  
Assistant Professor  
Oakland University

JAMES RIELY, PH.D.,  
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University of North Carolina at Chapel Hill

SCOTT ROBERTS, M.F.A., M.A.,  
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University of Wisconsin - Madison

JOHN ROGERS, PH.D.,  
Associate Professor  
University of Chicago

MARCUS SCHAEFER, PH.D.,  
Assistant Professor  
University of Chicago

ERIC SCHWABE, PH.D.,  
Associate Professor  
Massachusetts Institute of Technology

ERIC SEDGWICK, PH.D.,  
Associate Professor  
University of Texas

RAFFAELLA SETTIMI, PH.D.,  
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DeAndreis Institute of Theology

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HAROLD STREETER, M.S.,  
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Brown University

NORMA SUTCLIFFE, PH.D.,  
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University of California at Los Angeles

NORIKO TOMURO, PH.D.,  
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DePaul University

CURT WHITE, PH.D.,  
Associate Professor  
Wayne State University

PETER WIEMER- HASTINGS, PH.D.,  
Assistant Professor  
University of Michigan, Ann Arbor

CHARLES WILCOX, B.A.,  
Instructor  
Southern Illinois University

ROSALEE WOLFE, PH.D.,  
Professor  
Indiana University

YONGHE YAN, PH.D.,  
Assistant Professor  
The University of Hong Kong

JAMES YU, PH.D.,  
Assistant Professor  
Purdue University

LU ZHANG, PH.D.,  
Assistant Professor  
Iowa State University

JOANNE ZIELINSKI, M.F.A.,  
Instructor  
Rutgers University

## **PURPOSES**

**T**he School of Computer Science, Telecommunications and Information Systems (CTI) offers graduate level, professional education in these areas: artificial intelligence, collaborative technologies, computer science, computer graphics, computer vision, data analysis, database, data communications, data warehousing, distributed systems, e-commerce technology, human-computer interaction, information systems, management information systems, networking, project management, software engineering, systems foundation, systems development, telecommunication systems, and visual computing. 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 Information System Division (ISD) houses a large network of computers and allows students, access to a rich computing environment. The configuration includes 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 Naperville, 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 in the following:
  - American Sign Language (ASL) Lab
  - Animation Lab
  - Applied Requirements Engineering Lab
  - Artificial Intelligence (AI) Research Lab
  - Center for Applied Computer Science (CACCS)
  - Center for Web Intelligence
  - Critical Systems Lab
  - CTI Video Lab
  - Database Lab
  - Digital Video Editing Lab
  - E-Commerce Technology (ECT) Lab I & II
  - Gaming Lab
  - Local Area Networks (LAN) Lab
  - Millennium Boardroom

- Mobile E-Commerce Research Lab
- Multimedia Networking Research Lab
- PhD Office
- Software Engineering Research Lab
- Software Exploration Lab
- Solid Objects Lab
- Telecommunications Lab
- The Digital Cinema Center
- Usability Lab

## **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 standalone 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. Certificate programs are typically taught by a team of instructors, that includes full-time faculty with consulting experience and part-time instructors from industry. The programs require a substantial commitment of time, as most meet two nights per week and in the morning on approximately 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.

Current certificate program offerings include:

### **IPD 370 Advanced SQL Program**

A 2-week program covering advanced SQL features

### **IPD 371 Advanced Oracle PL/SQL Program**

A 3-week program covering advanced PL/SQL concepts and programming constructs

### **IPD 381 Best Practices in Web Design Program**

A 7-week comprehensive program covering best practices in web design based on current mark-up, presentation, and accessibility standards

### **IPD 395 Database Technologies Program**

A 12-week comprehensive program covering database applications development and administration using Oracle

### **IPD 380 Information Systems Project Management Program**

A 10-week comprehensive program covering best practices in information systems project management

### **IPD 390 Information Systems Security Management Program**

A 10-week comprehensive program covering best practices in designing, implementing and maintaining an organizational information security plan

### **IPD 394 J2EE Developer Program**

A 10-week in-depth program covering enterprise-wide applications development using J2EE

### **IPD 382 Java Developer Program**

A 10-week comprehensive program covering object-oriented applications development using Java

### **IPD 366 Java Web Services Program**

A 7-week concentrated program covering service-oriented architecture and the development of Web services using Java

### **IPD 393 Local Area Networks Program**

A 12-week intensive program in the fundamentals of wired and wireless local area networks, wide area networks, and network-based services

### **IPD 389 .NET Developer Program**

A 10-week comprehensive program covering .NET technologies

### **IPD 368/468 .NET Mobile Applications Development Program**

A 10-week focused program covering the basic skills and techniques for successfully building mobile applications using the .NET platform

### **IPD 398 .NET Web Services Program**

An 8-week concentrated program covering service-oriented architecture and the development of Web services using the .NET platform

### **IPD 396 Network Security Program**

An 11-week intensive program in the fundamentals of network security, hosts security, and Information Assurance

**IPD 376 Oracle Database Availability, Scalability, and Recoverability Program**

A 3-week program covering Oracle database availability, scalability, and recoverability

**IPD 372 Oracle Database Programming Using Open Architecture Program**

A 3-week program covering open architecture database application development

**IPD 367 Understanding Wireless Mobility & Security Program**

A 10-week rapidly-paced overview and exploration of the major concepts and key issues driving the wireless mobility revolution in business, industry, law, government, healthcare, transportation and education

**IPD 392 Voice-over-IP Program**

A 12-week integrated program focusing on designing and implementing fully converged and integrated Voice-over-IP (VoIP) networks and systems

**ADMISSION AND READMISSION PROCEDURES**

Procedures for admission to the School of CTI involve submission of a completed application form and supporting credentials, payment of admission fee, observance of deadlines and receipt of the Dean's admission letter.

Applications may be submitted online at [www.cs.depaul.edu](http://www.cs.depaul.edu).

Application Form: Applicants may obtain a graduate application form by mailing a request to the School of CTI Admissions Office, DePaul University, 243 South Wabash, Chicago, Illinois, 60604; by filling out a form at our website at [www.cs.depaul.edu](http://www.cs.depaul.edu), or by calling (312) 362 8381. The applicant should include his/her proposed program of study in the request.

Application deadlines for MS applicants are:

**August 1 for Autumn Quarter**

**November 15 for Winter Quarter**

**March 1 for Spring Quarter**

**May 1 for Summer Quarter**

Students educated and residing outside the United States must submit an application and all supporting credentials no later than:

**June 1 for Autumn Quarter**

**October 1 for Winter Quarter**

**January 1 for Spring Quarter**

**April 1 for Summer Quarter**

Supporting Credentials: Official transcripts of the applicant's 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 attention of CTI Admissions, DePaul University. The applicant is advised to make his/her request as early as possible, because there is frequently a delay in the forwarding of transcripts. A DePaul senior applying to the Graduate School should request that ARC forward an official transcript to CTI Admissions.

NOTE: Programs may require additional supporting credentials. Please consult the specific programs listed on this website to determine what additional materials are required for admission to the specific course of graduate study.

Admission Fee: A check or money order payable to DePaul University in the amount of \$25.00 must accompany the completed application form. This fee is nonrefundable. The applicant's full name must appear on the check or money order.

Dean's Admission Letter: The Dean will notify the applicant by letter of his/her 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. The review process is done on a rolling basis.

## **INTERNATIONAL STUDENT ADMISSION**

The admission requirements stated above also apply to international students. Applicants educated outside of the United States 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 I-20 form are issued only after admission. Please visit our web site at [www.cs.depaul.edu](http://www.cs.depaul.edu) for further details about I-20s.

International applicants are strongly urged to apply as early as possible. There are usually long delays in the forwarding of all supporting credentials

## **READMISSION PROCEDURES**

Applicants who have been admitted to the School but do not enroll in the University within one year of the date on their letter of admission must complete an application for readmission. There is a \$5.00 service fee for processing a readmission.

Former CTI students must also apply for readmission if they were previously enrolled in a graduate program in the School of CTI, but have not been in attendance for a period of one calendar year. If more than four calendar years have elapsed since the student has been in attendance, the student must submit a new application for admission, including the \$25.00 application fee. An official copy of transcripts recording scholastic work completed since the last enrollment at DePaul University must be submitted. Students are held to the degree requirements that are in effect at the time of readmission.

## **DEPAUL SENIORS**

Seniors in any of the undergraduate colleges or schools of DePaul University are eligible to apply for admission to the School of CTI while completing their undergraduate program.

## **ADMISSION CLASSIFICATIONS**

Applicants are admitted to the School of CTI 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 classified as degree-seeking students in either of two ways: conditional or full. A conditionally admitted applicant is eligible for reclassification to full degree-seeking status when the Prerequisite Phase is satisfied by coursework or waiver. (See Reclassification Procedures below.) The minimum requirements for conditional degree-seeking status are: possession of a bachelor's degree conferred by a regionally accredited institution, scholastic achievement in undergraduate studies indicating a capacity to successfully pursue a specific program of graduate study, submission of all required supporting credentials to the School office, and conditional approval by the program director of the applicant's proposed course of graduate study. The minimum requirements for full degree-seeking status include the requirements stated for conditional degree-seeking status, as well as fulfillment of all program-specific prerequisite phase requirements.

### ***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, apply for reclassification to degree-seeking status. The minimum requirements for this status are possession of a bachelor's degree conferred by a regionally accredited institution, scholastic achievement in undergraduate studies indicating a capacity to pursue successfully graduate course work, submission to the School office of all required supporting credentials, a letter of intent addressed to the Dean, and approval by the Dean. Students pursuing non-degree status will also have to submit a completed application, including a check or money order made payable to DePaul University in the amount of \$25.00 for the application fee. The application fee is nonrefundable.

When students with non-degree seeking status file for reclassification to degree-seeking status, the program director may recommend, in writing, to the Dean that a maximum of three

courses (12 quarter hours) that were completed by the student under the non-degree-seeking status be counted toward fulfillment of the advanced degree requirements.

In addition, non-degree seeking students will not have access to enroll in courses numbered 420 and higher on their own. They must seek approval from the instructors of the courses in which they wish to enroll. The enrollment transaction will be processed by the advising office at the request of the instructor.

### ***Student-at-Large***

The School of CTI 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 school Dean. A student-at-large must submit an application for admission to the School office (including the \$25.00 application fee). 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.

### **RECLASSIFICATION PROCEDURES**

Once a student fulfills the conditions of admission, the student must file a Change of Status application with the School office so his/her status can be updated to full degree-seeking status. A student must also file a Change of Concentration application if he/she decides to change his/her major. These requests can be filed through MyCTI. Students are held to the degree requirements that are in effect at the time the student changes his/her major.

### **GRADUATE CREDIT TRANSFER**

Credit transfer in degree programs leading to the master's or doctoral degree is ordinarily 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. Should an approval be granted, students are allowed to transfer a maximum of two graduate level courses. Additionally, these courses cannot have been used in the attainment of a previous degree.

### **DOCTORAL PROGRAM ADMISSION REQUIREMENTS**

The School of CTI offers a Doctor of Philosophy in Computer Science. The Doctor of Philosophy is the highest academic degree offered by DePaul University. This degree shows that the recipient has attained great proficiency in several broad areas of learning and has a demonstrated capability to explore and advance a particular field of knowledge through independent research. In order to be considered for admission to the doctoral program, students must:

- Hold a master's degree in Computer Science or an allied field or hold a Bachelor of Science degree with exceptional promise for completion of the Ph.D.
- Submit three letters of recommendation.
- Submit a written statement describing their accomplishments, goals and interests.
- Submit a completed application form.
- Submit an official score report of the Graduate Record Examination (GRE).

Applicants educated outside of the United States must demonstrate English proficiency with a TOEFL score of 580 or greater. A Ph.D. Admissions Committee determines which applicants will be admitted to the program. Because the School may only admit a limited number of students to the program, meeting the admission standards does not guarantee acceptance. Detailed program specifications can be found in the Ph.D. program section.

## DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE

**T**he Ph.D. program in Computer Science offers an opportunity for exceptional students to pursue substantial research in the computer sciences and related areas. The program is highly selective and is purposefully kept small so that each Ph.D. student can receive substantial advising and mentoring from CTI faculty. To earn a Ph.D. degree, a student must demonstrate breadth of knowledge in at least three research areas and significant depth in a chosen dissertation area. In addition, the student must conceive, write and defend a Ph.D. dissertation representing a significant and original contribution to current academic research as demonstrated by a public dissertation defense and publication in established peer-reviewed academic conferences and/or journals.

In keeping with the CTI philosophy of blending academic and professional pursuits, full-time employed students will be considered for admission as part-time doctoral students. However, these applicants must have sufficiently flexible work schedules to allow them to attend required meetings and academic seminars that occur during daytime working hours throughout their degree program. In addition, many working students will find that they must take a leave of absence or cut back to part-time employment for some time period during the research and candidacy phases of the degree program.

The deadlines to apply and submit all the required support documents are:

October 1st for Winter

January 15th for Autumn

### ***Admission Requirements***

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

- Hold a master's degree in Computer Science or an allied field.
- 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.
- Submit an official score report of the Graduate Record Examination (GRE) general examination.

Applicants educated outside of the United States must demonstrate English proficiency with a TOEFL score of 580 or greater.

### ***Guide to Applying for the PhD program***

\*\*\* GRE and TOEFL scores MUST be official copies sent directly by ETS. Photocopies CANNOT be accepted!

- The Institution Code for the GRE and TOEFL is 1165
- The Department Code for the GRE is 0402
- The Department Code for the TOEFL is 78

Students without a master's degree in computer science or an allied field may be considered for conditional admission to the doctoral program. These students must have an exceptional undergraduate record. A conditionally admitted student will be required to complete a doctoral prerequisite phase consisting of a set of courses determined to be appropriate for the student by the Ph.D. committee. These courses will include the core courses from the Master's of Science in Computer Science program. Upon completion of the prerequisite phase, the Ph.D. committee will conduct an evaluation of the student's progress. Assuming such



progress is satisfactory, the student will then be formally admitted into the doctoral program. Note: It is not the policy of the School to award a master's degree to a student enrolled in the Ph.D. program.

The Ph.D. Admissions Committee determines which applicants will be admitted to the program. Because the School admits only a limited number of students to the Ph.D. program, meeting the admission standards does not guarantee acceptance.

Students employed outside of the University can be admitted as part-time doctoral students. Students who can devote themselves full time to their doctoral studies can be admitted as full-time doctoral students. Only full-time students will be considered for substantial financial aid stipends.

### ***Completeness of credentials***

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

### ***Overview of the Degree***

The Doctor of Philosophy in Computer Science degree follows three phases, which may overlap in time:

#### ***Inquiry Phase:***

Coursework, initial research projects and successful completion of three Breadth Examinations.

#### ***Research Phase:***

Focused research leading to successful completion of a Dissertation Proposal. Upon completion of all requirements, the student is admitted to Candidacy.

#### ***Candidacy Phase:***

Further research, writing and defense of the Ph.D. dissertation.

### ***The Inquiry Phase***

During the Inquiry Phase a student will complete coursework in various areas of Computer Science to gain breadth and to discover the area in which dissertation research is to be done. Since considerable thought should be given to choosing the area in which the student wishes to do research in the future, the student may wish to do small research projects during this time period to explore where their research interests lie.

Three Breadth Examinations must be successfully completed. At least one of the 3 breadth exams must be in one of the core areas of computer science, namely, Artificial Intelligence, Database Systems, Operating Systems, Programming Languages, and Theoretical Computer Science. Furthermore, at least one breadth exam must be in the student's primary area of dissertation research. The choice of breadth exams must be approved by the student's PhD advisor. These examinations can be taken either during the Inquiry Phase or during the Research Phase. Each Breadth Examination will verify that the student has knowledge sufficient to teach an introductory graduate course in that area. A student must pass all three breadth exams with at most one re-take opportunity per exam. Re-takes of breadth exams must be approved by the PhD Committee.

A Ph.D. student enters the Research Phase when he or she has chosen an area in which to do dissertation research and has found a faculty member willing to act as his or her Dissertation Advisor. The amount of time spent in the Inquiry Phase will vary from student to student, but will typically be several years. The research phase may overlap with the inquiry phase, in fact, students are strongly encouraged to begin their research, under the supervision of a faculty PhD advisor, as early as possible upon entering the program.

### ***The Research Phase***

In this phase the doctoral student, in conjunction with his or her Dissertation Advisor, will conduct extensive readings in academic texts, journals and conference proceedings to become an expert in the chosen research area.

The student is responsible for approaching a faculty member to act as their Dissertation Advisor. The faculty member may request that the student perform additional projects or research before agreeing to be the Dissertation Advisor. The student and Dissertation Advisor then work together to choose three additional faculty which, together with the Dissertation

Advisor, form the Dissertation Committee. Three of the members must be full-time faculty members in the School of Computer Science, Telecommunications and Information Systems. The fourth committee member must be a faculty member from outside the division of the research, or a scholar from outside the School of CTI whose expertise is pertinent to the topic of the dissertation. The members of this committee must be approved by the School's Ph.D. Committee.

Once the student has enough preliminary results that the student and advisor are confident that the work should result in publishable results, the student will write an extensive review of previous work in the area and a research proposal for the dissertation research. The Dissertation Committee members will then choose a date for a public defense of the dissertation proposal. The student will provide an oral presentation of current results and future research goals at this defense. The proposal will be approved only if the Dissertation Committee agrees that the work that is planned will constitute an acceptable Ph.D. dissertation. The committee may recommend that the student repeat the proposal at a later date. The dissertation committee may require additional components in conjunction with proposal defense to test the student's depth of knowledge in the specific area of dissertation research.

A student generally enters the Candidacy Phase (and is considered a Candidate) after a successful defense of the Dissertation Proposal (see the full requirements for Candidacy below).

### **The Candidacy Phase**

In the Candidacy Phase the student performs the research promised in the dissertation proposal and writes the dissertation. Ph.D. dissertations in Computer Science are typically 100 to 300 pages in length and must represent a significant and original body of work.

Except in very unusual situations, the student will be required to publish some portion of the dissertation as an academic paper in a refereed journal or conference before completing the degree. This will demonstrate that the significance of this work is recognized in academic communities outside DePaul University.

After the dissertation has been written, the student will provide a copy to all members of the Dissertation Committee. After reading the dissertation, the Dissertation Committee must recommend whether or not a public dissertation defense should proceed. In particular, the members of the Dissertation Committee will determine whether the completed dissertation embodies the work that was promised in the dissertation proposal. The committee may recommend modifications or additional research to be completed before the defense can take place. Once the Dissertation Committee agrees that the defense should take place, a date will be scheduled for the dissertation defense. After the defense, the Dissertation Committee will determine whether all work has been satisfactorily completed or additional work or modifications must be made.

A bound copy of the dissertation and the abstract must be presented to the DePaul Library where it will be permanently available to current and future DePaul students. Consult the Handbook for Graduate Studies at the back of this bulletin for information on submitting the dissertation and abstract to the School. Contact the Student Services office for additional information regarding procedures to follow for binding the dissertation.

### ***Detailed Degree Requirements***

#### **Course Requirements**

Ph.D. students with a master's degree are required to complete a minimum of 60 credits (typically 15 courses) of graduate classes. These credits must include at least 48 credits of courses in the 420-599 range, including CSC 426 Values and Computer Technology, and 12 credits of CSC 699 Research. Students may enroll in CSC 699 only after completion of the Breadth Examinations. Conditionally admitted students must complete an additional 52 credits (typically 13 courses) of graduate classes, including at least 36 credits of courses in the 420-599 range. The written approval of the Ph.D. Committee is required, before registering, to apply courses taught outside the School towards the doctoral program course requirements.

Student progress will be evaluated annually. Students must maintain a grade point average of 3.5 or better to remain in good standing in the program. Any course grade below B- is unsatisfactory and will not be counted toward degree requirements. The Ph.D. Committee will ask a student to withdraw from the doctoral program if the members judge that that student is not progressing satisfactorily toward the degree.

### **Continuous Enrollment**

Prior to candidacy, a student must continuously enroll for at least one academic credit per quarter during every Autumn, Winter and Spring quarter. A student may apply to the Ph.D. committee for a leave of absence from this continuous enrollment requirement if exceptional circumstances arise. After admission to candidacy, a student must continuously enroll for at least one course per quarter during every Autumn, Winter and Spring quarter, but may enroll for CSC 701 Candidacy Continuation (0 academic credits) with advisor's approval.

### **Admission to Candidacy**

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

**Residency:** Three quarters of full-time study must be completed at DePaul University beyond the master's level. Full-time study is defined as registration for a minimum of eight credit hours (typically two courses) per quarter. With prior approval of the Ph.D. Committee, students may satisfy residency requirements by coursework, participation in seminars, or research performed off campus.

**Allied Course:** Complete CSC 426 Values and Computer Technology.

**Doctoral Examinations:** Pass three Breadth Examinations.

**Defense of Proposal:** Successfully defend a Dissertation Proposal.

### **Doctoral Examinations**

Breadth examinations are typically offered twice each year. Applications to take these exams must be completed three months prior to the exam date. At least one of the 3 breadth exams must be in one of the core areas of computer science, namely, Artificial Intelligence, Database Systems, Operating Systems, Programming Languages, and Theoretical Computer Science. Furthermore, at least one breadth exam must be in the student's primary area of dissertation research. The choice of breadth exams must be approved by the student's PhD advisor. Must pass all three breadth exams with at most one re-take opportunity per exam. Requests to re-take one or more breadth exams must be approved by the PhD Committee. Any student who fails to satisfy the breadth exam requirements will be asked to leave the program. Reading lists and copies of previous Breadth examinations are available. The reading list for each examination defines the specific subject areas covered by that examination.

Examinations are offered in each of the following areas:

- Artificial Intelligence
- Communications Networks
- Computer Graphics
- E-commerce Technology
- Theoretical Computer Science
- Information Systems
- Data Analysis
- Database Systems
- Human Computer Interaction
- Operating Systems
- Visual Computing
- Programming Languages
- Software Engineering
- Software Management

### **Program Time Limitations**

For part-time doctoral students, time limits are as follows:

No more than four years between admission to the doctoral program and completion of Breadth Examinations.

No more than two years between completion of Breadth Examinations and admission to Candidacy.

No less than eight months and no more than five years between admission to Candidacy and the dissertation defense.

For full-time doctoral students, time limits are as follows:

No more than three years between admission to the doctoral program and completion of Breadth Examinations.

No more than two years between completion of Breadth Examinations and admission to Candidacy.

No less than eight months and no 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.

## MASTER OF FINE ARTS IN DIGITAL CINEMA

**T**he Master of Fine Arts in Digital Cinema emphasizes the applied artistic or cinematic side of digital cinema. A student does not enter the MFA directly; rather, a student enters the Master of Science in DC to gain the required technical foundation and then, before completing the MS, applies for admittance into the MFA.

The MFA extends the course of study by roughly two years, with emphasis on the design and creation of an artistic work. The MFA culminates in the public presentation and defense of the student's thesis project. A student who does not successfully complete the MFA may still be awarded the MS, assuming that all requirements have been met. A student who completes the MFA successfully receives only the MFA degree. The MFA in DC, through the MS in DC material, provides a solid technical foundation; the MFA itself then extends the artistic emphasis found in the BA in DC.

Today, virtually all theatrically released films are edited on computers. More and more Hollywood films are shot using high-definition digital cameras. Filmmakers including George Lucas, James Cameron, and Robert Rodriguez have made movies without ever touching a piece of 35mm film. Theaters are now showing movies using digital video projectors. The number increases every year. The future belongs to Digital Cinema.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- Prerequisite Phase**
- Core Knowledge Phase**
- Advanced Phase**
- MFA Phase**

Upon acceptance into the masters degree program, the student will meet with their faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted masters student. In the Core Knowledge phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree. This phase adds depth to the work completed in the Core Knowledge Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

### **GPA requirements**

Grade Point Average Requirements A grade point average of at least 3.0 (A = 4.0) must be maintained in all course work toward the master's degree. Courses in which a grade of C- (1.7) or lower is earned will not apply toward a graduate degree.

### **Prerequisite Phase**

Students must demonstrate prerequisite competencies by transcript or by successful completion of the following courses:

- DC 201 Narrative Techniques in Digital Cinema
- DC 210 Digital Cinema Production I

DC 220 Non-Linear Editing I

and a choice of two from the following list:

DC 215 Digital Sound Design  
DC 275 Cinematography and Lighting  
ANI 230 3d Modeling for Animation and Gaming  
ANI 231 3d Animation for Cinema and Gaming  
GAM 244 Game Development I  
GAM 245 Game Development II

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Core Knowledge Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Core Knowledge Phase**

Fully admitted students in the Core Knowledge phase may register for a maximum of four Advanced phase courses. The Core Knowledge Phase courses for the MS in Digital Cinema are:

The core knowledge phase is designed to provide a common foundation in digital cinema production.

DC 460 Digital Cinema Proseminar  
DC 461 Production Seminar  
DC 462 Digital Cinema Workshop

### **Advanced Phase**

The advanced phase provides specialized knowledge in digital cinema topics, as well as allowing students to choose a particular emphasis for their studies.

### **Required Advanced Phase Courses**

DC 401 Writing the Short Motion Picture  
DC 495 Directing the Short Motion Picture  
DC 476 Visuals  
DC 430 Cinematic Animation  
DC 412 Production Design

### **Elective Advanced Phase Courses**

Students in this program will have 3 electives to be chosen from the following list:

DC 411 Music Video Production  
DC 415 Advanced Sound Design  
DC 420 Advanced Non-Linear Editing  
DC 471 Documentary Production  
DC 475 High-Definition Cinematography  
DC 478 Special Effects and Compositing  
DC 489 The Big Picture: the Entertainment Industry  
DC 490 Directing

DC 499 Internship  
DC 476 Visuals  
DC 402 Writing the Feature Film  
DC 480 Producing the Feature Film  
DC 481 Distribution and Exhibition  
ANI 430 3d Character Animation  
ANI 450 Motion Capture Workshop

Students in this program will also have to take 2 graduate-level electives from any CTI MS program.

**Master of Fine Arts Phase**

The Thesis Phase courses for the M.F.A. in Digital Cinema are:

DC 565 Thesis Development  
DC 566 Thesis Production  
DC 567 Thesis Post-Production

**Time Limit**

Students must maintain satisfactory progress toward their master's degree at all times. The time limit to complete all requirements for the M.S. is six years. The time limit to complete the M.F.A. is seven years. Course work more than seven years old is invalidated and will not be applied toward the degree.

## MASTER OF ARTS IN INFORMATION TECHNOLOGY

**T**his program is intended for to prepare professionals in the broad field of Information Technology. In particular, the program prepares graduates interact professionally with technologists, write about IT, manage impacts of IT on organizations or society, or evaluate IT-oriented data.

This program may be appropriate for individuals in sales, management, marketing, journalism, law, or other professions who need to interact closely with IT specialists and technicians without being an IT specialist or technician. The program also is suited for managers of IT staff. For example, a large telecommunications company may have a non-technical sales manager for a technical sales force whose customers are also technically oriented. The goal of the MA in Information Technology program is to prepare someone like the non-technical sales manager to interact effectively with the technical sales force and the technical customers

Students who complete this program will acquire an understanding of and experience with:

- The concepts, tools, and practices of information technology management (IS 425)
- The analysis phase of the software development life cycle (HCI 445).
- The fundamentals of networks for voice and data communications and for the integration of voice and data streams (TDC 460).
- The methods and problems associated with technology-triggered business transformation (IS 450).
- The basics of database design. (CSC451)
- The fundamentals of project management for software systems (IS 556 or SE 447).
- The skills to acquire and analyze data (HCI 445 and CSC 423).
  
- **Prerequisite Phase**
- **Foundation Phase**
- **Advanced Phase**
- **Culminating Thesis**

### **Prerequisite Phase**

The courses in the Prerequisite Phase for the MA in Information Technology are:

IT 130 The Internet and the Web

IT 223 Data Analysis

IT 230 Building Internet Applications

TDC 361 Basic Communication Systems

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Phase courses prior to completing their prerequisites. The student must submit a Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The form must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Foundation Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.



### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 will graduate with distinction.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.75 and a designation of *distinction* on the core examinations will graduate with distinction.

### **Foundation Phase**

Fully admitted students in the Foundation Phase may register for a maximum of four Advanced phase courses. The Foundation Phase courses for the MA in Information Technology are:

CSC 423 Data Analysis and Regression  
CSC 451 Database Design  
ECT 455 E-Commerce Web Site Engineering  
HCI 440 Usability Engineering  
HCI 445 Inquiry Methods and Use Analysis  
IS 511 Social Issues of Computing

### **Advanced Phase**

The advanced phase provides opportunities for breadth and depth in IT, and allows for specialized interests through five elective courses for which you have required prerequisites. Listed below are suggested courses. Two of the five elective courses must be taken at the 500 level.

CSC 424 Advanced Data Analysis  
CSC 428 Data Analysis for Experimenters  
CSC 449 Database Technologies  
ECT 480 Intranets and Portals  
ECT 556 Enterprise Architecture and Design  
ECT 565 Mobile Enterprise  
ECT 585 Legal Aspects of E-Commerce  
ECT 586 Customer Relationship Management Technologies  
ECT 589 E-Commerce Technology Capstone  
HCI 450 Foundations of Human-Computer Interaction  
HCI 454 Interaction Design  
HCI 460 Usability Evaluation Methods  
IPD 498 Topics in Global Information Technology  
IS 425 Enterprise Information  
IS 450 Enterprise System Implementation.  
IS 456 Knowledge Management Systems  
IS 482 Legal Aspects of Information Technology  
IS 483 Information Services and Operations  
IS 505 Business Continuity and Disaster Recovery  
IS 512 Groupware and Virtual Collaboration  
IS 540 Global Information Technology  
IS 560 Enterprise Systems  
IS 572 Information Security Management  
IS 577 Information Systems Capstone  
IS 578 Information Technology Consulting  
IS 596 Topics in Information Systems  
ITS 560 Information Technology Training and User Support  
SE 430 Object Oriented Modeling  
SE 477 Software and Systems Project Management  
TDC 463 Computer Networks and Data Systems  
TDC 464 Voice Communication Networks  
TDC 476 Economics of Telecommunication Systems  
TDC 511 Telecommunications Practicum  
TDC 569 Telecommunication Regulation, Policy, Law and Standards

**Culminating Thesis**

The Culminating Thesis is an independent research article that demonstrates a student's ability to integrate both technical expertise and IT domain knowledge. Normally, it is undertaken during the student's final year in the MA program.

In this work, the student is guided and assessed by a Thesis supervisor. The thesis must represent an original contribution, and may include system evaluation, empirical studies, or theoretical work. The scope and the details of the research project will be determined by the supervisor, and must be approved by the student's academic advisor.

IT 698 Masters Thesis is a two-credit hour course. Students must register for this course a minimum of two times and must continue to enroll in the course in every quarter after the first quarter until the thesis is completed to the satisfaction of their supervisor. A maximum of four credit hours will apply for degree credit.

## MASTER OF SCIENCE IN APPLIED TECHNOLOGY

**T**he Master of Science in Applied Technology (MSAT) is designed for experienced non-IT managers who wish to acquire advanced technical skills in a highly focused area, in combination with enhanced understanding of the larger organizational, economic, and social contexts within which these technical skills are practiced. The MSAT offers Areas of Specialization in either Applied Information Systems (AIS) or Applied Telecommunications Systems (ATS). This new degree program is being offered jointly by CTI and the School for New Learning (SNL), DePaul's nationally recognized college for adult learners; and students work with advisors from both colleges throughout their program. Students entering the MAAT must have an undergraduate degree with an appropriate GPA, although it need not have been in a technology-related field. They must also have had experience in the workplace sufficient to define the technological requirements of an organization as well as to understand the organizational system itself (generally, at least three years), and must have access to a worksite "laboratory" within which the application of learning can take place. Prospective students can find more information on this degree at the SNL website.

**The curriculum consists of three primary components:**

- An individualized Area of Specialization in either Applied Information Systems or Applied Telecommunications Systems offered through CTI; the Area of Specialization combines CTI coursework with on-the-job application of this coursework;
- A series of Liberal Learning Seminars offered through SNL which are designed to develop the skills of communication, interpersonal facility, problem-solving, analytical and systems thinking, ethical decision-making, and self-managed learning; and
- A Culminating Project which is designed to integrate the technical and liberal learning components of the program through the design and/or implementation of a major professional project in the workplace.

This degree is administered by the School for New Learning. Please see their catalog entry for current requirements.

## MASTER OF SCIENCE IN BUSINESS INFORMATION TECHNOLOGY

**T**he Master of Science in Business Information Technology is a joint degree between School of Computer Science, Telecommunications and Information Systems (CTI) and the Kellstadt Graduate School of Business (KGSB). The program addresses today's need for individuals who understand the core principles of both business and technology in corporations, health care institutions, and government agencies. Many of these people work as liaisons between the Information Technology department and a functional business unit. Others work within departments that are information dependent and rely heavily on information technology. The M.S. in Business Information Technology also provides a solid base for those interested in moving their career forward through project management or information technology management positions.

### **Admissions**

Your Application: Accepted throughout the Year.

Students are admitted to the MS in Business Information Technology throughout the year. Applicants must choose to apply through only one of the two schools. Students applying through the school of CTI must possess a bachelor's degree from a regionally accredited institution (or be in the final stages of completing the undergraduate degree). The primary criterion in determining eligibility for admission is previous academic achievement. Other factors, such as work experience and career progression, are also important and will be considered for admission. Thus, although not required, applicants may wish to include letters of recommendation, a resume and other supporting material which they feel may give an Admissions officer a broader view of their achievements. International students are required to submit a recent ( no more than two years old) TOEFL score.

To review application requirements, please go to:

[http://www.cs.depaul.edu/Admissions/admissions/admissions\\_gRequirements.asp](http://www.cs.depaul.edu/Admissions/admissions/admissions_gRequirements.asp)

Or to apply online:

[https://www.cs.depaul.edu/admissions/admissions/admissions\\_apply.asp](https://www.cs.depaul.edu/admissions/admissions/admissions_apply.asp)

This masters program does not require an admissions test. Please note that if you choose to apply through the Kellstadt School of Business, you will be required to submit a GMAT score.

### **Degree Program Courses**

There is a single prerequisite course, IT 130 The Internet and the Web, which can be waived based on discussion with a CTI or KGSB advisor.

### **Required Courses (10)**

#### **Courses (5) from the Kellstadt Graduate School of Business**

ACC 500 Financial Accounting  
MGT 502 Managing Operations for Competitive Advantage  
MIS 555 Management of Information Technology  
MIS 674 Systems Analysis and Design  
MKT 555 Decisions in Marketing Management

#### **Courses (5) from the School of CTI**

CSC 451 Database Design  
IS 572 Information Security Management  
IT 430 Building Internet Applications  
SE 477 Software and Systems Project Management  
TDC 425 Voice/Data Network Fundamentals

**Electives (3)**

Three electives, with one chosen from the business school, one chosen from the School of CTI, and one chosen from either the business school or from CTI:

**Business school courses available for use as electives: (choose 1)**

ACC535 Accounting Systems  
ACC555 Management Accounting for Decision Making  
MGT501 Strategic Supply Chain Management  
MGT502 Managing Operations for Competitive Advantage  
MGT506 Decision Making for Managers  
MGT570 Entrepreneurship and New Venture Management  
MIS 680 Electronic Business  
MIS 681 E-Business Strategies  
MIS 683 Information Technology Strategy and Architecture  
MIS 689 Knowledge Management  
MIS 798 Special Topics  
MIS 799 Independent Study  
MKT595 Internet Marketing

**CTI courses available for use as electives: (choose 1)**

CSC 599 Topics in Computer Science  
ECT 596 Topics in E-Commerce Technology  
HCI 422 Multimedia  
HCI 440 Usability Engineering  
HCI 454 Interaction Design  
IPD 499 Topics in Global Information Technology  
IS 450 Enterprise System Implementation.  
IS 482 Legal Aspects of Information Technology  
IS 505 Business Continuity and Disaster Recovery  
IS 511 Social Issues of Computing  
IS 512 Groupware and Virtual Collaboration  
IS 540 Global Information Technology  
IS 574 Decision Support Systems and Intelligent Systems  
IS 578 Information Technology Consulting  
IS 596 Topics in Information Systems  
IT 498 Topics in Global Information Technology  
SE 427 Software Quality Management  
TDC 463 Computer Networks and Data Systems

**Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.75 or higher and a designation of distinction on at least two core examinations and no failed core examination will graduate with distinction.

## MASTER OF SCIENCE IN COMPUTATIONAL FINANCE

**T**he Master of Science in Computational Finance is a joint degree between School of Computer Science, Telecommunications and Information Systems (CTI) and the Kellstadt Graduate School of Business (KGSB).

The objective of this program is to offer students the opportunity to acquire both the ability to understand existing financial models in a quantitative and mathematical way, and the ability to implement these models in the form of computer programs. This program differs from a regular MS in Finance because of a stronger mathematical component and the addition of an intensive computational component. The program aims to produce graduates with the required qualifications to become "quantitative financial analysts". The Computational Finance graduates will be able to apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management, and financial engineering.

### **Admissions**

Your Application: Accepted throughout the Year

Students are admitted to the MS in Computational Finance throughout the year.

Admission to this joint program is open to both students from the School of CTI and the College of Commerce. All applicants must: have successfully completed a bachelor's degree from an accredited four year United States institution, or its equivalent; have a minimum 3.2 GPA earned during the junior and senior academic years; submit a GMAT or a GRE score. International students also must submit a TOEFL score.

Students who choose to apply to the business school must submit their scores on the Graduate Management Admissions Test (GMAT). Upon completion of all requirements, these students will receive their M.S. degree from the Kellstadt Graduate School of Business.

Students who chose to apply to the School of CTI must submit GMAT or GRE scores. Upon completion of all requirements, these students will receive their M.S. degree

### **Prerequisites Course**

Chose a three course calculus sequence:

MAT 150 Calculus I and  
MAT 151 Calculus II

OR

MAT 160 Calculus for Mathematics and Science Majors I and  
MAT 161 Calculus for Mathematics and Science Majors II

OR

MAT 170 Promath Calculus for Mathematics and Science Majors I and  
MAT 171 Promath Calculus for Mathematics and Science Majors II

Courses (2) from the School of CTI

AND

CSC261 Programming Languages I: C/C++ and  
CSC 262 Programming Languages II: C/C++ OR  
CSC 309 Object-Oriented Programming

AND

CSC 393 Data Structures in C++

AND

CSC 202 Mathematics for Computer Science OR

CSC 321 Design and Analysis of Algorithms

**Required Courses**

Courses (7) from the Kellstadt Graduate School of Business Offered Fall

ACC 500 Financial Accounting

ECO 555 Economics for Decision-Making

FIN 555 Financial Management

FIN 523 Investment Analysis

FIN 525 Portfolio Management

FIN 562 Derivatives: Pricing and Risk Management

FIN662 Advanced Derivatives: Pricing and Applications

Courses (5) from the School of CTI

CSC 423 Data Analysis and Regression

CSC 425 Time Series Analysis and Forecasting

CSC 485 Numerical Analysis

CSC 521 Monte Carlo Simulations: Algorithms and Applications

CSC 696 Master's Project or CSC 697 Graduate Internship

One elective chosen from any 500 level course in the School of CTI.

**Grad and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.75 or higher will graduate with distinction.

## MASTER OF SCIENCE IN COMPUTER GRAPHICS AND ANIMATION

**T**he M.S. in Computer Graphics and Animation is a study of the technical and aesthetic foundations, design and development of Computer Graphics. This program prepares students for technical careers in the graphics industry. Several fundamental principles provide the basis for this curriculum:

- Computer graphics professionals, no matter their area of specialty, will need a solid grounding in both perception and technology.
- To be successful in the workplace, computer graphics professionals will need to be able to work well in multidisciplinary environments.
- To inculcate the flexibility required to adapt to rapid changes in technology and industry norms, students will need to be well versed in the foundations of the discipline.
- Practical experience must be coupled with theory to prepare students for the workplace.

The degree has five components:

- **Prerequisite Phase**
- **Fundamental Phase**
- **Core Phase**
- **Advanced Phase**
- **Electives**

In this program, students will:

- Develop a sensitivity to human perception, including a comprehension of fundamental design concepts, color theory, and the interaction of light with surfaces;
- Build a deep understanding of such technical concepts as interaction design, modeling objects, controlling cameras, rigging characters for animation and using particle and surface techniques;
- Learn to apply perceptual and technical abilities in creating shaders, textures, characters, scenes and animations;
- Acquire hands-on experience with a wide range of commercially-available tools;
- Develop a grasp of fundamentals that allow implementations beyond the extant user interfaces; and
- Become appreciative of the two “cultures” of computer graphics – the one drawing on communication design and the other deriving from computer science.
- The degree program offers two concentrations: a Technical Director concentration and a Developer concentration. While both concentrations have a balance of technical and aesthetic, the Technical Director will have a greater emphasis on the aesthetic while the Developer concentration will focus on the technical. After graduation, Technical Directors will be ready for jobs assisting Creative Directors in such activities as creating virtual sets, adjusting lighting and rigging characters for animation. Developers will learn technologies for graphics systems development, including game engines and plug-ins.

The degree program offers two concentrations: a Technical Director concentration and a Developer concentration. While both concentrations have a balance of technical and aesthetic, the Technical Director will have a greater emphasis on the aesthetic while the Developer concentration will focus on the technical. After graduation, Technical Directors will be ready for jobs assisting Creative Directors in such activities as creating virtual sets, adjusting lighting and rigging characters for animation. Developers will learn technologies for graphics systems development, including game engines and plug-ins.



The M.S. in Computer Graphics program consists of 13 courses with six or seven prerequisite courses. Students choosing the Technical Director concentration take six courses while students taking the Developer concentration take seven courses.

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.85 or higher will graduate with distinction.

### **Prerequisite Phase**

The courses in the Prerequisite Phase for the MS in Computer Graphics and Animation are:

#### **Both concentrations**

HCI 402 Foundations of Digital Design  
GPH 212 Perceptual Principles for Digital Environments II  
IT 240 Introduction to Desktop Databases

#### **Technical Director concentration \***

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
GPH 259 Design Geometry

#### **The CGA developer Track.**

CSC 261 Programming Languages I: C/C++  
CSC 262 Programming Languages II: C/C++  
CSC 393 Data Structures in C++  
MAT 150 Calculus I

\*The Technical Director prerequisite track requires two quarters of programming in either Java or C/C++ so students entering with prior coursework in C++ will satisfy this requirement. Any TD student who wishes to eventually take courses in the Developer track as electives are encouraged to take the C++ programming track CSC 261 and CSC 262 to satisfy their prerequisite programming requirement.

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

#### **Fundamental Phase**

The courses in the Fundamental Phase for the MS in Computer Graphics and Animation are:

HCI 470 Digital Page Formatting I  
GPH 425 Survey of Computer Graphics  
GPH 438 Computer Animation Survey  
GPH 448 Computer Graphics Scripting

**Core Phase**

The Core Knowledge Phase courses for the MS in Computer Graphics and Animation are:

**Technical Directors concentration**

GPH 450 Digital Modeling I  
GPH 560 Modeling Spaces  
HCI 422 Multimedia  
HCI 440 Usability Engineering

**Developers concentration**

GPH 436 Fundamentals of Computer Graphics  
GPH 469 Computer Graphics Development  
GPH 572 Principles of Computer Animation

**Advanced Phase**

The Advanced Phase courses for the MS in Computer Graphics and Animation are:

**Both concentrations**

GPH 539 Advanced Rendering Techniques

**Technical Directors concentration**

GPH 565 Designing for Visualization

**Developers concentration,**

GPH 570 Visualization

**Elective Courses**

Students in this program will have 4 electives to be chosen from the following list

ANI 430 3D Character Animation  
ANI 450 Motion Capture Workshop  
GPH 540 Procedural Shading  
GPH 541 Advanced Lighting Techniques  
GPH 538 Rigging for Animation  
GPH 436 Fundamentals of Computer Graphics  
GPH 450 Digital Modeling I  
GPH 469 Computer Graphics Development  
GPH 536 Smooth Surface Modeling for Graphics and Animation  
GPH 560 Modeling Spaces  
GPH 572 Principles of Computer Animation  
GPH 574 Computer Games  
GPH 575 Advanced Graphics Development  
GPH 576 Artificial Intelligence in Computer Games  
GPH 595 Topics in Graphics  
HCI 422 Multimedia  
HCI 423 Internet Multimedia  
HCI 440 Usability Engineering  
HCI 450 Foundations of Human-Computer Interaction  
HCI 460 Usability Evaluation Methods  
HCI 471 Digital Page Formatting II

## MASTER OF SCIENCE IN COMPUTER, INFORMATION AND NETWORK SECURITY

**T**he Master of Science in Computer, Information and Network Security is intended for those students who wish to specialize in the security aspects of the Information Technology (IT) field. It is suited for students who wish to pursue work in a security related field. Students who complete the program will be prepared to

- Assess the information security risks faced by an organization;
- Understand technology and human factors related to these risks;
- Evaluate tools and resources currently available to limit risk, mitigate the effects of hostile action and recover from attack;
- Manage the development, implementation and evolution of a security infrastructure;
- Assess the impact of policy, legislation and market trends on organizational security objectives;
- Design, implement and maintain software systems designed to support security policy and goals;
- Develop and maintain a network architecture consistent with mitigating risk and preventing hostile attack; and
- Be lifelong learners in the information security environment.

Students must complete the requirements of one of the three concentrations: Computer Security, Information System Security, or Network Security.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- **Prerequisite Phase**
- **Foundation Phase**
- **Advanced Phase**

Upon acceptance into the master's degree program, the student will meet with their faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted master's student. In the Core Knowledge phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree. This phase adds depth to the work completed in the Core Knowledge Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

### **Grade and GPA requirements**

Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses. GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 or higher will graduate with distinction.

### **Prerequisite Phase**

The following courses are required for the **Computer Security concentration**:

CSC 211 Programming in Java I Self Placement Test Available!  
and CSC 212 Programming in Java II  
or CSC 224 Java for Programmers  
or CSC 396 Programming in Java I and II  
CSC 309 Object-Oriented Programming in C++  
or CSC 261 Programming Languages I: C/C++

and CSC 262 Programming Languages II: C/C++  
CSC 373 Computer Systems I  
CSC 374 Computer Systems II  
CSC 383 Data Structures and Algorithms in Java

The following courses are required for the **Information Systems Security concentration:**

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
IT 223 Data Analysis  
IT 215 Analysis and Design Techniques  
ECT 310 Internet Application Development  
TDC 361 Basic Communication Systems

The following courses are required for the **Network Security concentration:**

CSC 211 Programming in Java I Self Placement Test Available!  
or CSC 261 Programming Languages I: C/C++  
or any more advanced programming course  
IT 223 Data Analysis Self Placement Test Available!  
CSC 202 Mathematics for Computer Science  
Or MAT 140 Discrete Mathematics I  
TDC 311 Computers in Telecommunications Systems  
or CSC 373 Computer Systems I  
TDC 361 Basic Communication Systems

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase.

All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Foundation Phase**

The following two (2) courses are required for the **Computer Security Concentration:**

SE435 Foundations of Distributed Systems I  
SE 450 Object-Oriented Software Development

The following two (2) courses are required for the **Information Systems Security Concentration:**

IS 425 Enterprise Information  
TDC 463 Computer Networks and Data Systems

The following two (2) courses are required for **Network Security Concentration:**

TDC 460 Foundations of Communications Systems  
TDC 463 Computer Networks and Data Systems

The following three (3) courses are required for **all concentrations:**

TDC 477 Network Security I  
IS 511 Social Issues of Computing  
    or CNS 477 Legal Issues in Information Assurance  
IS 433 Information Security Management

## **Foundation Phase GPA Requirements**

To progress to the Advanced Phase of the degree, a student must complete the Prerequisite Phase and Foundation Phases.

### **GPA Requirement:**

A student must achieve an average grade of 3.0 or better in the five (5) courses that form the Foundation Phase.

A student who does not meet the grade requirement must retake the course with the lowest grade. If a number of such courses exist, then it is up to the student to choose which class to retake. Only the higher grade will count toward the average grade for the purpose of completing the GPA Requirement.

Students that do not meet the GPA requirements, and do not want to re-take a class are encouraged to see faculty advising guidance to discuss their options.

A maximum of four (4) courses in the Advanced Phase can be taken before a student completes the Foundation Phase and fulfill the GPA Requirement.

## **Advanced Phase**

The MS-CINS advanced phase is composed of four (4) parts:

- CINS Concentration Area
- CINS Elective
- CTI Open Electives
- Capstone or Thesis Requirement

### **CINS Concentration Area**

According to their concentration a student must meet the following requirements:

#### **Computer Security Concentration:**

1) Complete the following 2 courses:

CSC 440 Cryptology

SE 473 Security Architecture I

2) Complete one (1) of the following two (2) courses:

SE 547 Foundations of Computer Security

SE 573 Security Architecture II

3) A student must complete one (1) of the following six (6) courses:

SE 535 Foundations of Distributed Systems II

SE 482 Requirements Engineering

SE 529 Software Risk Management

SE 547 Foundations of Computer Security

SE 573 Security Architecture II

TDC 577 Network Security II

#### **Information Systems Security Concentration:**

A student must complete the following course:

IS 533: Enterprise Security Infrastructure Controls and Regulatory Compliance

Complete four (3) of the following courses:

CNS 477 Legal Issues in Information Assurance (This course can not be counted in this category if used for foundation phase fulfillment)

ECT 582 Secure Electronic Commerce

ECT 585 Legal Aspects of E-Commerce

IS 483 Information Services and Operations

IS 505 Business Continuity and Disaster Recovery

IS 511 Social Issues of Computing (This course can not be counted in this category if used for foundation phase fulfillment)  
IS 540 Global Information Technology  
SE 430 Object Oriented Modeling  
SE 482 Requirements Engineering  
SE 529 Software Risk Management  
TDC 577 Network Security II

**Network Security Concentration:**

1) Complete the following 3 courses:  
TDC 511 Telecommunications Practicum  
TDC 563 Protocols and Techniques for Data Networks  
TDC 577 Network Security II

2) Complete two (1) of the following four (4) courses:  
TDC 561 Network Programming  
TDC 562 Computer-Communication Network Design and Analysis  
TDC 567 Telecommunication Systems Design and Management  
ECT 582 Secure Electronic Commerce

**CINS Elective**

Student must complete 1 additional course from any CINS concentration area. It can be from their concentration area or any others. That course can not be used to fulfill a student's CINS Concentration Area requirement.

**CTI Open Electives**

Student must complete two (2) CTI open electives.  
Elective courses are in the range of 420-699 and must be from the school of CTI.

**Capstone or Thesis Requirement**

The capstone class provides an opportunity for students to demonstrate and assess the skills they have developed during the rest of the degree.

Students should either take one of:  
CNS 594 Computer Information and Network Security Capstone  
or CSC 698, ECT 698, IS 698, SE 698, TDC 698 Masters Thesis

## MASTER OF SCIENCE IN COMPUTER SCIENCE

**T**he Master of Science in Computer Science is the most technical of CTI's master's programs. The courses in the Prerequisite Phase and Core Knowledge Phase focus on the foundations and fundamentals of programming languages, and the theoretical underpinnings of computer science. As part of the Advanced Phase, students get a breadth of training in traditional areas of computer science by taking one course each in Foundations, Computer Systems, and Database Systems. The remainder of the Advanced Phase gives students a great deal of flexibility. A student may choose to focus in a specific area by taking many courses in one area of computer science or from one of the other degree programs in CTI. Or, they may achieve a breadth of knowledge across many areas by selecting courses from a variety of areas. This degree is appropriate for students who wish to pursue a technical career in any of a number of areas of computer science, or for students who may wish to pursue a Ph.D. degree in the future.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- Prerequisite Phase
- Core Knowledge Phase
- Advanced Phase

Upon acceptance into the masters degree program, the student will meet with their faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted masters student. In the Core Knowledge phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree. This phase adds depth to the work completed in the Core Knowledge Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 or higher will graduate with distinction.

### **Prerequisite Phase**

The courses in the Prerequisite Phase for the MS in Computer Science are:

CSC 202 Mathematics for Computer Science  
CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
CSC 373 Computer Systems I  
CSC 374 Computer Systems II  
CSC 383 Data Structures and Algorithms in Java

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with

practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Core Knowledge Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Core Knowledge Phase**

Fully admitted students in the Core Knowledge phase may register for a maximum of four Advanced phase courses. The Core Knowledge Phase courses for the MS in Computer Science are:

CSC 447 Concepts of Programming Languages  
CSC 491 Design and Analysis of Algorithms  
SE 450 Object-Oriented Software Development Methods

### **Advanced Phase**

One course in each of the following areas: Foundations, Computer Systems, Database Systems

Four additional courses from the areas above or Artificial Intelligence, Computer Vision, Data Analysis, Computer Graphics, Software Engineering, Security, Network Technologies, two of which must be 500-level. Courses are grouped into different areas below for your convenience. A student may concentrate in one area by taking all 4 courses from the same area, or may wish to take courses from a variety of areas.

Three elective courses. Students must choose three graduate level elective courses from the School of CTI. Elective courses are in the range of 420-699.

Overall, at least four 500-level courses.

There is a research option for this degree as well.

### **Database Systems Area**

CSC 449 Database Technologies  
CSC 451 Database Design  
CSC 452 Database Programming  
CSC 454 Database Administration and Management  
CSC 549 Database System Implementation  
CSC 550 Object-Oriented Databases  
CSC 551 Distributed Database Systems  
CSC 553 Advanced Database Concepts  
CSC 575 Intelligent Information Retrieval  
CSC 589 Topics in Database

### **Foundations Area**

CSC 444 Automata Theory and Formal Grammars  
CSC 448 Compiler Design  
CSC 503 Parallel Algorithms  
CSC 504 Parallel Processing  
CSC 531 Introduction to Bioinformatics  
CSC 535 Formal Semantics of Programming Languages  
CSC 544 Theory of Computation  
CSC 547 Advanced Topics in Program Languages  
CSC 548 Advanced Compiler Design  
SE 580 Design of Object-Oriented Languages  
SE 590 Advanced Topics in Object Oriented Technology

### **Computer Systems Area**

CSC443 Operating Systems



CSC 545 Advanced Computer Organization  
CSC 546 Operating Systems Design  
SE435 Foundations of Distributed Systems I  
SE536 Foundations of Distributed Systems II  
DS 513 Client/Server Technologies  
SE 540 Software Development for Mobile and Wireless Systems  
SE 542 Software Development for Limited and Embedded Devices  
SE 550 Distributed Software Development  
SE 552 Concurrent Software Development  
TDC 561 Network Programming

**Artificial Intelligence Area**

CSC 457 Expert Systems  
CSC 458 Symbolic Programming  
CSC 480 Foundations of Artificial Intelligence  
CSC 578 Neural Networks and Machine Learning  
CSC 587 Cognitive Science  
CSC 575 Intelligent Information Retrieval  
CSC 594 Topics in Artificial Intelligence

**Bioinformatics Area**

CSC 532 Introduction to Bioinformatics  
CSC 541 Introduction to Proteomics  
CSC 542 Research Practicum in Computational Biology

**Computer Vision Area**

CSC 481 Introduction to Image Processing  
CSC 498 Digital Signal Processing  
CSC 538 Vision Systems  
CSC 581 Applied Image Analysis  
CSC 584 Computer Vision  
CSC 592 Topics in Computer Vision and Pattern Recognition

**Data Analysis Area**

CSC 423 Data Analysis and Regression  
CSC 424 Advanced Data Analysis  
CSC 428 Data Analysis for Experimenters  
CSC 521 Monte Carlo Simulations: Algorithms and Applications  
CSC 578 Neural Networks and Machine Learning  
CSC 598 Topics in Data Analysis  
ECT 584 Web Data Mining for Business Intelligence  
SE 468 Software Measurement/Project Estimation  
SE 567 Software Reliability

**Computer Graphics Area**

GPH 436 Fundamentals of Computer Graphics  
GPH 438 Computer Animation Survey  
GPH 448 Computer Graphics Scripting  
GPH 469 Computer Graphics Development  
GPH 470 Survey of Computer Graphics  
GPH 536 Smooth Surface Modeling for Graphics and Animation  
GPH 539 Advanced Rendering Techniques  
GPH 560 Modeling Spaces  
GPH 570 Visualization  
GPH 572 Principles of Computer Animation  
GPH 574 Computer Games  
GPH 575 Advanced Graphics Development  
GPH 595 Topics in Graphics

**Software Engineering Area**

SE 427 Software Quality Management  
SE 430 Object Oriented Modeling  
SE 431 Formal Software Specification and Development I  
SE 433 Software Testing  
SE 452 Object-Oriented Enterprise Computing  
SE 465 Software Engineering Principles  
SE 468 Software Measurement/Project Estimation  
SE 469 Software Safety  
SE 470 Software Development Processes  
SE 472 Personal Software Process  
SE 477 Software and Systems Project Management  
SE 480 Software Architecture  
SE 482 Requirements Engineering  
SE 529 Software Risk Management  
SE 531 Formal Software Specifications and Development II  
SE 533 Software Validation and Verification  
SE 546 Software Architecture and Design for Desktop Applications  
SE 554 Enterprise Component Architecture  
SE 558 Software Methodologies  
SE 560 Structured Document Interchange and Processing  
SE 571 Software Maintenance

#### **Security Area**

CSC 440 Cryptology  
SE 435 Foundations of Distributed Systems I  
SE 536 Foundations of Distributed Systems II  
ECT 582 Secure Electronic Commerce  
IS 511 Social Issues of Computing  
IS 572 Information Security Management  
SE 473 Security Architecture I  
SE 547 Foundations of Computer Security  
SE 573 Security Architecture II  
TDC 511 Telecommunications Practicum  
TDC 562 Computer-Communication Network Design and Analysis  
TDC 563 Protocols and Techniques for Data Networks  
TDC 572 Network Security

#### **Network Technologies Area**

TDC 432 Computer and Information Systems Modeling  
TDC 460 Foundations of Communications Systems  
TDC 463 Computer Networks and Data Systems  
TDC 464 Voice Communication Networks  
TDC 489 Queuing Theory with Computer Application  
TDC 511 Telecommunications Practicum  
TDC 512 Cellular and Wireless Telecommunications  
TDC 513 Client/Server Technologies  
TDC 514 Computer Telephony  
TDC 561 Network Programming  
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  
TDC 572 Network Security  
TDC 573 Multimedia Networking

#### **Masters Research Option**

Students interested in a more in-depth study of a particular area can choose to work with a faculty member (not necessarily their academic advisor) on a research project. This option can be satisfied by taking the course CSC 696 (Masters Project) at least twice, each time for 4 credits.

The Masters research option will replace one elective and one of the 4 required area courses. Students who choose this option must successfully complete the core exams prior to their first enrollment in CSC 696. The research project must represent an original contribution to the area, and may include system development, empirical studies, or theoretical work. The scope and the details of the research project will be determined by the research supervisor, and must be approved by the student's academic advisor. At the end of the two quarters, the student must submit a technical report detailing the results of the research project. This report must be approved by the student's research supervisor and the faculty advisor, at which point it will be made available to the public as a CTI Departmental Technical Report.

## MASTER OF SCIENCE IN DIGITAL CINEMA

**T**he Master of Science degree in Digital Cinema follows the tradition in the School of Computer Science, Telecommunications, and Information Systems (hereafter, CTI) of developing innovative programs designed to fill curricular needs. Nowhere is that need more prevalent than in the area of Digital Cinema. The program emphasizes the technical and technology-based topics and practices of digital cinema. Such topics and practices include post-production editing of video and audio, the integration of video and audio, special effects and computer-generated imaging, and modes of digital distribution.

Today, virtually all theatrically released films are edited on computers. More and more Hollywood films are shot using high-definition digital cameras. Filmmakers including George Lucas, James Cameron, and Robert Rodriguez have made movies without ever touching a piece of 35mm film. Theaters are now showing movies using digital video projectors. The number increases every year. The future belongs to Digital Cinema.

No U.S. university offers a MS degree in Digital Cinema. Many offer MA and/or MFA degrees in the traditional areas of cinema production and studies, firmly rooted in traditional film production techniques and aesthetics. Digital Cinema at CTI is dedicated to utilizing the latest cutting edge digital technology while incorporating classic cinema narrative theory and aesthetics. The program seeks to define and to develop the relationship between changing technologies and creative artistic expression.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

**Prerequisite Phase**  
**Core Knowledge Phase**  
**Advanced Phase**

Upon acceptance into the masters degree program, the student will meet with their faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted masters student. In the Core Knowledge phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree. This phase adds depth to the work completed in the Core Knowledge Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

**GPA requirements**

Grade Point Average Requirements A grade point average of at least 3.0 (A = 4.0) must be maintained in all course work toward the master's degree. Courses in which a grade of C- (1.7) or lower is earned will not apply toward a graduate degree.

**Prerequisite Phase**

Students must demonstrate prerequisite competencies by transcript or by successful completion of the following courses:

DC 201 Narrative Techniques in Digital Cinema  
DC 210 Digital Cinema Production I

DC 220 Non-Linear Editing I

and a choice of two from the following list:

DC 215 Digital Sound Design  
DC 275 Cinematography and Lighting  
ANI 230 3d Modeling for Animation and Gaming  
ANI 231 3d Animation for Cinema and Gaming  
GAM 244 Game Development I  
GAM 245 Game Development II

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Core Knowledge Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Core Knowledge Phase**

Fully admitted students in the Core Knowledge phase may register for a maximum of four Advanced phase courses. The Core Knowledge Phase courses for the MS in Digital Cinema are:

The core knowledge phase is designed to provide a common foundation in digital cinema production.

DC 460 Digital Cinema Proseminar  
DC 461 Production Seminar  
DC 462 Digital Cinema Workshop

### **Advanced Phase**

The advanced phase provides specialized knowledge in digital cinema topics, as well as allowing students to choose a particular emphasis for their studies.

### **Required Advanced Phase Courses**

DC 401 Writing the Short Motion Picture  
DC 495 Directing the Short Motion Picture  
DC 476 Visuals  
DC 430 Cinematic Animation  
DC 412 Production Design

### **Elective Advanced Phase Courses**

Students in this program will have 3 electives to be chosen from the following list:

DC 411 Music Video Production  
DC 415 Advanced Sound Design  
DC 420 Advanced Non-Linear Editing  
DC 471 Documentary Production  
DC 475 High-Definition Cinematography  
DC 478 Special Effects and Compositing  
DC 489 The Big Picture: the Entertainment Industry  
DC 490 Directing

DC 499 Internship  
DC 476 Visuals  
DC 402 Writing the Feature Film  
DC 480 Producing the Feature Film  
DC 481 Distribution and Exhibition  
ANI 430 3d Character Animation  
ANI 450 Motion Capture Workshop

Students in this program will also have to take 2 graduate-level electives from any CTI MS program.

## DISTRIBUTED SYSTEMS

**T**he Distributed Systems degree was discontinued in academic year 2005-2006 and is no longer offered. Please refer to earlier versions of the catalog if you want to read about this degree.

## E-COMMERCE TECHNOLOGY

**T**he Master of Science in E-Commerce Technology is designed for those who want to specialize in e-business systems development and management. Modern organizations are designing and deploying Internet-based technologies for integrated e-commerce transactions, supply chain management, customer relationship management, and enterprise portals. The movement toward e-business collaboration among organizations along industry value chains will demand IT professionals to develop strong technical skills as well as a deep knowledge of IT architecture and business processes. The MS in E-Commerce Technology exposes students to a broad and ever-changing mix of technologies, programming languages and tools. Practicum, team projects, and work for real clients provide an authentic environment for learning. The new curriculum provides flexible, modularized advanced training in e-business systems as well as competencies in Internet application development, advanced Internet technologies, and wireless applications. Students may also expand their competencies in IT architecture design, project management, enterprise systems integration, or design of information security, networks, and databases.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- **Prerequisite Phase**
- **Foundation Phase**
- **Advanced Phase**

Upon acceptance into the master's degree program, the student will meet with a faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted master's student. In the Foundation Phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical Foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within the chosen degree. This phase adds depth to the work completed in the Foundation Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 will graduate with distinction.

### **Prerequisite Phase**

The courses in the Prerequisite Phase for the Master of E-Commerce Technology are:

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
CSC 383 Data Structures and Algorithms in Java

ECT 310 Internet Application Development  
SE 325 Principles and Practices of Software Engineering

\*CSC 224 is equivalent to both CSC 211 and CSC 212. Only students with experience in programming languages should take CSC 224.

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

#### **Foundation Phase**

CSC 449 Database Technologies  
ECT 425 Technical Fundamentals of Distributed Information Systems  
ECT 455 E-Commerce Web Site Engineering  
SE 430 Object Oriented Modeling

#### **Advanced Phase (8 courses; at least four 500-level courses)**

Required (3 courses)(Note: Along with ECT 455 and ECT 589 or ECT 590, these five courses constitute the E-Business Systems module.)

ECT 480 Intranets and Portals  
ECT 481 Internet Supply Chain Management  
ECT 582 Secure Electronic Commerce

#### **Electives (5 courses)**

With numerous pre-defined competency modules, students can gain expertise in addition to competency in e-business systems. A student can take four courses listed in one of the competencies based on their career goals and preferences. Students can fulfill these electives by taking courses in:

- a) One pre-defined competency module or a customized module, and
- b) Additional elective courses.

#### **Capstone (1 course)**

ECT 589 E-Commerce Technology Capstone  
or ECT 590 E-Business Technology Practicum

#### **E-Commerce Technology Modules**

##### **IT Management Oriented [mn]**

mn1. IT Project Management I  
mn2. IT Project Management II  
mn3. IT Planning and Global Strategies  
mn4. Legal & Social Issues  
mn5. IT Regulatory Compliance



**Internet Oriented [in]**

- in1. Internet Application Development
- in2. Wireless/Mobile Applications

**Design/Development Oriented [dd]**

- dd1. Application Development
- dd2. Software Engineering
- dd3. e-Business Systems
- dd4. HCI Methods
- dd5. Enterprise Systems Integration

**Data Oriented [do]**

- do1. Database Design I
- do2. Database Design II
- do3. Data Mining & Analytics
- do4. Knowledge Management

**Infrastructure Oriented [if]**

- if1. Network Design
- if2. Information Assurance & Security Design
- if3. IT Architecture Design

## IT Management Oriented [mn]

## mn1. IT Project Management I

- IS 483 Information Services and Operations
- IS 512 Groupware and Virtual Collaboration
- IS 535 IT Investment Financial Analysis
- IS 556 Enterprise Project Management
- IS 560 Enterprise Systems
- IS 570 Enterprise System Implementation.
- SE 433 Software Testing
- SE 468 Software Measurement/Project Estimation
- SE 477 Software and Systems Project Management
- ACC 500 Financial Accounting (Kellstadt Graduate School of Business)
- MGT 500 Behavior in Organizations (Kellstadt Graduate School of Business)

## mn2. IT Project Management II

- ECT 556 Enterprise Architecture and Design
- ECT 589 E-Commerce Technology Capstone
- IS 511 Social Issues of Computing
- IS 533 Security Management & Compliance
- IS 556 Enterprise Project Management
- IS 565 It Outsourcing
- IS 578 Information Technology Consulting
- SE 529 Software Risk Management
- MGT 562 Resolving Conflict in Organizations (Kellstadt Graduate School of Business)
- MGT 563 Negotiation Skills (Kellstadt Graduate School of Business)

## mn3. IT Planning and Global Strategies

- ECT 556 Enterprise Architecture and Design
- ECT 565 Mobile Enterprise
- ECT 589 E-Commerce Technology Capstone
- IS 483 Information Services and Operations
- IS 512 Groupware and Virtual Collaboration
- IS 535 IT Investment Financial Analysis
- IS 540 Global Information Technology

IS 560 Enterprise Systems  
IS 577 Information Systems Capstone  
IT 599 Topics in Global Information Technology  
ACC 500 Financial Accounting (Kellstadt Graduate School of Business)  
MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)

mn4. Legal & Social Issues

ECT 585 Legal Aspects of E-Commerce  
IS 433 Information Security Management (formerly IS 572)  
IS 482 Legal Aspects of Information Technology  
IS 511 Social Issues of Computing  
IS 565 It Outsourcing  
IS 570 Enterprise System Implementation.  
IT 599 Topics in Global Information Technology  
TDC 569 Telecommunication Regulation, Policy, Law and Standards

mn5 IT Regulatory Compliance

CNS 477 Legal Issues in Information Assurance  
IS 433 Information Security Management (formerly IS 572)  
IS 505 Business Continuity and Disaster Recovery  
IS 533 Security Management & Compliance  
IS 535 IT Investment Financial Analysis  
IS 556 Enterprise Project Management  
IS 560 Enterprise Systems

Internet Oriented [in]

in1. Internet Application Development

ECT 455 E-Commerce Web Site Engineering  
ECT 556 Enterprise Architecture and Design  
ECT 557 Peer-To-Peer Technology  
ECT 583 Advanced Scripting Technologies  
ECT 588 E-Marketplace Technology  
ECT 590 E-Business Technology Practicum  
HCI 440 Usability Engineering  
IS 556 Enterprise Project Management  
SE 560 Structured Document Interchange and Processing

in2. Wireless/Mobile Applications

ECT 455 E-Commerce Web Site Engineering  
ECT 565 Mobile Enterprise  
ECT 587 Mobile Commerce Technology  
HCI 440 Usability Engineering  
HCI 530 Usability Issues for Handheld Devices  
SE 540 Software Development for Mobile and Wireless Systems

Design/Development Oriented [dd]

dd1. Application Development

ECT 455 E-Commerce Web Site Engineering  
ECT 557 Peer-To-Peer Technology  
ECT 565 Mobile Enterprise  
ECT 583 Advanced Scripting Technologies  
ECT 587 Mobile Commerce Technology  
HCI 440 Usability Engineering  
IS 565 It Outsourcing  
IS 570 Enterprise System Implementation.  
SE 433 Software Testing  
SE 470 Software Development Processes  
SE 482 Requirements Engineering  
SE 560 Structured Document Interchange and Processing

dd2. Software Engineering

- ECT 556 Enterprise Architecture and Design
- IS 556 Enterprise Project Management
- SE 425 Principles and Practices of Software Engineering
- SE 450 Object-Oriented Software Development
- SE 452 Object-Oriented Enterprise Computing
- SE 470 Software Development Processes
- SE 480 Software Architecture
- SE 482 Requirements Engineering
- SE 529 Software Risk Management
- SE 550 Distributed Software Development

dd3. e-Business Systems

- ECT 455 E-Commerce Web Site Engineering
- ECT 480 Intranets and Portals
- ECT 481 Internet Supply Chain Management
- ECT 557 Peer-To-Peer Technology
- ECT 582 Secure Electronic Commerce
- ECT 583 Advanced Scripting Technologies
- ECT 587 Mobile Commerce Technology
- ECT 589 E-Commerce Technology Capstone
- ECT 590 E-Business Technology Practicum
- IS 535 IT Investment Financial Analysis
- IS 556 Enterprise Project Management
- IS 560 Enterprise Systems
- IS 565 It Outsourcing
- IS 570 Enterprise System Implementation.
- MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)
- MKT 555 Decisions in Marketing Management (Kellstadt Graduate School of Business)

dd4. HCI Methods

- ECT 557 Peer-To-Peer Technology
- ECT 587 Mobile Commerce Technology
- HCI 430 Prototyping and Implementation
- HCI 440 Usability Engineering
- HCI 445 Inquiry Methods and Use Analysis
- HCI 450 Foundations of Human-Computer Interaction
- HCI 454 Interaction Design
- HCI 460 Usability Evaluation Methods
- IS 421 Information Systems Analysis

dd5. Enterprise Systems Integration

- ECT 480 Intranets and Portals
- ECT 481 Internet Supply Chain Management
- ECT 556 Enterprise Architecture and Design
- ECT 565 Mobile Enterprise
- ECT 584 Web Data Mining for Business Intelligence
- ECT 586 Customer Relationship Management Technologies
- IS 535 IT Investment Financial Analysis
- IS 549 Data Warehousing and Data Mining
- IS 556 Enterprise Project Management
- IS 560 Enterprise Systems
- MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)

Data Oriented [do]

do1. Database Design I

- CSC 449 Database Technologies
- CSC 451 Database Design
- CSC 452 Database Programming
- CSC 454 Database Administration and Management

IS 549 Data Warehousing and Data Mining

do2. Database Design II

CSC 543 Spatial Databases and GIS  
CSC 550 Object-Oriented Databases  
CSC 551 Distributed Database Systems  
CSC 553 Advanced Database Concepts  
IS 549 Data Warehousing and Data Mining  
IS 556 Enterprise Project Management

do3. Data Mining & Analytics

CSC 423 Data Analysis and Regression  
ECT 480 Intranets and Portals  
ECT 584 Web Data Mining for Business Intelligence  
ECT 586 Customer Relationship Management Technologies  
IS 549 Data Warehousing and Data Mining  
IS 567 Knowledge Discovery Technologies  
IS 574 Decision Support Systems and Intelligent Systems  
MKT 555 Decisions in Marketing Management (Kellstadt Graduate School of Business)

do4. Knowledge Management

CSC 480 Foundations of Artificial Intelligence  
ECT 480 Intranets and Portals  
IS 456 Knowledge Management Systems  
IS 512 Groupware and Virtual Collaboration  
IS 574 Decision Support Systems and Intelligent Systems  
IS 575 Intelligent Information Retrieval

Infrastructure Oriented [if]

if1. Network Design

ECT 557 Peer-To-Peer Technology  
ECT 587 Mobile Commerce Technology  
TDC 460 Foundations of Communication Systems  
TDC 463 Computer Networks and Data Systems  
TDC 511 Telecommunications Practicum  
TDC 564 Local Area Networks  
TDC 567 Telecommunication Systems Design and Management

if2. Information Assurance & Security Design

CNS 477 Legal Issues in Information Assurance  
CNS 594 Computer Information and Network Security Capstone  
ECT 582 Secure Electronic Commerce  
IS 433 Information Security Management (formerly IS 572)  
IS 505 Business Continuity and Disaster Recovery  
IS 511 Social Issues of Computing  
IS 533 Security Management & Compliance  
SE 473 Security Architecture I  
SE 529 Software Risk Management  
TDC 477 Network Security  
TDC 463 Computer Networks and Data Systems

if3. IT Architecture Design

CSC 551 Distributed Database Systems  
DS 520 System Design and Implementation with Distributed Object Frameworks  
ECT 556 Enterprise Architecture and Design  
ECT 565 Mobile Enterprise  
ECT 590 E-Business Technology Practicum  
IS 535 IT Investment Financial Analysis  
IS 556 Enterprise Project Management  
SE 450 Object-Oriented Software Development  
SE 473 Security Architecture I

SE 480 Software Architecture  
SE 554 Enterprise Component Architecture  
TDC 463 Computer Networks and Data Systems  
TDC 567 Telecommunication Systems Design and Management

**Elective Course Restrictions**

Elective courses are in the range of 420-699 and must be from the school of CTI. Credit for courses taken outside of the school will only be given if approved by a faculty advisor. Courses suggested for any Prerequisite Phase in any concentration do not count for elective credit. 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.

## HUMAN COMPUTER INTERACTION

**T**he Human-Computer Interaction (HCI) master's degree program focuses on the rapidly growing discipline called Human-Computer Interaction. HCI practitioners are involved in the design, implementation, and evaluation of computer interfaces that are accessible and easy for people to use. This degree integrates courses in computer science, graphic design, psychology, and Human-Computer Interaction to provide a broad understanding of the discipline. The program has five phases, with each phase preparing the student for the subsequent phase.

The master's degree program consists of:

- **Prerequisite Courses**
- **Fundamentals Courses**
- **Core Courses**
- **Advanced Phase Courses**
- **Capstone Course**

Upon acceptance into the master's degree program, the student will meet with a faculty advisor to discuss Prerequisite courses. The Prerequisite courses are intended to ensure that all students enter graduate courses with an equivalent background. The Fundamental courses offer knowledge in the multiple disciplines that contribute to HCI. Students in the Core courses acquire an understanding of the technological and theoretical foundations, and the Advanced Phase provides students the opportunity to study specialized topics in greater depth. This phase adds depth to the work completed in the previous phases. The degree culminates in the experience of the Capstone Course where students take a real-life problem from design through implementation and usability testing.

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 or higher will graduate with distinction.

### **Prerequisite Courses**

The courses in the Prerequisite Phase for the MS in Human-Computer Interaction are listed below. Students who intend to take implementation courses at the graduate level are encouraged to take CSC 212 and the graduate-level database course (CSC 449).

IT 130 The Internet and the Web  
IT 223 Data Analysis  
CSC 211 Programming in Java I  
\*CSC 212 Programming in Java II  
or IT 240 Introduction to Desktop Databases  
IT 236 User Interface Development  
HCI 402 Foundations of Digital Design

\*In place of CSC 211 and CSC 212, students may take CSC 396. CSC 224 is also a substitute for CSC 211 and 212 if students have prior programming experience.

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be

waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Fundamentals Courses**

Students should complete their Prerequisite courses before beginning the Fundamental courses. However, while completing the Prerequisite courses, students may take Fundamental courses with consent of their faculty advisor. The Fundamental courses for the MS in Human-Computer Interaction are:

HCI 440 Introduction to Human-Computer Interaction  
HCI 450 Foundations of Human-Computer Interaction  
HCI 470 Digital Page Formatting I

### **Core Courses**

Students must complete all Prerequisite courses and should complete all Fundamental courses before taking Core courses. The Core courses are:

HCI 430 Prototyping and Implementation  
HCI 445 Analysis and Design for Hci  
HCI 460 Usability Evaluation Methods  
HCI 471 Digital Page Formatting II

### **Advanced Phase Courses**

Students must complete four courses either from the HCI offering or from the courses listed below, plus one advisor-approved elective from the School of CTI. All advanced phase courses in CTI must be numbered 420 or higher.

### **The HCI offering includes: ( but is not limited to )**

HCI 422 Multimedia  
HCI 432 User-centered Web Development  
HCI 511 Designing for Disabilities  
HCI 530 Usability Issues for Handheld Devices  
HCI 590 Topics in Human-Computer Interaction

### **Non-HCI Advanced phase courses open to all HCI graduate students**

CSC 423 Data Analysis and Regression  
CSC 424 Advanced Data Analysis  
CSC 428 Data Analysis for Experimenters  
CSC 449 Database Technologies  
CSC 451 Database Design  
CSC 587 Cognitive Science  
ECT 433 Survey of Web Programming Technologies  
ECT 455 E-Commerce Web Site Engineering  
ECT 480 Intranets and Portals  
ECT 586 Customer Relationship Management Technologies  
IS 450 Enterprise System Implementation.  
IS 456 Knowledge Management Systems  
IS 511 Social Issues of Computing  
IS 512 Groupware and Virtual Collaboration  
ITS 427 Information Processing Models of Learning  
ITS 431 Instructional Delivery and Course Management Systems  
ITS 560 Information Technology Training and User Support  
PSY 402 Perceptual Processes  
PSY 404 Learning and Cognitive Processes  
PSY 473 The Psychology of Judgment and Decision- Making  
PSY 557 Seminar in Learning and Cognitive Processes

PSY 680 Industrial and Organizational Psychology  
SE 477 Software and Systems Project Management

**Advanced phase courses open to students who have taken CSC 212**

GPH 425 Survey of Computer Graphics  
GPH 438 Computer Animation Survey  
SE 430 Object Oriented Modeling

**Capstone Course**

HCI 594 Human-Computer Interaction Capstone



## INFORMATION SYSTEMS

**T** The master's degree program in Information Systems (IS) provides flexible, modularized advanced training in IS design and management. Today organizations expect IS professionals to be competent in both breadth and depth of IT solutions. Students in this program are not only exposed to the breadth of information technologies (IT) but can also attain multiple competencies as IS professionals. With numerous competencies available, a student can choose those competencies that best meet current and future career plans. Future career possibilities include systems analysts, business analysts, IS managers, project leaders, IT consultants, database designers, enterprise systems integrators, IT architects, e-business systems developers, and network designers, who can integrate people, process, and organization to provide cutting-edge IT solutions.

The program follows a four-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- **Prerequisite Phase**
- **Foundation Phase**
- **Advanced Phase**
- **Capstone Course**

Upon acceptance into the master's degree program, the student will meet with a faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted master's student.

After the Prerequisite Phase, the student will complete 13 graduate level courses to meet degree requirements. In the Foundation Phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree with eight courses. This phase adds depth to the work completed in the Foundation Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor. The student finishes the MS program with IS 577, the capstone course

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 or higher will graduate with distinction.

### **Prerequisite Phase**

CSC 211 Programming in Java I

CSC 212 Programming in Java II

or CSC 224 Java for Programmers

or CSC 396 Programming in Java I and II

IT 215 Analysis and Design Techniques

ECT 310 Internet Application Development

CSC 224 is equivalent to both CSC 211 and CSC 212. Only students with experience in programming languages should take CSC 224.

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be

waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Knowledge Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Foundation Phase**

Fully admitted students in the Foundation Knowledge phase may register for a maximum of four Advanced phase courses. The Foundation Knowledge phase courses for the MS in Information Systems are:

CSC 451 Database Design  
ECT 425 Technical Fundamentals of Distributed Information Systems  
IS 425 Enterprise Information  
SE 430 Object Oriented Modeling

### **Advanced Phase**

Advanced Phase (8 elective courses, at least three are 500-level courses)

The advanced phase is designed to meet a student's career goals in Information Systems. With numerous predefined competency modules, a student can gain expertise in more than one area. There are two choices open to a student:

The student may attain two or more competencies, by taking at least four courses listed under each competency module. Because some courses, such as IS 556 (project management), are shared by several modules, it is possible to attain more than two competencies. A student should pick competencies based on their career goals and preferences. For example, a student can pick Application Development and Project Management for a career as project manager or a student can pick E-Business Systems and Enterprise Systems Integration for a career as a web enterprise systems integrator.

If a competency does not exist that meets a student's career plans, a student can also design a personal breadth competency consisting of a maximum of 8 courses with advisor approval.

### **Capstone Course (required)**

IS 577 Information Systems Capstone

### **Advanced Electives**

#### **IT Management Oriented [mn]**

mn1. IT Project Management I  
mn2. IT Project Management II  
mn3. IT Planning and Global Strategies  
mn4. Legal & Social Issues  
mn5. IT Regulatory Compliance

#### **Internet Oriented [in]**

in1. Internet Application Development  
in2. Wireless/Mobile Applications

#### **Design/Development Oriented [dd]**

dd1. Application Development  
dd2. Software Engineering  
dd3. e-Business Systems  
dd4. HCI Methods  
dd5. Enterprise Systems Integration

**Data Oriented [do]**

- do1. Database Design I
- do2. Database Design II
- do3. Data Mining & Analytics
- do4. Knowledge Management

**Infrastructure Oriented [if]**

- if1. Network Design
- if2. Information Assurance & Security Design
- if3. IT Architecture Design

## IT Management Oriented [mn]

## mn1. IT Project Management I

- IS 483 Information Services and Operations
- IS 512 Groupware and Virtual Collaboration
- IS 535 IT Investment Financial Analysis
- IS 556 Enterprise Project Management
- IS 560 Enterprise Systems
- IS 570 Enterprise System Implementation.
- SE 433 Software Testing
- SE 468 Software Measurement/Project Estimation
- SE 477 Software and Systems Project Management
- ACC 500 Financial Accounting (Kellstadt Graduate School of Business)
- MGT 500 Behavior in Organizations (Kellstadt Graduate School of Business)

## mn2. IT Project Management II

- ECT 556 Enterprise Architecture and Design
- ECT 589 E-Commerce Technology Capstone
- IS 511 Social Issues of Computing
- IS 533 Security Management & Compliance
- IS 556 Enterprise Project Management
- IS 565 It Outsourcing
- IS 578 Information Technology Consulting
- SE 529 Software Risk Management
- MGT 562 Resolving Conflict in Organizations (Kellstadt Graduate School of Business)
- MGT 563 Negotiation Skills (Kellstadt Graduate School of Business)

## mn3. IT Planning and Global Strategies

- ECT 556 Enterprise Architecture and Design
- ECT 565 Mobile Enterprise
- ECT 589 E-Commerce Technology Capstone
- IS 483 Information Services and Operations
- IS 512 Groupware and Virtual Collaboration
- IS 535 IT Investment Financial Analysis
- IS 540 Global Information Technology
- IS 560 Enterprise Systems
- IS 577 Information Systems Capstone
- IT 599 Topics in Global Information Technology
- ACC 500 Financial Accounting (Kellstadt Graduate School of Business)
- MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)

## mn4. Legal &amp; Social Issues

- ECT 585 Legal Aspects of E-Commerce
- IS 433 Information Security Management (formerly IS 572)
- IS 482 Legal Aspects of Information Technology
- IS 511 Social Issues of Computing

IS 565 It Outsourcing  
IS 570 Enterprise System Implementation.  
IT 599 Topics in Global Information Technology  
TDC 569 Telecommunication Regulation, Policy, Law and Standards

mn5 IT Regulatory Compliance

CNS 477 Legal Issues in Information Assurance  
IS 433 Information Security Management (formerly IS 572)  
IS 505 Business Continuity and Disaster Recovery  
IS 533 Security Management & Compliance  
IS 535 IT Investment Financial Analysis  
IS 556 Enterprise Project Management  
IS 560 Enterprise Systems

Internet Oriented [in]

in1. Internet Application Development

ECT 455 E-Commerce Web Site Engineering  
ECT 556 Enterprise Architecture and Design  
ECT 557 Peer-To-Peer Technology  
ECT 583 Advanced Scripting Technologies  
ECT 588 E-Marketplace Technology  
ECT 590 E-Business Technology Practicum  
HCI 440 Usability Engineering  
IS 556 Enterprise Project Management  
SE 560 Structured Document Interchange and Processing

in2. Wireless/Mobile Applications

ECT 455 E-Commerce Web Site Engineering  
ECT 565 Mobile Enterprise  
ECT 587 Mobile Commerce Technology  
HCI 440 Usability Engineering  
HCI 530 Usability Issues for Handheld Devices  
SE 540 Software Development for Mobile and Wireless Systems

Design/Development Oriented [dd]

dd1. Application Development

ECT 455 E-Commerce Web Site Engineering  
ECT 557 Peer-To-Peer Technology  
ECT 565 Mobile Enterprise  
ECT 583 Advanced Scripting Technologies  
ECT 587 Mobile Commerce Technology  
HCI 440 Usability Engineering  
IS 565 It Outsourcing  
IS 570 Enterprise System Implementation.  
SE 433 Software Testing  
SE 470 Software Development Processes  
SE 482 Requirements Engineering  
SE 560 Structured Document Interchange and Processing

dd2. Software Engineering

ECT 556 Enterprise Architecture and Design  
IS 556 Enterprise Project Management  
SE 425 Principles and Practices of Software Engineering  
SE 450 Object-Oriented Software Development  
SE 452 Object-Oriented Enterprise Computing  
SE 470 Software Development Processes  
SE 480 Software Architecture  
SE 482 Requirements Engineering  
SE 529 Software Risk Management  
SE 550 Distributed Software Development

dd3. e-Business Systems

ECT 455 E-Commerce Web Site Engineering  
ECT 480 Intranets and Portals  
ECT 481 Internet Supply Chain Management  
ECT 557 Peer-To-Peer Technology  
ECT 582 Secure Electronic Commerce  
ECT 583 Advanced Scripting Technologies  
ECT 587 Mobile Commerce Technology  
ECT 589 E-Commerce Technology Capstone  
ECT 590 E-Business Technology Practicum  
IS 535 IT Investment Financial Analysis  
IS 556 Enterprise Project Management  
IS 560 Enterprise Systems  
IS 565 It Outsourcing  
IS 570 Enterprise System Implementation.  
MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)  
MKT 555 Decisions in Marketing Management (Kellstadt Graduate School of Business)

dd4. HCI Methods

ECT 557 Peer-To-Peer Technology  
ECT 587 Mobile Commerce Technology  
HCI 430 Prototyping and Implementation  
HCI 440 Usability Engineering  
HCI 445 Inquiry Methods and Use Analysis  
HCI 450 Foundations of Human-Computer Interaction  
HCI 454 Interaction Design  
HCI 460 Usability Evaluation Methods  
IS 421 Information Systems Analysis

dd5. Enterprise Systems Integration

ECT 480 Intranets and Portals  
ECT 481 Internet Supply Chain Management  
ECT 556 Enterprise Architecture and Design  
ECT 565 Mobile Enterprise  
ECT 584 Web Data Mining for Business Intelligence  
ECT 586 Customer Relationship Management Technologies  
IS 535 IT Investment Financial Analysis  
IS 549 Data Warehousing and Data Mining  
IS 556 Enterprise Project Management  
IS 560 Enterprise Systems  
MGT 501 Strategic Supply Chain Mgt. (Kellstadt Graduate School of Business)

Data Oriented [do]

do1. Database Design I

CSC 449 Database Technologies  
CSC 451 Database Design  
CSC 452 Database Programming  
CSC 454 Database Administration and Management  
IS 549 Data Warehousing and Data Mining

do2. Database Design II

CSC 543 Spatial Databases and GIS  
CSC 550 Object-Oriented Databases  
CSC 551 Distributed Database Systems  
CSC 553 Advanced Database Concepts  
IS 549 Data Warehousing and Data Mining  
IS 556 Enterprise Project Management

do3. Data Mining & Analytics

CSC 423 Data Analysis and Regression

ECT 480 Intranets and Portals  
ECT 584 Web Data Mining for Business Intelligence  
ECT 586 Customer Relationship Management Technologies  
IS 549 Data Warehousing and Data Mining  
IS 567 Knowledge Discovery Technologies  
IS 574 Decision Support Systems and Intelligent Systems  
MKT 555 Decisions in Marketing Management (Kellstadt Graduate School of Business)

do4. Knowledge Management

CSC 480 Foundations of Artificial Intelligence  
ECT 480 Intranets and Portals  
IS 456 Knowledge Management Systems  
IS 512 Groupware and Virtual Collaboration  
IS 574 Decision Support Systems and Intelligent Systems  
IS 575 Intelligent Information Retrieval

Infrastructure Oriented [if]

if1. Network Design

ECT 557 Peer-To-Peer Technology  
ECT 587 Mobile Commerce Technology  
TDC 460 Foundations of Communication Systems  
TDC 463 Computer Networks and Data Systems  
TDC 511 Telecommunications Practicum  
TDC 564 Local Area Networks  
TDC 567 Telecommunication Systems Design and Management

if2. Information Assurance & Security Design

CNS 477 Legal Issues in Information Assurance  
CNS 594 Computer Information and Network Security Capstone  
ECT 582 Secure Electronic Commerce  
IS 433 Information Security Management (formerly IS 572)  
IS 505 Business Continuity and Disaster Recovery  
IS 511 Social Issues of Computing  
IS 533 Security Management & Compliance  
SE 473 Security Architecture I  
SE 529 Software Risk Management  
TDC 477 Network Security  
TDC 463 Computer Networks and Data Systems

if3. IT Architecture Design

CSC 551 Distributed Database Systems  
DS 520 System Design and Implementation with Distributed Object Frameworks  
ECT 556 Enterprise Architecture and Design  
ECT 565 Mobile Enterprise  
ECT 590 E-Business Technology Practicum  
IS 535 IT Investment Financial Analysis  
IS 556 Enterprise Project Management  
SE 450 Object-Oriented Software Development  
SE 473 Security Architecture I  
SE 480 Software Architecture  
SE 554 Enterprise Component Architecture  
TDC 463 Computer Networks and Data Systems  
TDC 567 Telecommunication Systems Design and Management

**Advanced Elective Restrictions**

Elective courses are in the range of 420-699 and must be from the school of CTI. Credit for courses taken outside of the school will only be given if approved by a faculty advisor. Courses suggested for any Prerequisite Phase in any concentration do not count for elective credit. Any course required for the student's concentration but taken as part of the requirements of another degree earned by the student may be used to satisfy a competency, but cannot be used to satisfy the 8 elective course requirement.

## INSTRUCTIONAL TECHNOLOGY SYSTEMS

**T**his MS in Instructional Technology Systems program is intended for graduate students who plan to work with Instructional Technology Systems in two possible capacities: Students in the Software Design in Instructional Technology Track emerge as accomplished software engineers and programmers. They will be prepared for jobs in software design and construction at Universities and at coding shops that specialize in educational software.

Students in the Systems Integration in Instructional Technology Track emerge as accomplished systems planners, systems analysts, and systems managers. They will be prepared for jobs in instructional software systems management, or as business/systems analysts at coding shops that specialize in educational software.

The MS in Instructional Technology Systems will equip the student with the core theories and skills to advance to be the CIO or CTO of an instruction delivery organization. A primary focus of the degree is to develop practitioners at corporate training and development organizations. The degree is split into two tracks, matching the two capacities listed above.

This program is guided by several curriculum principles:

- Reflecting the eclectic and developing nature of current Internet and instructional technology design, this program does not presuppose any dominant technologies or programming languages. Rather, students will be exposed to a broad mix of technologies, programming languages and tools.
- The program is designed to adapt to rapid changes in both technology and industry norms.
- The program is designed around industry needs and based upon a long-term partnership with instructional technology leaders.
- The program is designed to provide maximum opportunities for practicum and team projects.

The program has five phases, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- **Prerequisite Courses**
- **Fundamentals Courses**
- **Advanced Phase Courses**
- **Elective Courses**
- **Capstone Course**

### **Grade and GPA requirements**

Grades: Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.

GPA: Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 will graduate with distinction.

### **Prerequisite Courses**

The courses in the Prerequisite Phase for the MS in Instructional Technology Systems:

#### **Both Tracks**

CSC 211 Programming in Java I

CSC 212 Programming in Java II

or CSC 224 Java for Programmers

or CSC 396 Programming in Java I and II

IT 223 Data Analysis

**Software Design in Instructional Technology Track**

CSC 373 Computer Systems I  
CSC 374 Computer Systems II  
CSC 383 Data Structures and Algorithms in Java

**Systems Integration in Instructional Technology Track**

IT 240 Introduction to Desktop Databases  
CNS 340 Fundamentals of Information Assurance  
IT 215 Analysis and Design Techniques  
TDC 361 Basic Communication Systems

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination ((GAE) to show competency in a prerequisite. All students are blocked from enrolling in the graduate phase of the degree prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

**Fundamentals Courses**

Students should complete their Prerequisite courses before beginning the Fundamental courses. However, while completing the Prerequisite courses, students may take Fundamental courses with consent of their faculty advisor. The Fundamental courses for the MS in Instructional Technology Systems are

**Both Tracks**

HCI 440 Usability Engineering  
HCI 460 Usability Evaluation Methods  
ITS 427 Information Processing Models of Learning  
ITS 431 Instructional Delivery and Course Management Systems  
ITS 560 Instructional Technology Training and User Support

**Software Design Track**

DS 420 Foundations of Distributed Systems I  
SE 450 Object-Oriented Software Development

**Systems Integration in Instructional Technology Track**

ITS 440 Distance Learning Technologies  
HCI 445 Analysis and Design for HCI

**Advanced Phase****Software Design in Instructional Technology Track**

Options: Pick Three from the list below:

CSC 449 Database Technologies  
CSC 457 Expert Systems  
CSC 458 Symbolic Programming  
CSC 480 Foundations of Artificial Intelligence  
CSC 578 Neural Networks and Machine Learning  
CSC 587 Cognitive Science  
DS 421 Foundations of Distributed Systems II  
DS 520 System Design and Implementation with Distributed Object Frameworks  
DS 575 Intelligent Information Retrieval  
ECT 480 Intranets and Portals  
HCI 422 Multimedia  
HCI 423 Internet Multimedia



ITS 440 Distance Learning Technologies  
ITS 584 Artificial Intelligence in Learning Environments  
SE 452 Object-Oriented Enterprise Computing  
SE 550 Distributed Software Development  
TDC 460 Foundations of Communications Systems

**Systems Integration in Instructional Technology Track**

Options: Pick Three from the list below:

CSC 423 Data Analysis and Regression  
CSC 424 Advanced Data Analysis  
CSC 428 Data Analysis for Experimenters  
ECT 425 Technical Fundamentals of Distributed Information Systems  
ECT 433 Survey of Web Programming Technologies  
ECT 480 Intranets and Portals  
HCI 422 Multimedia  
HCI 423 Internet Multimedia  
HCI 430 Prototyping and Implementation  
HCI 450 Foundations of Human-Computer Interaction  
IS 450 Enterprise System Implementation  
IS 511 Social Issues of Computing  
IS 512 Groupware and Virtual Collaboration  
IS 572 Information Security Management

**Elective Courses**

Both Tracks

Two open electives from CTI courses numbered 420-599

**Capstone Course**

Required Both Tracks

ITS 589 ITS Capstone Projects Course

## SOFTWARE ENGINEERING

**S**oftware Engineering is a discipline concerned with the practical problems of developing large-scale software systems. Software engineers are the architects of the software component of a computer-based system, providing several levels of representations or blueprints leading to specifications through which programmers build the subsystems and modules of the system. Software development methodologies and management techniques combine with theories from mathematics and computer science in a cost-effective manner to solve real-world system development problems. This degree provides students with the theoretical foundations of software engineering, experience in team projects involving software development and management, hands-on experience with state-of-the-art tools, an understanding of advanced software development and management techniques, and exposure to the most recent developments and emerging technologies in SE.

All students complete any necessary prerequisite courses plus 13 graduate courses. All students are required to participate in an extensive team software development project using cutting edge technologies and the Software Engineering Research Seminar to keep them abreast of this rapidly changing field. For this reason, they are not required to take a Core Knowledge Examination. However, to be admitted into the program, they need to have demonstrated through their prior coursework that they can consistently perform at a B level or higher. Students complete the requirements of one of the three concentrations: Project Management, Software Development, or Software Systems.

The Project Management Concentration of the Master of Science in Software Engineering addresses the management of the quality of software products and processes and provides coursework in management and measurement techniques.

The Software Development Concentration of the Master of Science in Software Engineering addresses the foundations, methodologies, and tools for developing high quality large-scale software systems, with an emphasis on the technical issues of software development.

The Software Architecture Concentration of the Master of Science in Software Engineering addresses the management and design of large-scale or enterprise-level software systems solutions. Emphasis is on integrating and balancing the needs and expectations of all stakeholders in the system, including customers, developers, and end users.

The Gaming and Entertainment Technologies Concentration of the Master of Science in Software Engineering addresses the foundations, methodologies, and tools for developing large-scale computer games and entertainment software systems. The emphasis is placed on the software architecture of such systems and their main components such as physics engines, artificial intelligence modules, and communication subsystems, etc.

The Software Engineering program has two phases:

- **Prerequisite Phase**
- **Graduate Phase**

The Prerequisite Phase ensures that all students acquire the necessary background prior to enrolling in graduate courses. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. In the Graduate Phase, students develop as software engineering professionals by completing required courses that provide a common body of knowledge for their concentration as well as advanced courses that complement and add depth to the common body of knowledge. All students also participate in an extensive team software development project and the Software Engineering Research Seminar. Individual needs are addressed through elective courses chosen in consultation with a faculty advisor.

### **Grade and GPA requirements**

Students in this degree program must complete 13 courses (52 hours) beyond the Prerequisite Phase. Successful completion of the Software Engineering Program consists of:

- Students must receive a grade of B- or better in each prerequisite course and a C- or better in all other courses.
- Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree.
- Students will not be approved for graduation with less than a 2.50 GPA.
- Students with a GPA of 3.9 or higher and a grade of A in SE681, SE696 or SE698 will graduate with distinction.

### **Prerequisite Phase for Project Management, Software Development and Software Architecture**

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
CSC 373 Computer Systems I  
CSC 374 Computer Systems II  
CSC 383 Data Structures and Algorithms in Java

### **Prerequisite Phase for Gaming and Entertainment Technologies**

GAM 224 Strategies in Game Design  
CSC 211 Programming in Java I  
    and CSC 212 Programming in Java II  
    or CSC 224 Java for Programmers  
    or CSC 396 Programming in Java I and II  
CSC 373 Computer Systems I  
CSC 374 Computer Systems II  
CSC 383 Data Structures and Algorithms in Java  
    or CSC 393 Data Structures in C++

### **Graduate Phase**

Students may register for graduate courses only after meeting all Prerequisite Phase requirements. The graduate phase consists of the following components:

- **Foundation Phase**
- **Advanced Phase**
- **Elective Phase**
- **Software Engineering Studio or Capstone**
- **One of the following options\***
  - **Professional Option**
  - **Research Option\*\***

\*Gaming and Entertainment Technologies has a capstone instead of a studio

\*\*Software Development and Project Management students only.

\*\*\* Software Architecture students may pursue a research option if they select these courses as electives.

**Foundation Phase – All Concentrations**

SE 425 Principles and Practices of Software Engineering  
SE 430 Object Oriented Modeling  
SE 450 Object-Oriented Software Development

**Additional Courses Required in Gaming and Entertainment Technologies**

Offered Fall  
SE 456 Architecture of Computer Games  
HCI 440 Usability Engineering  
GPH 425 Survey of Computer Graphics

**Advanced Phase**

**Software Development Concentration**

Required  
SE 431 Formal Software Specification and Development I

Two of the following:

SE 473 Security Architecture I  
SE 480 Software Architecture  
SE 435 Foundations of Distributed Systems I  
SE 552 Concurrent Software Development

**Project Management Concentration**

Required  
SE 477 Software and Systems Project Management

Two of the following:

SE 468 Software Measurement/Project Estimation  
SE 470 Software Development Processes  
SE 482 Requirements Engineering  
SE 529 Software Risk Management

**Software Architecture Concentration**

Required:  
ECT556 Enterprise Architecture and Design  
HCI 440 Usability engineering  
SE 480 Software architecture  
SE 482 Requirements Engineering  
SE 477 Software and Systems Project Management

One of:

IS 482 Legal aspects of IT  
IS 572 Information Security Management  
IS 560 Enterprise Systems  
SE 468 Software Measurement/Project Estimation  
SE 470 Software Development Processes  
SE 529 Software Risk Management

Gaming and Entertainment Technologies Concentration  
Required

SE 556 Advanced Architecture of Computer Games

One of the following:

GAM 476 Artificial Intelligence for Computer Games  
SE 558 Architecture and Design for Multiplayer Games  
CSC 480 Foundations of Artificial Intelligence  
CSC 578 Neural Networks and Machine Learning

Two of the following:

SE 435 Foundations of Distributed Systems I  
SE 473 Security Architecture I  
SE 477 Software and Systems Project Management  
SE 552 Concurrent Software Development  
SE 550 Distributed Software Development  
SE 542 Software Development for Limited and Embedded Devices  
TDC 463 Computer Networks and Data Systems  
TDC 573 Multimedia Networking  
SE 435 Foundations of Distributed Systems I  
SE 535 Foundations of Distributed Systems II  
GAM 476 Artificial Intelligence for Computer Games  
SE 558 Architecture and Design for Multiplayer Games  
CSC 480 Foundations of Artificial Intelligence  
CSC 578 Neural Networks and Machine Learning

### **Elective Phase**

Elective courses are in the range of 420-699, not including SE 465 and must be from the school of CTI. Credit for courses taken outside of the school will only be given if approved by a faculty advisor. Courses suggested for any Prerequisite Phase in any concentration do not count for elective credit. 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.

### **Software Development and Project Management**

- Two SE graduate level classes. CSC 447 and/or CSC 491 may be substituted for one or both of these electives.
- One CTI elective. See elective course restrictions below.
- At least one of the electives must be 500 level.

### **Software Architecture Concentration**

- Two SE courses or courses listed in the Advanced Phase of any concentration.
- One CTI elective.
- At least one of the electives must be 500 level.

### **Gaming and Entertainment Technologies Concentration**

Two CTI elective courses in the range of 420-699, at least one SE.

### **Software Engineering Studio or Capstone Phase**

Students in all concentrations are required to complete the following:

Students in the Software Development and Project Management concentrations are required to complete the following:

SE 491 Software Engineering Studio  
SE 591 Software Engineering Studio II

These two courses must be taken as a sequence in consecutive quarters. Students will be working on a large, real project in a team. The project will be carried out from conceptualization to completion using the current technologies.

Students in the Software Architecture concentration are required to complete

SE 491 Software Engineering Studio  
Or ECT 589 E-Commerce Technology Capstone

### **Software Development Professional Option**

Students in the Software Development Concentration:

SE 477 Software and Systems Project Management

### **Students in the Project Management Concentrations:**

- one course listed in the Advanced Phase of either Software Development or Project Management concentration or any SE course above 500.

All students taking the Software Engineering Professional option must complete the following course:

SE 681 Software Engineering Professional Practices

### **Students in the Gaming and Entertainment Technology concentration are required to complete**

One of the following:

GAM 594 Gaming and Entertainment Technology Capstone  
SE 491 Software Engineering Studio  
SE 696 Master's Project  
SE 698 Master's Thesis

### **Research Option**

Students taking the research option must take the following course:

SE 690 Research Seminar

Students must also complete one of the following:

SE 696 Master's Project  
SE 698 Master's Thesis

SE 698 Masters Thesis is a two-credit hour course. Students must register for this course a minimum of two times and must continue to enroll in the course in every quarter after the first quarter until the thesis is completed to the satisfaction of their advisor. A maximum of four credit hours will apply for degree credit.

The Master's project or thesis must represent an original contribution to the area, and may include system development, empirical studies, or theoretical work. The scope and the details of the research project will be determined by the research supervisor, and must be approved by the student's academic advisor.

### **Elective Course Restrictions**

Elective courses are in the range of 420-699, not including SE 465 and must be from the school of CTI. Credit for courses taken outside of the school will only be given if approved by a faculty advisor. Courses suggested for any Prerequisite Phase in any concentration do not count for elective credit. Any course required for the students 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.

## TELECOMMUNICATIONS

**T**he MS in Telecommunications Systems offers extensive theoretical and practical knowledge in voice and data communications networks. Students completing this degree program have a thorough understanding of the technical and operational aspects of networks as well as the foundational theory of voice and data communications and network management.

The program follows a three-phase sequence, with each phase preparing the student for the subsequent phase. The master's degree program consists of:

- **Prerequisite Phase**
- **Foundation Phase**
- **Advanced Phase**

Upon acceptance into the master's degree program, the student will meet with their faculty advisor to discuss required courses for the Prerequisite Phase. The Prerequisite Phase is intended to ensure that all students enter graduate courses with an equivalent background. While completing this phase, a student is considered a conditionally admitted master's student. In the Foundation phase, a student will follow a sequence of courses to acquire an understanding of the technological and theoretical foundations for the particular degree. In the Advanced Phase of the program, the fundamental information learned previously allows a student to study advanced topics within their chosen degree. This phase adds depth to the work completed in the Foundation Phase. Individual interests and needs are also addressed through a series of elective courses chosen in consultation with the student's faculty advisor.

### **Grade and GPA requirements**

**Grades:** Students must receive a grade of B- or better in each Prerequisite and Foundation Phase course and a C- or better in all other courses..

**GPA:** Students must maintain a graduate level GPA of 2.50 or higher while pursuing their degree. Students will not be approved for graduation with less than a 2.50 GPA. Students with a GPA of 3.90 will graduate with distinction.

### **Prerequisite Phase**

CSC 211 Programming in Java I  
or CSC 261 Programming Languages I: C/C++  
or any more advanced programming course  
IT 223 Data Analysis  
CSC 202 Mathematics for Computer Science  
TDC 311 Computers in Telecommunications Systems  
or CSC 374 Computer Systems II  
TDC 361 Basic Communication Systems

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Prerequisite Phase. All or part of the Prerequisite Phase may be waived if a student has the equivalent academic background. Alternatively, students with practical experience may complete a Graduate Assessment Examination (GAE) to show competency in a prerequisite. All students are blocked from enrolling in Foundation Phase courses prior to completing their prerequisites. The student must submit an online Change of Status request when the Prerequisite Phase is completed to inform the Student Services offices that the block can be removed. The online request must be submitted two weeks before the student intends to register for graduate level classes. The student will then be considered a fully admitted student, and may pass to the Graduate Phase of the program. Students may submit the Change of Status request by logging in to MyCTI.

### **Foundation Phase**

Fully admitted students in the Core Knowledge phase may register for a maximum of four Advanced phase courses. The Core Knowledge Phase courses for the MS in Telecommunications are:

TDC 460 Fundamentals of Communication Systems  
TDC 463 Computer Networks  
TDC 464 Voice Communication Networks

By taking these courses and receiving a grade of a B- or better in each, the student will have completed the requirements of the Foundation Phase. If a student receives a grade below B- but better than or equal to C- for a Foundation Phase course, the student is given an option to take a course-specific core competency exam to pass the failed course. If the student fails the exam, the student must retake the failed course. The student can take an exam only once for each failed course. There is no other core examination in the Foundation Phase.

### **Advanced Phase**

A student must complete 40 credits (10 courses) in the Advanced Phase to earn the MS in Telecommunication Systems. All courses in the Advanced Phase must be completed with a grade of C- or better.

TDC 511 Telecommunications Systems  
TDC 567 Telecommunications System Design and Management

- Five TDC courses from the range TDC 430 to TDC 599, where at least *three are numbered above 500*.
- Students must also complete three open electives.

### **Elective Course Restrictions**

Elective courses are in the range of 420-699 and must be from the school of CTI. Credit for courses taken outside of the school will only be given if approved by a faculty advisor. Courses suggested for any Prerequisite Phase in any concentration do not count for elective credit. 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.



## JURIS DOCTORATE AND MASTER OF ARTS

**T**he general objective of the joint JD/MA degree program at DePaul University College of Law Center for Intellectual Property Law & Information Technology (CIPLIT®) and its School of Computer Science, Telecommunications and Information Systems (CTI) is to offer law students the opportunity to acquire technology knowledge that will support them in their work in information technology law, intellectual property law, or patent law. This joint degree accommodates JD students without a technical or scientific background who are interested in intellectual property by offering a depth of knowledge and ability to communicate in technical terms. These tools are invaluable, as future intellectual property lawyers will require at a minimum a general understanding of computer and information systems, given the prominence of cyber- and telecommunications issues in today's legal practice. The JD/MA also accommodates JD students with technical or scientific backgrounds who may be interested in a broad-based exposure to computer or information systems. Where the JD/MS degree offers students an in-depth approach to specific computer science or information systems topics, the JD/MA presents a broader view that will prepare graduates of the joint degree program to interact successfully with clients and experts in computer-related fields.

### **Characteristics of the program include:**

- This joint degree is designed to provide intensive technological training to students with non-technical backgrounds who wish to pursue legal careers focused on high technology.
- Some students may wish to use the JD/MA program as a means to fulfill the technical education requirements for the patent bar exam. Such students will need to consult closely with faculty advisors in both Schools and to contact the USPTO for specific eligibility requirements.
- It is expected that most students who pursue this joint degree will also obtain a Certificate in Intellectual Property: General, Intellectual Property: Patent or Information Technology from the law school.
- This program simultaneously offers a variety of curriculum options encompassing key technological topics along with legal courses which prepare the student for transactional and/or litigation work.

### **In this program, students will acquire:**

- An in-depth understanding of the legal issues that confront present and future technologies.
- An understanding of legal principles and application of those principles to a growing number of legal issues facing technology
- A broad exposure to current IT theory and practices including telecommunication and data communication fundamentals, database, computer and network security, B2C e-commerce technologies, object-oriented concepts, and client server architecture.

### **Course Requirement Reductions in the Joint Degree Program:**

- Joint degree students may substitute up to 8 law semester hours in place of up to 3 CTI master's degree courses, reducing their CTI course requirements to 10 courses plus any necessary prerequisite coursework. Courses to be substituted must be selected from the elective and required courses for the College of Law certificates in Intellectual Property: General, Intellectual Property: Patent and Information Technology. Please see the certificate pages on the College of Law website for lists of qualifying courses.
- Joint degree students may substitute up to 15 CTI credit hours in place of up to 10 of the 86 required law semester hours, reducing their law course requirements to 76 semester hours. Only CTI courses taken after enrollment in the College of Law may be substituted for law courses.
- Joint degree students may not substitute CTI credit hours for required courses in the College of Law, such as the Professional Responsibility and Senior Seminar courses

- Joint degree students must graduate from both schools on the same date, in the same semester/quarter, and in the same year. Double counting of credit hours occurs only after the student concurrently completes both degree programs. Students should consult with the joint degree advisors regarding any questions about coordinating the completion of the two degrees.

### **Admission Procedures and Requirements**

Admission to this joint program requires: (1) completion with a 3.0 grade point average or better of the first-year required courses in the JD program at the DePaul University College of Law (part-time students must have completed three semesters) and (2) acceptance to CTI. Students should indicate their interest in the joint degree program when applying to CTI.

Application to the joint degree program should be made to Assistant Dean Diana White at the College of Law after the above requirements have been met. Applicants should submit a letter indicating their intent to apply for the joint degree program along with a copy of their first year (or first three semesters for part-time students) law grades demonstrating compliance with the 3.0 grade point average requirement. Students are encouraged to make an appointment with Dean White to discuss their joint degree applications and plans for pursuing the joint degree.

Application to CTI may be made at any time, but law students will ordinarily find it most advantageous to apply to CTI after receiving first-year law grades (ordinarily in early July following the first year.) Students accepted into the joint JD/MA Program must meet the CTI prerequisite phase course requirements for the MA degree, either through their undergraduate coursework or by adding a prerequisite phase to their joint degree program. Students who need to take prerequisite courses during their pursuit of the joint degree may require more than four years from admission to Law School to complete the Joint Degree. It is highly recommended that law students interested in the joint degree program contact Prof. Danny Mittleman or Prof. Curt White at CTI to discuss their individual circumstances before applying to CTI.

Transfer students or students who have enrolled in CTI before applying to the College of Law should consult with the joint degree program advisors to determine how their special circumstances may affect their qualifications for the joint degree.

Further information about admission requirements and procedures may be found in the general description of Admission Requirements for Joint Degrees found on the College of Law website under Academic Programs.

### **Financial Considerations:**

- Joint degree students will pay on a per-credit-hour basis in both the College of Law and CTI
- Because the joint degree program permits double-counting of coursework, the total cost for the two degrees will be significantly lower under the joint degree program
- Admission to the joint degree program will ordinarily not affect College of Law scholarship awards. However, students should consult with Dean White about their specific scholarships
- Financial aid recipients must consult with Clare Timm at the financial aid office to obtain a revised (often increased) financial aid award based on their participation in the joint degree program

### **Sample Law School/CTI four-year course plan**

The student must complete the regular first year JD program before being admitted to the Joint Degree. The second and third years might consist of three law courses in Fall Semester and two law courses in Spring Semester as well as one CTI course Fall Quarter, two CTI courses Winter Quarter, and two CTI courses Spring Quarter. The fourth year might consist of three law courses Fall Semester, one CTI course Fall Quarter, three CTI courses Winter Quarter, and three CTI courses Spring Quarter. This schedule allows for completion of the JD as well as completion of 14 CTI courses (the MS program plus four prerequisite courses). It is possible that, because of prerequisite coursework, the program may take some students more than four years.

Since each student will require a different number of CTI prerequisites and each student will select courses based on semester/quarter availability, any particular curriculum might be

different from the sample curriculum shown. All joint degree students will be encouraged to select courses with the assistance of Joint Degree program advisors at both the Law School and CTI.

### **Prerequisite Phase**

The Prerequisite Phase is intended to insure that all students enter CTI coursework with adequate preparation for successful work. Students may receive waivers for the Prerequisite Phase based on prior experience, previous coursework, or performance on a Graduate Assessment Examination (GAE). The following coursework constitutes the Prerequisite Phase:

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
IT 263 Applied Networks and Security

### **Graduate Phase**

The following coursework is required in the Graduate Phase:

ECT 425 Technical Fundamentals of Distributed Information Systems  
CSC 449 Database Technologies  
ECT 433 Survey of Web Programming Technologies  
ECT 455 E-Commerce Web Site Engineering  
IS 425 Enterprise Information  
IS 511 Social Issues of Computing  
TDC 572 Network Security  
or ECT 582 Secure Electronic Commerce

Two CTI elective courses [numbered 420-599] for which the student has completed adequate prerequisites.

### **Culminating Thesis**

The Culminating Thesis is an independent research article that demonstrates a student's ability to integrate both technical expertise and legal knowledge. Normally, it is undertaken during the student's final year in the Joint Degree program.

In this work, the student is guided and assessed by a Committee of three faculty, at least one of whom is fulltime at CTI and at least one of whom is fulltime at the College of Law. It is the responsibility of the student to find an advisor (Committee Chair) and assemble this committee.

The Masters Thesis will use the course number IT 698. It may be taken for two or four credits per quarter. 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 thesis to the satisfaction of their committee. They earn two hours of credit for each such registration but only four hours of credit will apply for degree credit.

### **Electives**

12 additional quarter hours fulfilled by courses from the IP Certificate courses. These courses will also be counted toward the JD degree.

### **Joint Degree Program Advising and For Further Information**

Students are encouraged to consult with the following advisors regarding their participation in the joint degree program:

- Assistant Dean Diana White - College of Law - [dwhite@depaul.edu](mailto:dwhite@depaul.edu) - For questions regarding administrative aspects of the joint degree and College of Law programs
- Professor Katherine Strandburg - College of Law - [kstrandb@depaul.edu](mailto:kstrandb@depaul.edu) - For questions regarding substantive aspects of the College of Law IP and IT programs
- Professor Danny Mittleman - CTI - [danny@cs.depaul.edu](mailto:danny@cs.depaul.edu) - For questions regarding substantive aspects of the CTI program
- Professor Curt White - CTI - [cwhite@cs.depaul.edu](mailto:cwhite@cs.depaul.edu) - For questions regarding substantive aspects of the CTI program

## JURIS DOCTORATE AND MASTER OF SCIENCE

**T**he primary goal of the joint degree JD/MS program at DePaul University College of Law Center for Intellectual Property Law & Information Technology (CIPLIT®) and its School of Computer Science, Telecommunications and Information Systems (CTI) is to educate students to take advantage of the opportunities presented by the legal needs of industry in this high technology age. A critical need exists for patent attorneys in the high-tech field who have a substantive understanding of IT as well as for attorneys, who need not be members of the patent bar, to provide client counseling or litigation services in the information technology field. Graduates of the joint degree program will be qualified for careers in intellectual property boutique law firms, in general practice firms with clients in the high technology field, as in-house counsel in the high technology industry, and in government agencies dealing with high technology regulation.

Many of the students completing the joint JD/MS degree will choose to join the Patent Bar. The technical education provided by the MS part of the program will help to qualify them for the patent bar exam. However, in today's society, members of the Patent Bar are not the only attorneys who need technological expertise for successful legal practice. Many patent litigators are not members of the patent bar, yet must become intimately familiar with the technological bases for their clients' litigation positions. Trademark attorneys face infringement and prosecution issues related to domain names and Internet websites. Copyright attorneys are frequently exposed to issues of protection for computer software and Internet website content. Even lawyers who do not specialize in intellectual property law frequently face computer-related issues, as such questions arise more and more frequently in "bread-and-butter" disputes between companies immersed in high technology.

The JD/MS program is primarily aimed at students with undergraduate scientific or technical degrees or with other substantial technological or scientific background who wish to deepen their technical expertise while also obtaining a law degree.

Characteristics of the program include:

- It is designed to provide a curriculum for students with significant undergraduate technological background who wish to pursue advanced studies in Computer Science, Telecommunications, and Information Systems jointly with their legal studies.
- It offers a variety of curriculum options encompassing key technological topics along with legal courses which prepare the student for transactional and/or litigation work.
- It is expected that most students who pursue this joint degree will also obtain a Certificate in Intellectual Property: General, Intellectual Property: Patent or Information Technology from the law school.
- It is expected that most students who pursue the JD/MS degree will already be qualified to sit for the patent bar exam. Students who need to "make up" some patent bar exam requirements may be able to pursue that goal as part of this program

**In this program, students will acquire:**

- An in-depth understanding of the legal issues that confront present and future technologies.
- An understanding of legal principles and application of those principles to a growing number of legal issues facing technology
- Core knowledge in a particular technology discipline
- In-depth fluency with state-of-the-art technologies and IT principles.

**Course Requirement Reductions in the Joint Degree Program:**

- Joint degree students may substitute up to 8 law semester hours in place of up to 3 CTI master's degree courses, reducing their CTI course requirements to 10 courses plus any necessary prerequisite coursework. Courses to be substituted must be selected from the elective and required courses for the College of Law certificates in Intellectual Property: General, Intellectual Property: Patent and Information Technology. Please see the

- certificate pages on the College of Law website for lists of qualifying courses.
- Joint degree students may substitute up to 15 CTI credit hours in place of up to 10 of the 86 required law semester hours, reducing their law course requirements to 76 semester hours. Only CTI courses taken after enrollment in the College of Law may be substituted for law courses.
  - Joint degree students may not substitute CTI credit hours for required courses in the College of Law, such as the Professional Responsibility and Senior Seminar courses
  - Joint degree students must graduate from both schools on the same date, in the same semester/quarter, and in the same year. Double counting of credit hours occurs only after the student concurrently completes both degree programs. Students should consult with the joint degree advisors regarding any questions about coordinating the completion of the two degrees.

### **Admission Procedures and Requirements**

Admission to this joint program requires: (1) completion with a 3.0 grade point average or better of the first-year required courses in the JD program at the DePaul University College of Law (part-time students must have completed three semesters) and (2) acceptance to CTI. Students should indicate their interest in the joint degree program when applying to CTI.

Application to the joint degree program should be made to Assistant Dean Diana White at the College of Law after the above requirements have been met. Applicants should submit a letter indicating their intent to apply for the joint degree program along with a copy of their first year (or first three semesters for part-time students) law grades demonstrating compliance with the 3.0 grade point average requirement. Students are encouraged to make an appointment with Dean White to discuss their joint degree applications and plans for pursuing the joint degree.

Application to CTI may be made at any time, but law students will ordinarily find it most advantageous to apply to CTI after receiving first-year law grades (ordinarily in early July following the first year.) Students must declare a specific MS degree upon application to CTI and meet the CTI prerequisite phase course requirements for that degree, either through their undergraduate coursework or by adding a prerequisite phase to their joint degree program. Students who need to take prerequisite courses during their pursuit of the joint degree may require more than four years from admission to law school for completion of the joint degree. It is highly recommended that law students interested in the joint degree program contact Prof. Danny Mittleman or Prof. Curt White at CTI to discuss their individual circumstances before applying to CTI.

Transfer students or students who have enrolled in CTI before applying to the College of Law should consult with the joint degree program advisors to determine how their special circumstances may affect their qualifications for the joint degree.

Further information about admission requirements and procedures may be found in the general description of Admission Requirements for Joint Degrees found on the College of Law website under Academic Programs.

### **Financial Considerations:**

- Joint degree students will pay on a per-credit-hour basis in both the College of Law and CTI
- Because the joint degree program permits double-counting of coursework, the total cost for the two degrees will be significantly lower under the joint degree program
- Admission to the joint degree program will ordinarily not affect College of Law scholarship awards. However, students should consult with Dean White about their specific scholarships
- Financial aid recipients must consult with Clare Timm at the financial aid office to obtain a revised (often increased) financial aid award based on their participation in the joint degree program

### **Sample Law School/CTI four-year course plan**

The student must complete the regular first year JD program before being admitted to the Joint Degree. The second and third years might consist of three law courses in Fall Semester and two law courses in Spring Semester as well as one CTI course Fall Quarter, two CTI courses Winter Quarter, and two CTI courses Spring Quarter. The fourth year might consist of three law courses Fall Semester, one CTI course Fall Quarter, three CTI courses Winter Quarter, and three CTI courses Spring Quarter. This schedule allows for completion of the JD as well as completion of 14 CTI courses (the MS program plus four prerequisite courses). It is possible that, because of prerequisite coursework, the program may take some students more than four years.

Since each student will require a different number of CTI prerequisites and each student will select courses based on semester/quarter availability, any particular curriculum might be different from the sample curriculum shown. All joint degree students will be encouraged to select courses with the assistance of Joint Degree program advisors at both the Law School and CTI.

### **CTI Requirements for an MS Degree**

For the CTI portion of the joint degree, students may major in:

- Computer Information and Network Security
- Computer Science
- Distributed Systems
- E-Commerce Technology
- Information Systems
- Telecommunications

Each program listed above follows the requirements as listed on its page on the CTI website. These requirements are divided into the phases. Upon completion of those requirements, each student will move to the Elective Phase as described below.

### **Electives**

12 additional quarter hours fulfilled by courses from the IP Certificate courses. These courses will also be counted toward the JD degree.

### **Joint Degree Program Advising and For Further Information**

- Students are encouraged to consult with the following advisors regarding their participation in the joint degree program:
- Assistant Dean Diana White - College of Law - [dwhite@depaul.edu](mailto:dwhite@depaul.edu) - For questions regarding administrative aspects of the joint degree and College of Law programs
- Professor Katherine Strandburg - College of Law - [kstrandb@depaul.edu](mailto:kstrandb@depaul.edu) - For questions regarding substantive aspects of the College of Law IP and IT programs
- Professor Danny Mittleman - CTI - [danny@cs.depaul.edu](mailto:danny@cs.depaul.edu) - For questions regarding substantive aspects of the CTI program
- Professor Curt White - CTI - [cwhite@cs.depaul.edu](mailto:cwhite@cs.depaul.edu) - For questions regarding substantive aspects of the CTI program

## ADVANCED SOFTWARE DEVELOPMENT PROFESSIONAL

**A**fter completing a Master's Degree, or gaining software engineering certification, a student may decide to continue their education as a software development professional. They might come back to gain new technical skills, take advanced classes which did not fit into their degree plan, or to help with professional recertification. The IEEE Computer Society Certified Software Development Professional program requires continual recertification, which may include College and University Courses. As part of DePaul University's commitment to life-long-learning, CTI is pleased to offer students with a Master's degree or IEEE professional certification an opportunity to enroll for advanced classes.

The program is an open-ended series of courses, which does not lead to a degree. To qualify for the Advanced Software Development Professional program, a student must either:

Have a Master's Degree in Computer Science, Software Engineering, or another technical, scientific or engineering field, or be certified by the IEEE Computer Society Certified Software Development (CDSP®) program.

Upon acceptance into the program, the student will meet with their faculty advisor to discuss which classes they would like to take.

After meeting with their faculty advisor, the student will have Non-Degree-Seeking status, and will be able to take any CTI class, as long as they satisfy the prerequisites for that class. If they do not have a Master's degree from DePaul University, they should discuss with their faculty advisor which classes they may have to take to satisfy these prerequisite requirements.

Courses taken as part of the Advanced Software Development Professional program may be used towards recertification for the IEEE Computer Society Certified Software Development Professional program. To be recertified, a candidate must first gain CDSP certification, and must then earn 30 Professional Development Units, 15 of which may come from College and University courses. Since each CTI course is worth 5.2 PDUs, three CTI courses will earn those 15 PDUs. CDSP recertification is required every three years, and so one CTI course per year will count for half of a candidate's recertification requirements.

A student in the Advanced Software Development Professional program who later is accepted to a degree program at DePaul University may count up to three courses taken in this program towards the degree.

Students are free to take any CTI classes they satisfy the prerequisite requirements for. The following classes may be of particular interest to software professionals:

- SE 480 Software Architecture
- SE 469 Software Safety
- SE 470 Software Development Processes
- SE 472 Personal Software Process
- SE 473 Security Architecture I
- SE 477 Software and Systems Project Management
- SE 480 Software Architecture
- SE 482 Requirements Engineering
- SE 529 Software Risk Management
- SE 531 Formal Software Specifications and Development II
- SE 533 Software Validation and Verification
- SE 540 Software Development for Mobile and Wireless Systems
- SE 542 Software Development for Limited and Embedded Devices

SE 546 Software Architecture and Design for Desktop Applications  
SE 550 Distributed Software Development  
SE 552 Concurrent Software Development  
SE 554 Enterprise Component Architecture  
SE 558 Software Methodologies  
SE 560 Structured Document Interchange and Processing  
SE 567 Software Reliability  
SE 571 Software Maintenance  
SE 573 Security Architecture II  
SE 580 Design of Object-Oriented Languages  
SE 590 Advanced Topics in Object Oriented Technology

DePaul University's Software Engineering Program is an IEEE Computer Society registered Education Provider. DePaul University's Software Engineering Program is committed to enhancing the ongoing professional development of software development professionals, Certified Software Development Professionals (CSDP®), and other software stakeholders through appropriate software engineering learning activities and products. As a CSDP Education Provider, DePaul University's Software Engineering Program has agreed to abide by IEEE Computer Society established operational and educational criteria, and is subject to random audits for quality assurance purposes.

Advice given by DePaul University faculty and staff about CSDP recertification is for informational purposes only. This document may not reflect the most recent requirements for CSDP recertification.



## THE VINCENTIAN CHARACTER OF DEPAUL UNIVERSITY

**D**ePaul, 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.

### **GRADUATE ASSISTANTSHIPS**

**A**nnouncement of Graduate Assistantships is generally made by June 1. Assistantships must be accepted or declined, in writing, by July 1. Recipients will be assigned by their program directors or departments to activities appropriate for a teaching, research or administrative assistant.