



# 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.  
Associate Dean  
DAVID MILLER, PH.D.  
Associate Dean  
ANNE B. MORLEY  
Assistant Dean  
TERRY SKWAREK  
Director, Institute for Professional Development  
Assistant Dean

## FACILITIES

## FACULTY

## ADMISSION

## ACADEMIC PROGRAMS

BACHELOR OF SCIENCE IN COMPUTER GAMES DEVELOPMENT

BACHELOR OF SCIENCE IN COMPUTER GRAPHICS AND ANIMATION

- I. Developer
- II. Technical Designer

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

- I. Computer Science Concentration
- II. Honors in Software Engineering

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN DIGITAL CINEMA

BACHELOR OF SCIENCE IN E-COMMERCE TECHNOLOGY

BACHELOR OF SCIENCE IN HUMAN-COMPUTER INTERACTION

BACHELOR OF SCIENCE IN INFORMATION ASSURANCE ENGINEERING

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BACHELOR OF SCIENCE IN MATHEMATIC AND COMPUTER SCIENCE

- I. Theory
- II. Computational Methods
- III. Graphics
- IV. Artificial Intelligence
- V. Data Analysis

BACHELOR OF SCIENCE IN NETWORK TECHNOLOGY

- I. Standard
- II. Network Security

## COMBINED BACHELOR OF SCIENCE AND MASTER OF SCIENCE DEGREES

- I. BS/MS in Computer Science
- II. BS/MS in Network and Telecommunications
- III. BS in Math/Computer Science and MS in Computer Science
- IV. BS in Computer Science and MS in Software Engineering
- V. BS in Computer Science – Software Engineering Honors Concentration and MS in Software Engineering
- VI. BS IS / MS CINS – Information Systems Security track
- VII. BS CS / MS CINS – Computer Security track
- VIII. BS MATH-CS / MS CINS – Computer Security track
- IX. BS NT / MS CINS – Network Security track
- X. BS in Computer Science and MS in Distributed Systems
- XI. BS in Math/Computer Science and MS in Distributed Systems

## BACHELOR OF ARTS IN COMPUTING (JOINT DEGREE WITH SCHOOL OF NEW LEARNING)

## SPECIAL PROGRAM: TEACHER OF COMPUTER SCIENCE: SECONDARY LEVEL

## MINORS

## COURSES

### GENERAL INFORMATION

**T**he School of Computer Science, Telecommunications and Information Systems offers a course of studies leading to the degrees of Bachelor of Science in Computer Graphics and Animation, Bachelor of Science in Computer Science, Bachelor of Science in E-Commerce Technology, Bachelor of Science in Information Systems, Bachelor of Science in Human-Computer Interaction, Bachelor of Science in Math and Computer Science, Bachelor of Science in Network Technology and Bachelor of Arts in Computing. The purpose of each curriculum is to prepare the student with the requisite theoretical, technical, and practical knowledge for a professional career in various computer or computer-related fields. Each degree program develops an informed view of the relationship between computer science and its allied fields while equipping the student with the technical expertise necessary to enter a computer-related career.

### 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:

- Requirements Engineering Lab
- Mobile E-Commerce Lab
- Solid Objects Lab
- Software Research Lab
- Multimedia Networking Lab
- Artificial Intelligence Lab
- American Sign Language Lab
- E-Commerce Technology Lab
- Information Systems Lab

## **FACULTY**

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Illinois Institute of Technology

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Purdue University  
ROBERT FISHER, PH.D.,  
Associate Professor  
Harvard University  
JACOB FURST, PH.D.,  
Associate Professor  
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University of California, Berkeley  
JANE HUANG, PH.D.,  
Assistant Professor  
University of Illinois at Chicago  
LOUIS IBARRA, PH.D.,  
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University of Victoria  
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Assistant Professor  
Columbia College  
RADHA JAGADEESAN, PH.D.,  
Professor  
Cornell University  
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University of Oxford  
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American Film Institute

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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.,  
Assistant Professor  
University of North Carolina at Chapel Hill

JOHN ROGERS, PH.D.,  
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University of Chicago

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

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Massachusetts Institute of Technology

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CHARLES WILCOX, B.A.,  
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Southern Illinois University

ROSALEE WOLFE, PH.D.,  
Professor  
Indiana University

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The University of Hong Kong

JAMES YU, PH.D.,  
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Purdue University

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

## **ADMISSION**

Candidates interested in admission to the school should direct all inquiries to the Office of admission, DePaul University, 1 E. Jackson Boulevard, Chicago, Illinois 60604. Telephone (312) 362-8300; e-mail: [admitdpu@depaul.edu](mailto:admitdpu@depaul.edu). The Office of Admission will provide each candidate with the required forms and instructions for filing the application or visit the web site at [www.depaul.edu](http://www.depaul.edu) to apply on-line. A non-refundable application fee of \$25.00 is required of each applicant. For further information on the regulations and procedures governing admission, consult page 441 of the Bulletin.

## **ACADEMIC ADVISEMENT**

The school believes that academic advisement is necessary for the vitality and success of the student's undergraduate education. The purposes of liberal education require that the education of the student form a coherent whole. Therefore, the requirements of the Liberal Studies Program and to a degree the major field of study are determined by the individual student's intellectual interests, needs and abilities.

Students will be assigned a faculty advisor upon admission to the school. Academic approval of a course of study is required of all students in the school. All students are encouraged to meet with their faculty advisor at least once each year to plan their course of study.

## **PROGRAM AND CURRICULUM INFORMATION**

### **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 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 392 IP Telephony Program**

A 12-week integrated program focusing on designing and implementing fully converged IP telephony networks.

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

A 10-week comprehensive program covering current 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 393 Local Area Networks Program**

A 12-week intensive program in the fundamentals of local area networks, wide area networks, and data communications

**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

**TRANSFER CREDIT**

Prospective students may transfer credit from an accredited college to DePaul University. All transfer credit will be initially evaluated by an Admission counselor; final course placement will be made by an academic advisor in the School of Computer Science, Telecommunications and Information Systems (CTI). For specific information governing transfer admission and evaluation of credit, please consult page 442 of this Bulletin. Current CTI students may take courses at another accredited college either in the summer or during the regular school year and transfer the credit back to DePaul University only with prior approval from the student's academic advisor.

**GRADES**

Students must earn grades of 'C' or above in all courses taken for credit in the major field. Grades of 'C-' may be accepted for major field credit provided the overall grade point average within the major is 2.0 or above. All other courses require grades of 'D' or better. In addition, all students must fulfill the graduation requirements as noted on page 469 of this Bulletin.

**MODERN LANGUAGE OPTION**

Students in the School of Computer Science, Telecommunications and Information Systems (CTI) may choose to study a modern language and use the credit earned from the language courses to satisfy Liberal Studies domain requirements. Students reduce their Liberal Studies domain requirements by two courses if they complete a three-course language sequence. From the following combinations of learning domains, students can select their two course reduction: Philosophical Inquiry or Religious Dimensions; Understanding the Past or Self, Society and the Modern World; Arts and Literature (at most one course from each combination). The third course in the three-course language sequence may apply as open elective credit only.

**BACHELOR OF SCIENCE****LIBERAL STUDIES PROGRAM**

**T**he student's course of study in the Liberal Studies Program is part of the undergraduate program devoted exclusively to liberal education. The program seeks to balance and, when necessary, augment the student's course in the major field. In addition to the 24 quarter hours required in the liberal studies core, all students in the School are required to complete 52 quarter hours distributed through 6 learning domains as part of one degree program. The number and distribution of courses in each of the areas are as follows:

**Liberal Studies Core: 6 courses/24 quarter hours required**

First Year Program: (16 quarter hours required) Discover Chicago or Explore Chicago, Focal Point Seminar, and Composition and Rhetoric I and II.

Sophomore Seminar: (4 quarter hours required) Sophomore Seminar on Multiculturalism in the United States

Junior Year Experiential Learning: (4 quarter hours required) If your junior year experiential learning requirement also fulfills a major field requirement, you may substitute a liberal studies domain elective (from outside your major field area) or the third course in the modern language option for this requirement.

Senior capstone: All CTI majors require that students complete the senior capstone in their major field.

**Liberal Studies Learning Domains: 13 courses/52 quarter hours required**

**Arts and Literature:** 12 quarter hours required. At most 2 courses from the same department or program. (ART 102 is required for the Bachelor of Science in Computer Graphics and Animation technical designer concentration.)

**Philosophical Inquiry:** 8 quarter hours required.

**Religious Dimensions:** 8 quarter hours required; 4 quarter hours in “Patterns and Problems,” and 4 quarter hours in “Traditions in Context.” Note: One course from either Philosophical Inquiry or Religious Dimensions must be a course in ethics. CSC 208 strongly recommended, MGT/PHIL/REL 228 recommended.

**Scientific Inquiry:** 4 quarter hours required. The course must be designated as a lab course. Courses in mathematics or CTI are not acceptable.

**Self, Society and the Modern World:** 12 quarter hours required. At most 2 courses from the same department or program. (Psychology 105 is required for the Human-Computer Interaction degree).

**Understanding the Past:** 8 quarter hours required; 4 quarter hours of history pre-1800 and 4 quarter hours of history 1800-1945. In addition, courses must be from two different categories:

- 1) Asia, 2) Latin America, 3) Africa, 4) North America or Europe; 5) intercontinental or comparative.

Although study in CTI courses contributes to a student’s liberal education, courses offered through CTI may not be applied towards liberal studies requirements.

## **ACADEMIC PROGRAMS**

### **BACHELOR OF SCIENCE IN COMPUTER GAMES DEVELOPMENT**

The B.S. degree in Computer Games Development reflects the fact that the field of computer games development is tremendously multidimensional and requires expertise from such areas as: game play, game design, art, 3D modeling, animation, procedural art development, physics, programming languages, artificial intelligence to name only a few. The program emphasizes the fact that a game developer needs inspiration from such areas as art, architecture and engineering. Students graduating from this program will be prepared for design, modeling and programming jobs in the gaming industry.

ANI 101 Animation  
ANI 200 3D Modeling for Animation and Gaming  
ANI 210 3D Animation for Cinema and Gaming  
ANI 310 Motion Capture Workshop  
CSC 261 Programming Languages I: C/C++  
CSC 262 Programming Languages II: C/C++  
DC 201 Narrative Techniques in Digital Cinema  
GAM 224 Strategies in Game Design  
GAM 244 Game Development I  
GAM 245 Game Development II  
GAM 341 Artifact, Level and Terrain Design  
GAM 350 Physics for Game Developers  
GAM 374 Action Games Programming  
GAM 376 Artificial Intelligence for Computer Games  
GAM 378 Strategy Games Programming  
GAM 394 Game Development Project I  
GAM 395 Game Development Project II  
IT 228 Ethics in Computer Games and Cinema  
MAT 150 Calculus I

- Gaming Electives (5)
- GPH 211 is required as a liberal studies course
- Open Electives (5)

### **Gaming Electives**

ANI 300 3D Character Animation  
 Any 200 and 300 level GPH courses  
 Any 300 level TDC courses  
 DC 205 Foundations of Digital Cinema  
 DC 215 Digital Sound Design  
 DC 220 Non-Linear Editing I  
 GAM 250 Digital Sound for Computer Games  
 GAM 380 Console Game Development Environments  
 GAM 382 Educational and Children's Games  
 GAM 385 Introduction to Game Programming in Java  
 GAM 386 Game Development for Mobile Devices  
 GAM 390 Multiplayer Game Development  
 HCI 210 Introduction to Human-Computer Interaction  
 HCI 360 User-Centered Evaluation  
 IS 372 Fundamentals of Software Project Management  
 IS 373 Introduction to Large Systems Implementation  
 IS 375 Object-Oriented Analysis and Design  
 IT 130 The Internet and the Web  
 IT 215 Analysis and Design Techniques  
 IT 223 Data Analysis  
 IT 230 Building Internet Applications  
 IT 236 User Interface Development  
 IT 240 Introduction to Desktop Databases  
 MAT 141 Discrete Mathematics II  
 MAT 151 Calculus II  
 MAT 220 Linear Algebra with Applications  
 SE 325 Principles and Practices of Software Engineering  
 SE 325 Principles and Practices of Software Engineering  
 SE 330 Object Oriented Modeling  
 SE 330 Object Oriented Modeling  
 SE 350 Object-Oriented Software Development

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **BACHELOR OF SCIENCE IN COMPUTER GRAPHICS AND ANIMATION**

### **I. DEVELOPER CONCENTRATION**

The developer concentration in the B.S. in Computer Graphics and Animation degree emphasizes software development for such areas as computer animation, video gaming, multimedia, and special effects. It prepares students for such careers as games development, visualization, and modeling.

CMN 220 Public Speaking  
 CSC 261 Programming Languages I: C/C++  
 CSC 262 Programming Languages II: C/C++  
 CSC 321 Design and Analysis of Algorithms  
 CSC 393 Data Structures in C++  
 ENG 204 Technical Writing  
 GPH 211 Perceptual Principles for Digital Environments I  
 GPH 212 Perceptual Principles for Digital Environments II

GPH 213 Perceptual Principles for Digital Environments III  
 GPH 325 Survey of Computer Graphics  
 GPH 329 Computer Graphics Development  
 GPH 339 Advanced Rendering Techniques  
 GPH 372 Principles of Computer Animation  
 GPH 375 Advanced Graphics Development  
 GPH 395 Computer Graphics Senior Project  
 HCI 315 Theory and Perception of Color  
 MAT 140 Discrete Mathematics I  
 MAT 150 Calculus I  
 MAT 151 Calculus II  
 MAT 220 Linear Algebra with Applications
 

- Graphics Electives (6) (See list below)
- Open Electives (3)

## **II. TECHNICAL DESIGNER CONCENTRATION**

The technical designer concentration in the B.S. in Computer Graphics and Animation degree prepares students to support and engage in the visual aspects of the graphics and entertainment industry, including such careers as technical director for computer animation, games designer and new media consultant.

ART 106 Beginning Drawing  
 ART 242 Survey of Asian Art  
 ART 322 Contemporary Art  
 CMN 220 Public Speaking  
 CSC 211 Programming in Java I  
 CSC 212 Programming in Java II  
 ENG 204 Technical Writing  
 GPH 211 Perceptual Principles for Digital Environments I  
 GPH 212 Perceptual Principles for Digital Environments II  
 GPH 213 Perceptual Principles for Digital Environments III  
 GPH 255 Hand Prototyping for Graphic Visualization  
 GPH 250 Digital Modeling I  
 GPH 325 Survey of Computer Graphics  
 GPH 338 Survey of 3-D Animation  
 GPH 339 Advanced Rendering Techniques  
 GPH 395 Computer Graphics Senior Project  
 HCI 210 Introduction to Human-Computer Interaction  
 HCI 315 Theory and Perception of Color  
 IT 130 The Internet and the Web  
 IT 236 User Interface Development  
 MAT 140 Discrete Mathematics I
 

- Graphics Elective (4) (See list below)
- Open Electives (4)
- ART 102 Principles of Art History is required as a liberal studies course

### **Graphics Electives List**

Students may take any of the following courses as long as they were not previously used to satisfy the computer graphics and animation core:

ART 225 Beginning Photography  
 ART 329 Digital Photography  
 ART 360 Illustration  
 ART 373 History of Design  
 GPH 250 Digital Modeling I  
 GPH 259 Design Geometry  
 GPH 329 Computer Graphics Development  
 GPH 336 Smooth Surface Modeling for Graphics and Animation  
 GPH 350 Digital Modeling II  
 GPH 360 Modeling Spaces  
 GPH 374 Computer Games  
 GPH 375 Advanced Graphics Development  
 GPH 376 Artificial Intelligence in Computer Games

GPH 380 Visualization  
GPH 389 Real-Time Graphics Techniques  
HCI 210 Introduction to Human-Computer Interaction  
HCI 270 Formatting Digital Pages I  
HCI 271 Formatting Digital Pages II  
HCI 322 Multimedia  
HCI 341 Usability Issues for Electronic Commerce  
IT 223 Data Analysis  
IT 236 User Interface Development  
MAT 150 Calculus I  
MAT 151 Calculus II  
MAT 152 Calculus III

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

### **I. COMPUTER SCIENCE CONCENTRATION**

CMN 212 Small Group Communication or CMN 220 Public Speaking  
CSC 211 Programming in Java I and CSC 212 Programming in Java II  
Or CSC 261 Programming Languages I: C/C++ and or CSC 262 Programming Languages II: C/C++  
CSC 309 Object-Oriented Programming in C++ or CSC 224 Java for Programmers  
CSC 321 Design and Analysis of Algorithms  
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++  
CSC 390 Fundamentals of Information Assurance or IT 378 Host and Information Security  
CSC 394 Software Projects  
ENG 204 Technical Writing or ENG 301 Writing in the Professions  
IT 130 The Internet and the Web  
IT 223 Data Analysis  
IT 240 Introduction to Desktop Databases  
IT 263 Applied Networks and Security  
MAT 140 Discrete Mathematics I  
MAT 141 Discrete Mathematics II  
SE 325 Principles and Practices of Software Engineering  
SE 350 Object-Oriented Software Development

- 300-level CTI Electives (2) chosen in consultation with student's advisor.
- Open Electives (6)
- One of the following calculus sequences must be completed (both courses in a sequence must be completed to satisfy this requirement):
  - MAT 147 and MAT 148 Calculus with Integrated Precalculus
  - MAT 160 and 161 Calculus for Mathematics and Science Majors
  - MAT 170 171 – Promath Calculus for Mathematics and Science Majors

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## II. SOFTWARE ENGINEERING HONORS CONCENTRATION

The Honors Software Engineering (HSE) concentration has been designed for students who are interested in studying advanced software development techniques and technologies. Because of its advanced nature, much of this material is normally accessible only to graduate students. It is therefore only available to students with a strong academic background. Furthermore, students must apply for admission to the program.

Students should apply for the HSE concentration by the end of the winter quarter of their sophomore year, and will be notified of their acceptance (pending completion of requirements) in the spring quarter. Progress will be reviewed at the end of the third year to determine eligibility for continuing to the fourth year. Review is automatic for all students, but students may opt out of review and voluntarily change to another concentration.

**NOTE:** For each graduate course listed below you will participate in a graduate section as an undergraduate. You will receive undergraduate credit and be charged an undergraduate tuition rate. The course number will also be an undergraduate course number to be determined.

CMN 212 Small Group Communication or CMN 220 Public Speaking  
CNS 390 Fundamentals of Information Assurance  
CSC 211 Programming in Java I and CSC 212 Programming in Java II OR  
CSC 261 Programming Languages I: C/C++ and CSC 262 Programming Languages II: C/C++  
CSC 309 Object-Oriented Programming in C++ or CSC 224 Java for Programmers  
CSC 321 Design and Analysis of Algorithms  
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++  
ENG 204 Technical Writing or ENG 301 Writing in the Professions  
IT 130 The Internet and the Web  
IT 223 Data Analysis  
IT 240 Introduction to Desktop Databases  
IT 263 Applied Networks and Security  
MAT 140 Discrete Mathematics I  
MAT 141 Discrete Mathematics II  
MAT 150 Calculus I  
MAT 151 Calculus II  
SE 325 Principles and Practices of Software Engineering  
SE 352 Object-Oriented Enterprise Application Development  
SE 391 Software Engineering Studio I  
SE 392 Software Engineering Studio II  
XSE 330 Object Oriented Modeling  
XSE 331 Model-Driven Software Development  
XSE 350 Object-Oriented Software Development

Note: XSE courses denotes a undergraduate class cross-listed with a graduate class in which the student will be responsible for graduate level work but will receive undergraduate credit.

- Software Engineering Electives (3 – from a restricted list)
- CTI Electives (1)
- Open Elective (1)

### Software Engineering Electives

#### Open Electives

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN DIGITAL CINEMA**

Digitization has caused the convergence of cinema, computer graphics, animation, and gaming. Digital Cinema is an innovative production program dedicated to defining and developing the relationship between changing technologies and creative artistic expression.

The convergence of cinema, animation and gaming in the BS and BA in Digital Cinema will train you to redefine cinematic reality.

The B.A. degree, with its greater number of electives, offers the student a chance to create an interdisciplinary program of study.

The B.S. degree, with its increased technical emphasis, provides students with more comprehensive training in the three areas of digital cinema.

**Please note:** Students in the both Digital Cinema programs are required to take 4 quarter hours in Quantitative Reasoning (ISP120) in addition to the nineteen (19) liberal studies courses other CTI majors must take.

### **BACHELOR OF ARTS IN DIGITAL CINEMA**

ANI 101 Animation

DC 201 Narrative Techniques in Digital Cinema

DC 205 Foundations of Digital Cinema

DC 210 Digital Cinema Production I

DC 215 Digital Sound Design

DC 220 Non-Linear Editing I

DC 320 Non-Linear Editing II

DC 206 Introduction to Film History

DC 225 Digital Cinema Practicum

DC 273 Film/Video Aesthetics I

DC 275 Cinematography and Lighting

DC 270 Topics in Digital Cinema

DC 310 Digital Cinema Production II

DC 315 Advanced Digital Sound Design

DC 311 Music Video Production

DC 371 Documentary Production

DC 375 High Definition Cinematography

DC 378 Compositing and Special Effects

DC 389 The Big Picture

DC 390 Topics in Directing

DC 395 Topics in Production

DC 398 Digital Cinema Capstone

GAM 224 Strategies in Game Design

- Open Electives (6)
- GPH 211 Perceptual Principles for Digital Environments I is required as one of the A&L Liberal Studies courses.
- 

### **BACHELOR OF SCIENCE IN DIGITAL CINEMA**

ANI 101 Animation

ANI 200 3D Modeling for Animation and Gaming

ANI 210 3D Animation for Cinema and Gaming

ANI 300 3D Character Animation

ANI 310 Motion Capture Workshop

DC 201 Narrative Techniques in Digital Cinema

DC 205 Foundations of Digital Cinema

DC 206 Introduction to Film History

DC 210 Digital Cinema Production I

DC 215 Digital Sound Design

DC 220 Non-Linear Editing I

DC 225 Digital Cinema Practicum

DC 275 Cinematography and Lighting

DC 273 Film/Video Aesthetics I

DC 310 Digital Cinema Production II

DC 315 Advanced Digital Sound Design  
 DC 320 Non-Linear Editing II  
 DC 375 High Definition Cinematography  
 DC 378 Compositing and Special Effects  
 DC 390 Topics in Directing  
 DC 395 Topics in Production  
 DC 398 Digital Cinema Capstone  
 GAM 224 Strategies in Game Design  
 GAM 244 Game Development I  
 GAM 245 Game Development II

- Open Electives (4)
- GPH 211 Perceptual Principles for Digital Environments I is required as one of the A&L Liberal Studies courses.

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

### **BACHELOR OF SCIENCE IN E-COMMERCE TECHNOLOGY**

Students earning the Bachelor of Science program in E-Commerce Technology will acquire computer programming, user-centered design, and E-Commerce system development skills, as well as knowledge of the technology of databases, networking, and middleware.

CMN 212 Small Group Communication or CMN 220 Public Speaking  
 CSC 211 Programming in Java I  
 CSC 212 Programming in Java II  
 ECT 330 Advanced Internet Application Development  
 ECT 355 E-Commerce Application Models  
 ECT 359 E-Commerce Technology Senior Project  
 ECT 360 Introduction to Xml  
 ECT 365 Web Server Operations  
 ECT 372 Software Project Development and Management  
 ENG 204 Technical Writing or ENG 301 Writing in the Professions  
 HCI 210 Introduction to Human-Computer Interaction  
 IT 130 The Internet and the Web  
 IT 201 Introduction to Information Systems  
 IT 215 Analysis and Design Techniques  
 IT 223 Data Analysis  
 IT 230 Building Internet Applications  
 IT 240 Introduction to Desktop Databases  
 IT 263 Applied Networks and Security  
 MAT 140 Discrete Mathematics I or BMS 125 Business Calculus I  
 SE 330 Object Oriented Modeling

- 300-level CTI elective (2) - chosen in consultation with student's advisor.
- Open Electives (7)
- 

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.



## **BACHELOR OF SCIENCE IN HUMAN-COMPUTER INTERACTION**

The Bachelor of Science in Human-Computer Interaction is a multidisciplinary degree program designed to study methods that improve the working relationship between humans and computers. HCI practitioners enable individuals and groups to make more effective use of computers by creating better user interfaces and supportive surrounding environments. Drawing on principles from such diverse disciplines as art, psychology, engineering and computer science, HCI involves the analysis, design, development and evaluation of interfaces that are easy to use but powerful enough to accomplish complex tasks.

CMN 212 Small Group Communication or CMN 220 Public Speaking  
CSC 211 Programming in Java I  
CSC 394 Software Projects  
ENG 204 Technical Writing or ENG 301 Writing in the Professions  
GPH 211 Perceptual Principles for Digital Environments I  
HCI 210 Introduction to Human-Computer Interaction  
HCI 270 Formatting Digital Pages I  
HCI 360 Evaluating Human-Computer Interaction  
IT 130 The Internet and the Web  
IT 201 Introduction to Information Systems  
IT 215 Analysis and Design Techniques  
IT 223 Data Analysis  
IT 230 Building Internet Applications  
IT 236 User Interface Development  
IT 240 Introduction to Desktop Databases  
PSY 241 Research Methods I  
PSY 242 Research Methods II

- HCI Electives (4)
- Open Electives (8)
- ART 105 is a required Liberal Studies Course

### **HCI Elective List**

The degree requires 4 electives chosen from the list of courses below, at least one per group.

#### **Design:**

ART 261 Art and Design II: Word and Image  
ART 264 Typography I  
ART 359 Publication Design  
GPH 212 Perceptual Principles for Digital Environments II  
GPH 250 Digital Modeling I  
HCI 271 Formatting Digital Pages II  
HCI 315 Theory and Perception of Color  
HCI 322 Multimedia

#### **Technology:**

CSC 212 Programming in Java II  
CSC 351 Database Design  
ECT 330 Advanced Internet Application Development  
GAM 244 Game Development I  
GPH 325 Survey of Computer Graphics  
IT 263 Applied Networks and Security

#### **Methods and human factors:**

ANT 201 Ethnographic Research Methods  
CSC 324 Data Analysis and Statistical Software II  
IS 372 Fundamentals of Software Project Management  
PSY 360 Theories of Learning and Cognition  
PSY 375 Sensation and Perception  
PSY 380 Industrial and Organizational Psychology  
PSY 383 Psychology of Design

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

Note: Liberal Studies: Required: PSY 105 Introductory Psychology I

### **BACHELOR OF SCIENCE IN INFORMATION ASSURANCE ENGINEERING**

The Bachelor of Science in Information Assurance and Security Engineering prepares students for many possible careers in the rapidly growing Information Assurance and Security industry.

The program of study allow the student to learn the necessary foundations of Information Assurance theory, technology , and technique as well as the knowledge of Security Engineering processes used to implement, support and manage them in real-world systems.

A graduate will be prepared to join an information security team and perform risk assessment, security infrastructure design, network security administration, vulnerability assessment/scanning and incident response as well as any technology position where information security is an important part of the work function.

Graduates' possible career paths include Information Security Engineer, Technical Security Auditor, Network Security Engineer, Information Assurance Analyst and Forensics Engineer.

- ACC 101 Introduction to Accounting I
  - or FIN 290 Finance for Non-Commerce Majors
- CMN 212 Small Group Communication
  - or CMN 220 Public Speaking
- CNS 320 Computer Forensic and Incident Response
- CNS 330 Legal, Ethical and Social Issues in Information Security
- CNS 340 Fundamentals of Information Assurance
- CNS 394 Information Systems Security Engineering I
- CNS 395 Information Systems Security Engineering II
- CSC 211 Programming in Java I
- CSC 212 Programming in Java II
  - or CSC 261 Programming Languages I: C/C++
  - CSC 262 Programming Languages II: C/C++
- CSC 233 Codes and Ciphers
- CSC 373 Computer Systems I
- ENG 204 Technical Writing
- IT 130 The Internet and the Web
- IT 230 Building Internet Applications
- IT 240 Introduction to Desktop Databases
- IT 263 Applied Networks and Security
- IT 378 Host and Information Security
- MAT 140 Discrete Mathematics I
- TDC 362 Principles of Data Communications
- TDC 365 Network Interconnection Technologies
- TDC 377 Fundamentals of Network Security
  - 300-Level CTI electives (2) - chosen in consultation with your advisor.
  - Open Electives (4)

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **BACHELOR OF SCIENCE IN INFORMATION SYSTEMS**

Information Systems is devoted to the application of computers and related technologies to organizational and business problems. IS professionals apply their knowledge of hardware, software, business processes and procedures to help organizations improve performance and meet tactical and strategic goals. IS graduates gain employment in a wide variety of positions, including business application programmers, help desk analysts, end user training and support personnel, database analysts, process consultants, user liaisons, and business system analysts.

CMN 212 Small Group Communication or CMN 220 Public Speaking

CSC 211 Programming in Java I

CSC 212 Programming in Java II

CSC 324 Data Analysis and Statistical Software II

CSC 390 Fundamentals of Information Assurance

ENG 204 Technical Writing or ENG 301 Writing in the Professions

HCI 210 Introduction to Human-Computer Interaction

IS 371 Introduction to I.T. System Management

IS 372 Fundamentals of Software Project Management

IS 373 Introduction to Large Systems Implementation

IS 375 Object-Oriented Analysis and Design

IS 376 Information Systems Project

IT 130 The Internet and the Web

IT 201 Introduction to Information Systems

IT 215 Analysis and Design Techniques

IT 223 Data Analysis

IT 230 Building Internet Applications

IT 236 User Interface Development

IT 240 Introduction to Desktop Databases

IT 263 Applied Networks and Security

- 300-Level CTI electives (2) - chosen in consultation with your advisor.
- Open Electives (7)

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

### **BACHELOR OF ARTS**

The Bachelors of Arts in Information Technology program will give students a broad education in current areas of information technology, with a focus on producing educated and sophisticated consumers of information technology.

CMN 212 Small Group Communication or CMN 220 Public Speaking

CSC 223 The Impact of Computing Technology On Our Lives

CSC 378 Software Projects for Community Clients

ENG 204 Technical Writing or ENG 301 Writing in the Professions

HCI 210 Introduction to Human-Computer Interaction

ICS 200 Introduction to Business

IT 121 Mathematical and Technological Literacy II

IT 130 The Internet and the Web

IT 201 Introduction to Information Systems

IT 223 Data Analysis or CSC 239 Personal Computing

IT 230 Building Internet Applications

IT 240 Introduction to Desktop Databases

IT 263 Applied Networks and Security or TDC 361 Basic Communication Systems

SOC 394 Sociology and Society (Also counts as a liberal studies course)

- 300-Level CTI electives (8)
- Open Electives (4)
- Technical Grounding Courses (3)

### **Technical Grounding Courses**

CSC 211 Programming in Java I  
 CSC 212 Programming in Java II  
 CSC 261 Programming Languages I: C/C++  
 CSC 262 Programming Languages II: C/C++  
 ECT 330 Advanced Internet Application Development  
 GAM 244 Game Development I  
 GAM 245 Game Development II  
 GPH 211 Perceptual Principles for Digital Environments I  
 GPH 212 Perceptual Principles for Digital Environments II  
 HCI 322 Multimedia  
 IT 215 Analysis and Design Techniques  
 IT 230 Building Internet Applications  
 IT 236 User Interface Development  
 SE 325 Principles and Practices of Software Engineering  
 TDC 363 Introduction to Local Area Networks

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

### **BACHELOR OF SCIENCE**

The Bachelor of Science in Information Technology is a technical degree that will instruct students in core competencies in the areas of problem solving and programming, networks and communications systems, databases, Internet and Web technologies, security, and project management, along with a foundation in business concepts and technical communication. The proposed degree is suitable background for employment in the area of software development and testing, application support, network maintenance, database development, IT management, technical sales, technical liaison within a business or operational unit, and IT services.

ACC 101 Introduction to Accounting I or FIN 290 Finance for Non-Commerce Majors  
 CMN 212 Small Group Communication or CMN 220 Public Speaking  
 CSC 211 Programming in Java I and CSC 212 Programming in Java II  
     or CSC 261 Programming Languages I: C/C++ and CSC 262 Programming Languages II:  
     C/C++  
 CSC 309 Object-Oriented Programming in C++ (Take this if you took JAVA programming.)  
     or CSC 224 Java for Programmers (Take this if you took C++ programming.)  
 CSC 352 Database Programming  
 CSC 373 Computer Systems I  
 CSC 383 Data Structures and Algorithms in Java or CSC 393 Data Structures in C++  
 ENG 204 Technical Writing or ENG 301 Writing in the Professions  
 ICS 200 Introduction to Business  
 IS 372 Fundamentals of Software Project Management  
 IT 130 The Internet and the Web  
 IT 215 Analysis and Design Techniques  
 IT 223 Data Analysis  
 IT 230 Building Internet Applications  
 IT 240 Introduction to Desktop Databases  
 IT 263 Applied Networks and Security  
 IT 378 Host and Information Security  
 MAT 140 Discrete Mathematics I  
 MKT 301 Principles of Marketing
 

- Capstone (Any CTI Capstone)

- Open Electives (5)
- Expansion Area (4)

### **EXPANSION AREA**

GAM 244 Game Development I  
 GAM 245 Game Development II  
 GPH 211 Perceptual Principles for Digital Environments I  
 GPH 212 Perceptual Principles for Digital Environments II  
 GPH 213 Perceptual Principles for Digital Environments III  
 GPH 250 Digital Modeling I  
 GPH 259 Design Geometry  
 HCI 210 Introduction to Human-Computer Interaction  
 HCI 270 Formatting Digital Pages I  
 HCI 271 Formatting Digital Pages II

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

### **BACHELOR OF SCIENCE IN MATH/COMPUTER SCIENCE**

The Mathematics and Computer Science major is meant for mathematics students with talent and interest in computer science and computer science students with talent and interest in mathematics to develop the necessary background to be able to work in areas which depend on knowledge from both fields. It is designed to prepare the student for graduate study in various areas of computer science such as theoretical computer science, graphics, and computational methods and in areas in applied mathematics such as numerical analysis or discrete mathematics. It is also a good preparation for the more intellectually demanding jobs in computer software development.

CSC 211 Programming in Java I or CSC 261 Programming Languages I: C/C++  
 CSC 212 Programming in Java II or CSC 262 Programming Languages II: C/C++  
 CSC 321 Design and Analysis of Algorithms  
 CSC 373 Computer Systems I  
 CSC 374 Computer Systems II or CSC 347 Concepts of Programming Languages  
 CSC 378 Software Projects for Community Clients  
 or CSC 394 Software Projects  
 or GPH 395 Computer Graphics Senior Project  
 or MAT 398 Senior Capstone Seminar  
 CSC 383 Data Structures and Algorithms in Java or CSC 393 Data Structures in C++  
 IT 130 The Internet and the Web  
 MAT 140 Discrete Mathematics I  
 MAT 141 Discrete Mathematics II  
 MAT 150 Calculus I  
 or MAT 160 Calculus for Mathematics and Science Majors I  
 or MAT 170 Promath Calculus for Mathematics and Science Majors I  
 or MAT 147 Calculus with Integrated Precalculus I  
 MAT 151 Calculus II  
 or MAT 161 Calculus for Mathematics and Science Majors II  
 or MAT 171 Promath Calculus for Mathematics and Science Majors II  
 or MAT 148 Calculus with Integrated Precalculus II  
 MAT 152 Calculus III  
 or MAT 162 Calculus for Mathematics and Science Majors III  
 or MAT 172 Promath Calculus for Mathematics and Science Majors III  
 or MAT 149 Calculus with Integrated Precalculus III  
 MAT 260 Multivariable Calculus I  
 MAT 262 Linear Algebra

- Math Elective (3)
- Math or CTI Elective (1)
- CTI Elective (3)

Students choose seven courses from the following area lists. At least three of the courses have to be in computer science (or graphics) and at least three in mathematics. Courses not on this list need to be approved by an advisor. In particular, students are encouraged to take an independent study (MAT 399 or CSC 399).

### **I. THEORY CONCENTRATION**

The theory concentration is aimed at students with an interest in the mathematical and foundations of computer science.

CSC 333 Cryptology  
 CSC 344 Automata Theory and Formal Grammars  
 CSC 348 Introduction to Compiler Design  
 CSC 358 Symbolic Programming  
 CSC 387 Operations Research I: Linear Programming  
 or MAT 387 Operations Research I: linear Programming  
 CSC 389 Theory of Computation  
 MAT 302 Combinatorics  
 MAT 303 Theory of Numbers  
 MAT 310 Abstract Algebra I  
 MAT 311 Abstract Algebra II  
 MAT 312 Abstract Algebra III  
 MAT 351 Probability and Statistics I  
 MAT 370 Advanced Linear Algebra  
 MAT 372 Logic and Set Theory

### **II. COMPUTATIONAL METHODS CONCENTRATION**

The computational methods concentration is intended for students with an interest in quantitative and computational methods in computer science.

CSC 385 Numerical Analysis or MAT 385 Numerical Analysis I  
 CSC 386 Advanced Numerical Analysis or MAT 386 Numerical Analysis II  
 MAT 330 Methods of Computation and Theoretical Physics I  
 MAT 331 Methods of Computation and Theoretical Physics II

### **III. GRAPHICS CONCENTRATION**

The graphics concentration is intended for students who want to study the technical and mathematical foundations of computer graphics and animation.

GPH 211 Perceptual Principles for Digital Environments I  
 GPH 212 Perceptual Principles for Digital Environments II  
 GPH 325 Survey of Computer Graphics  
 GPH 329 Computer Graphics Development  
 GPH 336 Smooth Surface Modeling for Graphics and Animation  
 GPH 339 Advanced Rendering Techniques  
 GPH 372 Principles of Computer Animation  
 MAT 261 Multivariable Calculus II  
 MAT 337 Complex Analysis  
 MAT 370 Advanced Linear Algebra  
 MAT 385 Numerical Analysis I or CSC 385 Numerical Analysis

### **IV. ARTIFICIAL INTELLIGENCE CONCENTRATION**

For students with an interest in the computational relations between syntax and semantics.

CSC 357 Expert Systems  
 CSC 358 Symbolic Programming  
 CSC 380 Artificial Intelligence

## **V. DATA ANALYSIS CONCENTRATION**

The graphics courses are intended for students who want to study the technical and mathematical foundations of computer graphics and animation.

CSC 328 Data Analysis for Experimenters  
CSC 332 Simulation and Modeling or MAT 359 Simulation Models and the Monte Carlo Method  
CSC 334 Advanced Data Analysis or MAT 354 Multivariate Statistics  
CSC 367 Introduction to Data Mining  
CSC 381 Introduction to Digital Image Processing  
CSC 382 Applied Image Analysis  
CSC 384 Introduction to Computer Vision  
MAT 261 Multivariable Calculus II  
MAT 348 Applied Statistical Methods  
MAT 351 Probability and Statistics I  
MAT 352 Probability and Statistics II  
MAT 353 Probability and Statistics III  
MAT 355 Stochastic Processes  
MAT 356 Applied Regression Analysis  
MAT 357 Nonparametric Statistics  
MAT 370 Advanced Linear Algebra  
MAT 384 Mathematical Modeling

## **BACHELOR OF SCIENCE IN NETWORK TECHNOLOGIES**

### **I. STANDARD CONCENTRATION**

The Bachelor of Science in Network Technologies degree program is designed for students who wish to learn to select, justify, configure, and manage appropriate network technologies for a wide variety of business applications. Course topics include the foundations of networking, local area network design and management, Internet access technologies, routing, and interconnection technologies. There is also a concentration in Network Security.

First Year

CMN 212 Small Group Communication or CMN 220 Public Speaking  
CSC 211 Programming in Java I or CSC 261 Programming Languages I: C/C++  
CSC 212 Programming in Java II or CSC 262 Programming Languages II: C/C++  
ENG 204 Technical Writing or ENG 301 Writing in the Professions  
IT 130 The Internet and the Web  
IT 201 Introduction to Information Systems  
IT 223 Data Analysis  
IT 230 Building Internet Applications  
IT 240 Introduction to Desktop Databases  
IT 263 Applied Networks and Security  
MAT 140 Discrete Mathematics I  
TDC 311 Computers in Telecommunications Systems  
TDC 362 Principles of Data Communications  
TDC 363 Introduction to Local Area Networks  
TDC 364 Voice Communications Technologies  
TDC 365 Network Interconnection Technologies  
TDC 376 Network Project

Open Electives (6)

- 300-level TDC elective chosen in consultation with student's advisor (3).
- IT 378 Host and Information Security may be substituted for one of the 300-level TDC electives.

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **II. NETWORK SECURITY**

This concentration is designed to provide focused coursework in network security technologies, including detailed instruction in security infrastructure design, deployment, configuration and support.

While this concentration is designed for students that are planning to start their career as network security engineers, security administrators, security auditors and security infrastructure designers, it is also appropriate for any student that wants to integrate security practice within their career.

CMN 212 Small Group Communication or CMN 220 Public Speaking

CSC 261 Programming Languages I: C/C++

CSC 262 Programming Languages II: C/C++

CSC 390 Fundamentals of Information Assurance

ENG 204 Technical Writing or ENG 301 Writing in the Professions

IT 130 The Internet and the Web

IT 201 Introduction to Information Systems

IT 230 Building Internet Applications

IT 240 Introduction to Desktop Databases

IT 263 Applied Networks and Security

IT 378 Host and Information Security

MAT 140 Discrete Mathematics I

TDC 311 Computers in Telecommunications Systems

TDC 362 Principles of Data Communications

TDC 363 Introduction to Local Area Networks

TDC 365 Network Interconnection Technologies

TDC 368 Network Programming

TDC 375 Network Protocols

TDC 376 Network Project

TDC 377 Fundamentals of Network Security

TDC 379 Telecommunication and Network Security Practicum

- 300-level TDC elective chosen in consultation with student's advisor (2).
- Open Electives (6)

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

### **Open Electives**

Open Electives may be taken from any department or program. These are the only courses that may be taken under the pass/fail option (see the undergraduate Bulletin for details). If you wish to pursue a minor, most minor field courses will be credited as open electives.

Note: Grades for all courses in the students major (i.e. non-Liberal Studies and non-Open Elective) must be 'C' or better. Grades of 'C-' may be accepted provided the overall grade point average in the major is 2.0 or better.

## **COMBINED BACHELOR OF SCIENCE AND MASTER OF SCIENCE DEGREES**

The Combined Degree Programs at CTI are designed to allow academically gifted students to complete both a bachelor and master's degree in a shorter amount of time by taking three Master's level courses in their junior and senior year that count toward both their bachelor and master's degree requirements at same time. Students in this program will receive both a bachelor degree, after 192 undergraduate credit hours, and a master's degree after 10 more graduate courses (40 hours), instead of the standard 13 (52 hours).

### **Admission criteria are as follows:**

Apply to enter the Combined Degree program any time after having achieved Junior standing (at least 88 credit hours completed) by sending an email to your advisor. Your advisor will then review your record and forward their recommendation along to the admissions office.

GPA of 3.5 or better in courses with a CTI label, eg. CSC, ECT, etc.

Overall GPA is at least 3.2



### **Maintaining Good Standing**

Students who fail to maintain academic standards equivalent to the admission criteria will be dismissed from the Combined Degree and returned to normal undergraduate degree seeking status. Any graduate courses passed before dismissal will not be counted toward graduate credit and may not be retaken. If dismissed students wish to apply to a CTI graduate degree program, they may do so following normal CTI admissions procedures, but will still be required to take 13 graduate courses for a MS degree.

### **Combined Degree Program Requirements**

The tables below list which BS requirement is affected by which BS/MS requirement. The top part of the table deals with the three restricted enrollment graduate courses. The bottom part (light blue) deals with any special requirement due to the prerequisite for the MS (if any).

Left column lists the undergraduate course students should **not** take.

The middle column lists the restricted enrollment courses students should take instead.

The right column lists the actual graduate course corresponding to the restricted enrollment course.

All other BS requirements remain unchanged. Please refer to the program pages on the CTI web site (<http://cs.depaul.edu/>) for the other courses you must take. You need to receive a grade of B- or higher in each course taken to fulfill MS prerequisite requirements. The 10 courses necessary to complete the Master's Phase of the BS/MS, follow the MS degree program minus the three already taken. For all courses that will be counted toward your MS, you are subject to the same grade requirement as regular MS students. Please work with your advisor to formulate a plan that works best for your circumstances.

#### **BS Computer Science / MS Computer Science**

Don't Take	Take Instead	Corresponding to
SE 350	XSE 350	SE 450
CSC 321	XCSC 391	CSC 491
1 CTI 300-level Elective	XCSC 347	CSC 447

#### **BS Network Technology - Standard / MS Telecommunications Systems**

Don't Take	Take Instead	Corresponding to
TDC 362	XTDC 360	TDC 460
TDC 364	XTDC 364	TDC 464
TDC 365	XTDC 363	TDC 463

#### **BS MATH—Computer Science / MS Computer Science**

Don't Take	Take Instead	Corresponding to
1 CTI 300-level Elective	XSE 350	SE 450
CSC 321	XCSC 391	SE 491
CSC 347 or CSC 374	XCSC 347	SE 447
1 CTI 300-level Elective	CSC 374	Prerequisite phase

#### **BS Computer Science - Standard / MS Software Engineering**

Don't Take	Take Instead	Corresponding to
SE 350	XSE 350	SE 450
1 CTI 300-level Elective	XSE 330	SE 430
1 CTI 300-level Elective	XSE 377	SE 477

Students with SE325 and SE477 will be considered to have fulfilled the MS-SE SE425 requirement. Students must meet with their faculty advisor to determine an appropriate SE graduate course to substitute for SE425.

**BS CS – Honors Software Engineering / MS Software Engineering**

Don't Take	Take Instead	Corresponding to
SE 350	XSE 350	SE 450
SE 330	XSE 330	SE 430
SE 430	XSE 331	SE 431

Students with SE325 will be considered to have fulfilled the MS-SE SE425 requirement.

**BS Information Systems / MS Computer, Information and Network Security- Information Systems Security track**

Don't take	Take Instead	Corresponding to
IS 373	XIS 325	IS 425
1 300-level CTI Elective	XTDC 363	TDC 463
1 300-level CTI Elective	XIS 372	IS 572
1 Open Elective	ECT 330 or ECT 353	Prerequisite Phase

**BS Computer Science / MS Computer, Information and Network Security – Computer Security track**

Don't take	Take Instead	Corresponding to
SE 350	XSE 350	SE 450
1 300-level CTI Elective	XDS 320	DS 420
1 300-level CTI Elective	XTDC 372	TDC 572

**BS Math--Computer Science / MS Computer, Information and Network Security – Computer Security track**

Don't take	Take Instead	Corresponding to
1 300-level CTI Elective	XSE 350	SE 450
1 300-level CTI Elective	XDS 320	DS 420
1 300-level CTI Elective	XTDC 372	TDC 572
CSC 347 or CSC 374	CSC 374	Prerequisite Phase

**BS Network Technology / MS Computer, Information and Network Security –Network Security track**

Don't Take	Take Instead	Corresponding to
TDC 362	XTDC 360	TDC 460
TDC 365	XTDC 363	TDC 463
1 300-level TDC Elective	XTDC 372	TDC 572
1 300-level TDC Elective	CNS 340	Prerequisite Phase

**BS Computer Science / MS in Distributed Systems**

Don't Take	Take Instead	Corresponding to
<b>SE 350</b>	<b>XSE 350</b>	<b>SE 450</b>
<b>CSC 321</b>	<b>XCSC 391</b>	<b>CSC 491</b>
1 CTI 300-level Elective	<b>XDS 320</b>	<b>DS 420</b>

**BS in Math--Computer Science / MS in Distributed Systems**

Don't Take	Take Instead	Corresponding to
<b>CSC 321</b>	<b>XCSC 391</b>	<b>CSC 491</b>
<b>1 CTI 300-level</b>	<b>XSE 350</b>	<b>SE 450</b>
<b>Elective</b>		
<b>1 CTI 300-level</b>	<b>XDS 320</b>	<b>DS 420</b>
<b>Elective</b>		
1 CTI 300-level	<b>CSC 374</b>	<b>Prerequisite phase</b>
Elective		

**BACHELOR OF ARTS IN COMPUTING**

The Bachelor of Arts in Computing is offered jointly by the School of Computer Science, Telecommunications and Information Systems and the School for New Learning. This degree is designed for working adults at least 24 years of age, who wish to obtain credit for their careers as technology professionals, and gain new skills in problem-solving, design, testing and communicating. The BA in Computing differs from the BS in Computer Science in that the BS places heavier emphasis on traditional programming and formal algorithmic analysis. The BA in computing program focuses on relating program design and computing to organizational dynamics and human relations. It helps to prepare students to analyze and negotiate the social, ethical, and technological systems of a business and to act as a liaison between the technical and non-technical sides of a company.

The computer competencies in the BA in Computing program cover a variety of topics directly related to current industry practice. These competences include skills and knowledge in information systems, data communications, databases, software engineering, and the design and evaluation of user interfaces. In the general studies area of the program, competences are tied to the humanities, the natural sciences and the social sciences. Students may select competences in the arts, design, ecology, human biology, multicultural relations, and politics and so on that are tailored to their individual goals and interests. The BA in Computing is completed by satisfying a total of fifty (50) competences; this amounts to the equivalent of 140 quarter hours. Typically these competences are satisfied through course work or equivalent work experience.

For a copy of the Program Guide for the Bachelor of Arts in Computing or to make reservations for a BA in Computing Information Session, please call either the School of Computer Science, Telecommunications and Information Systems at (312)362-8381 or the School for New Learning at (312)362-8001.

**SPECIAL PROGRAMS****TEACHER OF COMPUTER SCIENCE: SECONDARY LEVEL**

In cooperation with the School of Education, the School of Computer Science, Telecommunications and Information Systems (CTI) offers a concentration of study which combines the requirements for a major in Computer Science with certification for teaching computer science at the junior high, middle, and senior high school levels. A student electing such a program should consult the School of Education counselor as soon as possible after entering DePaul.

**MINORS**

A minor is a combination of courses that provides a cohesive introduction to an area of study. Typically, courses taken to satisfy minor field requirements are credited as open electives; however, there are some instances where minor field courses may be used for credit in other areas of the student's curriculum. Grades for all courses, taken to fulfill a minor field requirement must be 'C' or above. Grades of 'C-' may be accepted for credit in the minor provided the minor GPA is 2.0 or above. A minimum of one-half of the courses required for a minor must be completed at DePaul University.

**MINORS IN THE COLLEGE OF COMMERCE**

Students enrolled in the School of Computer Science, Telecommunications and Information Systems (CTI) may obtain a minor in Accounting, Business Administration, E-Business, Economics, Management, MIS, Marketing, and Pre-MBA. Please see the College of Commerce Section for Minor Requirements.

## **MINORS IN THE COLLEGE OF LIBERAL ARTS AND SCIENCES**

Students enrolled in the School of Computer Science, Telecommunications and Information Systems (CTI) may obtain a minor through the College of Liberal Arts and Sciences. Most Liberal Arts and Science departments offer minor concentrations of study. In general, a minor in a Liberal Arts and Sciences discipline consists of a set of introductory courses plus another set of more specialized courses. Most minors require six courses, some of which may also be used for credit in the Liberal Studies Program. For a complete list of minors offered through the College of Liberal Arts and Sciences, please consult that section of this online Bulletin

## **MINORS IN THE COLLEGE OF COMPUTER SCIENCE, TELECOMMUNICATIONS AND INFORMATION SYSTEMS**

### **Minors Within CTI for CTI Students**

To obtain a minor in CTI when the major is also in CTI:

1. Satisfy all requirements for the major
2. Satisfy all requirements for the minor
3. Students must take at least 6 courses in the minor area that do not count towards their CTI major

Note: If you have already taken some of the courses listed under your minor on this page, work with your advisor to choose other courses within the same program area, ie. NT minor would look under NT major courses and Computer Graphics Software Development would look under Computer Graphics Courses, in order to have 6 distinct courses.

## **CTI MINOR REQUIREMENTS FOR NON-CTI MAJORS**

### **Computer Games Development**

DC 201 Narrative Techniques in Digital Cinema  
GPH 211 Perceptual Principles for Digital Environments I  
GPH 212 Perceptual Principles for Digital Environments II  
GPH 213 Perceptual Principles for Digital Environments III  
GAM 224 Strategies in Game Design  
GAM 244 Game Development I  
GAM 245 Game Development II

### **Computer Graphics Software Development**

CSC 261 Programming Languages I: C/C++  
CSC 262 Programming Languages II: C/C++  
GPH 211 Perceptual Principles for Digital Environments I  
GPH 212 Perceptual Principles for Digital Environments II  
GPH 329 Computer Graphics Development  
GPH 339 Advanced Rendering Techniques

### **Computer Science Minor**

CSC 211 Programming in Java I or CSC 261 Programming Languages I: C/C++  
CSC 212 Programming in Java II or CSC 262 Programming Languages II: C/C++  
CSC 309 Object-Oriented Programming in C++ or CSC 224 Java for Programmers  
CSC 393 Data Structures in C++ or CSC 383 Data Structures and Algorithms in Java  
IT 130 The Internet and the Web  
IT 240 Introduction to Desktop Databases  
MAT 140 Discrete Mathematics I

- 1 300-level CTI elective

### **Data Analysis Minor**

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
CSC 324 Data Analysis and Statistical Software II  
IT 130 The Internet and the Web  
IT 223 Data Analysis  
IT 240 Introduction to Desktop Databases

One course from the following list:

- CSC 328 Data Analysis for Experimenters
- CSC 334 Advanced Data Analysis

## **Digital Modeling**

### **Course Requirements**

GPH 211 Perceptual Principles of Digital Environments I  
GPH 212 Perceptual Principles of Digital Environments II  
GPH 259 Design Geometry  
GPH 250 Digital Modeling I  
GPH 350 Digital Modeling II  
GPH 360 Modeling Spaces

- Special Topics/Independent Project

## **Digital Cinema Minor**

DC 205 Foundations of Digital Cinema  
DC 225 Digital Cinema Practicum  
DC 201 Narrative Techniques in Digital Cinema  
DC 220 Non-Linear Editing I

Three courses from the following list:

ANI 101 Animation  
DC 210 Digital Cinema Production I  
DC 215 Digital Sound Design  
DC 275 Cinematography and Lighting  
DC 310 Digital Cinema Production II  
DC 320 Non-Linear Editing II  
DC 389 The Big Picture: the Entertainment Industry  
GAM 224 Strategies in Game Design  
GPH 211 Perceptual Principles for Digital Environments I  
TDC 350 Modes of Digital Distribution

## **E-Commerce Technology Minor**

CSC 211 Programming in Java I  
CSC 212 Programming in Java II  
ECT 330 Advanced Internet Application Development  
HCI 210 Introduction to Human-Computer Interaction  
IT 130 The Internet and the Web  
IT 230 Building Internet Applications

One course from the following list:

- ECT 355 E-Commerce Application Models
- ECT 360 Introduction to Xml
- ECT 365 Web Server Operations

## **Human-Computer Interaction Minor**

IT 130 The Internet and the Web  
or HCI 201 Multimedia and the World Wide Web  
HCI 210 Introduction to Human Computer Interaction  
PSY 105 Introduction to Psychology I  
GPH 211 Perceptual Principles for Digital Environments I  
or ART 105 Two-Dimensional Foundations  
HCI 270 Formatting Digital Pages I  
or ART 227 Computer Applications for Design I: Illustrator and Photoshop  
HCI 360 User-Centered Evaluation

One course from the following list:

- HCI 271 Formatting Digital Pages II
- HCI 322 Multimedia
- IT 215 Analysis and Design Techniques
- IT 230 Building Internet Applications
- IT 240 Introduction to Desktop Databases
- CSC 211 Programming in Java I
- IT 223 Data Analysis

- PSY 240 Statistics I
- PSY 241 Research Methods I

### **Information Systems Minor**

CSC 211 Programming In Java I  
 HCI 210 Introduction To Human-Computer Interaction  
 IT 130 The Internet And The Web  
 IT 201 Introduction To Information Systems  
 IT 215 Analysis And Design Techniques  
 IT 230 Building Internet Applications  
 IT 240 Introduction To Desktop Databases

One course from the following list:

- IS 371 Introduction To I.T. System Management
- IS 372 Fundamentals Of Software Project Management
- IS 373 Introduction To Large Systems Implementation
- IS 374 Management Support Systems

### **Information Technology**

IT 130 The internet and the Web  
 IT 230 Building Internet applications  
 IT 240 Introduction to desktop databases  
 TDC 361 Basic Communication Systems  
     or IT 263 Applied Networks and Security  
 IT 215 Analysis and Design Techniques

One additional CTI course.

### **Network Technology Minor**

CSC 211 Programming in Java I  
     or CSC 261 Programming Languages I: C/C++  
 CSC 212 Programming in Java II  
     or CSC 262 Programming Languages II: C/C++  
 IT 130 The Internet and the Web  
 IT 201 Introduction to Information Systems  
 IT 263 Applied Networks and Security  
 TDC 362 Principles of Data Communications  
 TDC 363 Introduction to Local Area Networks

### **COURSES**

Please visit Campus Connection at <https://campusconnect.depaul.edu> for current course information. If you do not have a password for Campus Connection you may log on as a guest. Once you are on Campus Connection please select Course Catalog followed by the department.