

COLLEGE OF COMPUTING & INFORMATICS

APPROVALS

MEMORANDUM

TO: Interim Dean Bill Chu, College of Computing and Informatics

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: April 3, 2009

RE: Request to add a requirement in the Computer Science MS program that those graduate courses taken as core subjects or within the student's chosen concentration must be passed with a grade of "A" or "B."

The request to add a requirement in the Computer Science MS program that those graduate courses taken as core subjects or within the student's chosen concentration must be passed with a grade of "A" or "B" was approved by the Chair of the Graduate Council on March 2, 2009. **It is approved for implementation Spring Semester 2010.**

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I. Core Requirement

All students must take two courses from the Core Category:

ITCS 5102 Survey of Programming Languages

ITCS 5141 Computer Organization and Architecture or

ITCS 6182 Advanced Computer Architecture

ITCS 6112 Software System Design and Implementation

ITCS 6114 Algorithms & Data Structures

The two courses taken to satisfy the core requirement must each be passed with an “A” grade or a “B” grade.

III. Area of Concentration

Each student must take at least three related courses (9 hours) to form an area of concentration. The area of concentration may differ from the Course Categories; students are encouraged to have their areas of concentration aligned with faculty research areas. The three courses forming the student's area of concentration must have the written approval of the student's academic advisor. Only one breadth course can be included in the area of concentration courses. Core courses cannot be used in area of concentration. At least two of the three courses forming an area of concentration should be from the Department of Computer Science. **The three courses taken to satisfy the concentration requirement must each be passed with an “A” grade or a “B” grade.**

MEMORANDUM

TO: Interim Dean Bill Chu, College of Computing & Informatics

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: February 16, 2009

RE: Request to make prerequisites modification for ITCS 3183, 4141, 4145, & 4181 and to delete ITCS 4112 & 4130.

The request to make prerequisites modification for ITCS 3183, 4141, 4145, & 4181 and to delete ITCS 4112 & 4130 was approved by the Chair of the Undergraduate Course and Curriculum Committee on February 12, 2009. **It is approved for implementation First Summer Session, 2009.**

Catalog copy:

ITCS 3183. Hardware System Design. (3) Prerequisite: [ITCS 3181](#) or ITCS 3182 or permission of the department. Design of hardwired control systems; processors and

memory systems; application specific design; use of simulation tools. Laboratory intensive course. (Spring, **even years**) (**Evenings**)

ITCS 4141. Computer Organization and Architecture. (3) Prerequisite: **ITCS 3181** or **ITCS 3182** or equivalent. Fundamentals of computer design; instruction set design, basic processor implementation techniques; pipelining; memory hierarchy; Input/Output. Cost/performance and hardware/software trade-offs. (Fall, **alternate years**) (**Evenings**)

ITCS 4145. Parallel Computing. (3) Prerequisites: **ITCS 2214** and **ITCS 3181** or **ITCS 3182**. Types of parallel computers, programming techniques for multiprocessor and multicomputer systems, parallel strategies, algorithms, and languages. (**Fall**) (**Once every 3 semesters**) (Evenings)

ITCS 4181. Microcomputer Interfacing. (3) Prerequisite: **ITCS 3181** or **ITCS 3182** or **ECGR 3181** or permission of the Department. Signal conditioning, A/D conversion, noise, transmission line effects, signal processing, D/A conversion and serial/parallel interfaces. (Fall) (Even years) (Evenings)

Delete:

ITCS 4112 (Software System Design and Implementation)

ITCS 4130 (Computer Graphics)

MEMORANDUM

TO: Interim Dean Bill Chu, College of Computing and Informatics

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: February 12, 2009

RE: Request to establish **ITIS 2211** for CCI majors only to satisfy **LBST 2211** requirement for General Education

The request to establish ITIS 2211 for CCI majors only to satisfy LBST 2211 requirement for General Education was approved by the Chair of the Undergraduate Course and Curriculum Committee on January 29, 2009. **It is approved for implementation First Summer Session, 2009.**

Catalog Copy

ITIS 2211. Ethical Issues in Personal, Professional, and Public Life: Technology. (3) Crosslisted as LBST 2211. For CCI majors only. An analysis of the conceptual tools needed to make informed, responsible judgments based on the ability to think critically and knowledgeably about issues of personal, professional, and public ethics and morality. The study of a variety of ethical views and ethical issues. Successful completion of the course satisfies the LBST 2211 requirement for General Education. *(Fall, Spring, Summer) (Evenings)*

Additionally:

Insert ITIS 2211 into the degree requirements of all CS undergraduate programs:

Phil 1105, [ITIS 2211](#), and ENGL 2116 are also required.

MEMORANDUM

TO: Interim Dean Bill Chu, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: December 10, 2008

RE: Request to revise the SIS undergraduate curriculum by adding Web Development and Software Engineering Concentrations

The request to revise the SIS undergraduate curriculum by adding Web Development and Software Engineering Concentrations was approved by the chair of the

Undergraduate Course and Curriculum Committee on November 26, 2008 for implementation First Summer Session, 2009.

Catalog Copy:

NEW COURSES:

ITIS 2110. IT Infrastructure I: Design and Practice. (3) Prerequisite: Sophomore standing or permission of the Department. This course covers basic concepts for IT infrastructure systems administration such as networking administration (e.g., DNS configuration, router configuration, firewall setup, and web server configurations), operating system administration (e.g., account and privilege management, and service management). The course will have heavy hands-on laboratory emphasis. *(Fall, Spring)*

ITIS 2211. Ethical Issues in Personal, Professional, and Public Life: Technology. (3) An analysis of the conceptual tools needed to make informed, responsible judgments based on the ability to think critically and knowledgeably about issues of personal, professional, and public ethics and morality. The study of a variety of ethical views and ethical issues. *(Fall, Spring, Summer) (Evenings)*

ITIS 3105. Server-Side Applications and Data Management. (3) Prerequisites: ITIS 2300 and ITCS 1215, or permission of the Department. This course covers principles that are important for implementing advanced Web-based applications. Emphasis will be placed on industrial and business applications which require robust and secure implementations. Server-side scripting and processing techniques will be exercised in class projects. *(Spring)*

ITIS 3110. IT Infrastructure II: Design and Practice. (3) Prerequisite: ITIS 2110 or permission of the Department. This course covers concepts for the design and implementation of robust IT infrastructures. Topics covered include system hardening, secured access, penetration testing, file storage services, as well as advanced topics in design and configuration of network based services. The course will have heavy hands-on laboratory emphasis. *(Fall, Spring)*

ITIS 3150. Rapid Prototyping and Interface Building. (3) Students will learn various ways to rapidly prototype interface design ideas. This course will teach the theory behind rapid prototyping and how it relates to Human-Computer Interaction. Students will study low fidelity prototyping methods such as FIDO design and paper prototyping, and then move into higher fidelity prototyping methods such as throwaway digital

prototyping. Evolutionary prototyping, interface building using high-level programming languages, will be covered. In addition to software prototyping, students will also perform blank model prototyping for physical devices. (*On demand*)

ITIS 4170. Advanced Client Applications. (3) This course covers the theory and practice of techniques to develop Web applications that have the features and functionality of traditional desktop applications, dealing with the browser as graphical user interface and the Internet as platform, with attention to interactivity, speed, functionality, and usability. Technologies covered include: X/D/HTML, DOM, CSS, and client-side scripting for layout and formatting, data interaction formats such as XML and JSON, and asynchronous server interaction with client-side scripting and XML (AJAX). The course will examine emerging frameworks for development support, as well as typical applications such as mapping "mashups," folksonomies, and social networking. (*Spring*)

ITIS 4221. Secure Programming and Penetration Testing. (3) Prerequisite: ITIS 4166 or permission of the department. This course covers techniques for web application penetration testing, secure software development techniques for network based applications. Automated approaches such as static code analysis and application scanning will also be discussed. (*On demand*)

Department of Software and Information Systems

Interim Chair and Associate Professor: W. Tolone; *Graduate Coordinator and Assistant Professor:* Y. Wang; *Assistant Chair and Director of Undergraduate Programs:* B. Long; *Professor:* B. Chu, Y. Zheng; *Associate Professor:* M. Hadzikadic, X. Wu; *Assistant Professors:* B. Kang, C. Latulipe, S. Lee, H. Lipford, Z. Liu, A. Raja, M. Shehab, W. Wang, Y. Wang, D. Wilson; *Lecturer:* A. Kombol; *Adjunct Professors:* J. Dominick, P. Foley, T. Inskeep, T. Kitrick, F. Williams; *Adjunct Lecturers:* R. Callahan, R. Clark, J. Melton, S. Phillips, K. Russell, A. Shub, B. Teal.

The Bachelor of Arts in Software and Information Systems is designed for students interested in pursuing a career in Web Development, Software Engineering, Information Technology, or Financial Services Informatics. This degree will also well prepare students to pursue graduate studies in related areas. The focus of this program includes:

- Network-based Application Development
- Software Engineering (design, integration, testing, and assurance)
- e-Business Technologies
- Information Security and Privacy

- Human – Computer Interaction
- IT Infrastructure Design
- Ubiquitous Computing
- Financial Services Informatics

The Department of Software and Information Systems offers both undergraduate and graduate programs. The undergraduate program leads either to the Bachelor of Arts in Software and Information Systems or to a minor in Software and Information Systems. The graduate program leads to a Master of Science in Information Technology (see the *Graduate Catalog* for information on the M.S. degree.). Graduate certificate programs in Information Security and Privacy and Information Technology Management are also available. To assist them in their studies, students have access to advanced computer labs and software where they can practice and experiment in controlled environments. In addition, the Department maintains a high degree of interaction with working industry professionals who provide real-world expertise and experience.

Cooperative Education in Software and Information Systems. By participating in the Cooperative Education program, students in the department may pursue their education along with alternating work experiences so that they may be better prepared to enter their chosen professional career. Interested students should contact the University Career Center for more information.

BACHELOR OF ARTS: SOFTWARE AND INFORMATION SYSTEMS

Under this program, the requirements for the B.A degree may be fulfilled by completing the [traditional program](#) or any of ~~five~~ [four](#) concentrations. The traditional program emphasizes advanced programming and mathematics skills. It is intended for students who have a general interest in information technology and who want to maintain maximum flexibility in course selection and job opportunity. The Web Development concentration emphasizes software development using Internet and World-Wide Web technologies that are increasingly the default model for business-customer interaction. The Software Engineering concentration integrates mathematics and computer science to achieve classical engineering approaches to software system problem solving. The Information Technology concentration emphasizes usability, security, and reliability of IT infrastructures, writing and communications skills. These four concentrations prepare students for a wide variety of jobs or graduate studies. The Financial Services Informatics concentration is designed to meet the needs of the financial services sector with a unique combination of finance and information technology courses, industry internships, and sponsored capstone projects.

A common feature of this degree program is that students in all concentrations must complete a course in critical thinking, PHIL 1105, and a course in ethics that addresses issues of information technology. A special section of LBST 2211, Ethical Issues in Personal, Professional, and Public Life, will be designated as Ethical Issues: Technology (EI:T). Software and Information Systems majors who complete this section of LBST 2211 (identified as ITIS 2211 for registration purposes) will fulfill both departmental and General Education requirements for a course in ethical issues and cultural critique.

Traditional Program. This concentration requires 120 credit hours total including 51 hours of major courses, 12 hours of English and Communications courses, 12 hours in mathematics and statistics, 10 hours of sciences, 6 hours of critical thinking and ethics, and 14-17 hours of general education courses and free electives. Required major courses include: ITIS 2110, 2300, 3200, 3300, 3310, and 3320; ITCS 1212/1212L, 1215, 2175, 2214, 2215, 3160, 3166, and 3688; PHIL 1105 and ITIS 2211; and 9 hours of approved ITIS or ITCS courses numbered 3000 or above. Required English and Communications courses include ENGL 1101 and ENGL 1102 (or ENGL 1103), ENGL 2116, and COMM 2105. The mathematics and statistics requirements can be fulfilled by completing one of two course sequences:

- MATH 1120 and 2164; and STAT 1220 and 2223
- MATH 1241, 1242, and 2164; and STAT 2122

In addition, each student must complete at least 15 semester hours in a concentration of courses that form a coherent body of study related to developing applications of information systems. At least six of the 15 hours must be upper division courses. These courses must be completed in a major outside the College of Information Technology and require approval of the student's academic advisor.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS

(Traditional Program)

| | <i>Fall</i> | Freshman Year | | <i>Spring</i> |
|--|-----------------|----------------------|--|------------------|
| | ITCS 1212/1212L | 3 | | ITCS 1215 3 |
| | MATH 1120* | 3 | | ITCS 2175 3 |
| | ENGL 1101 | 3 | | ENGL 1102 3 |

| | |
|-------------------------|----------|
| LBST 110x | 3 |
| <u>Science with lab</u> | <u>4</u> |
| | 16 |

| | |
|----------------|----------|
| STAT 1220* | 3 |
| <u>Science</u> | <u>3</u> |
| | 15 |

Fall

Sophomore Year

Spring

| | |
|-------------------|----------|
| ITIS 2110 | 3 |
| ITIS 2300 | 3 |
| ITCS 2214 | 3 |
| PHIL 1105 | 3 |
| <u>MATH 2164*</u> | <u>3</u> |
| | 15 |

| | |
|------------------------------|----------|
| ITIS 2211† | 3 |
| ITCS 2215 | 3 |
| STAT 2223* | 3 |
| ENGL 2116 | 3 |
| <u>Outside concentration</u> | <u>3</u> |
| | 15 |

Fall

Junior Year

Spring

| | |
|-----------------------|----------|
| ITIS 3200 | 3 |
| ITCS 3166 | 3 |
| ITCS 3688 | 3 |
| Outside concentration | 3 |
| <u>LBST 2101</u> | <u>3</u> |
| | 15 |

| | |
|------------------------------|----------|
| ITIS 3310 | 3 |
| ITCS 3160 | 3 |
| COMM 2105 | 3 |
| Social Science | 3 |
| <u>Outside concentration</u> | <u>3</u> |
| | 15 |

Fall

Senior Year

Spring

| | |
|-----------------------|---|
| ITIS 3300 | 3 |
| ITIS/ITCS Elective | 3 |
| LBST 2102 | 3 |
| Outside concentration | 3 |

| | |
|-----------------------|---|
| ITIS 3320 | 3 |
| ITIS/ITCS Elective | 3 |
| ITIS/ITCS Elective | 3 |
| Outside concentration | 3 |

Free elective 3

15

Free elective 2

14

Total Hours 120

*A mathematics option consisting of MATH 1241, 1242, and 2164, and STAT 2122 may be selected as an alternate to the math courses listed.

†Also fulfills the General Education requirement for an LBST 22XX course in ethics and cultural critique.

Web Development Concentration. This concentration requires 120 credit hours total including 54 hours of major courses, 12 hours of English and Communications courses, 12 hours in mathematics and statistics, 10 hours of sciences, 6 hours of critical thinking and ethics, and 11-14 hours of general education courses and free electives. Required major courses include: ITIS 1210, 2110, 2300, 3105, 3110, 3130, 3150, 3200, 3300, 4166, 4170, 4221; ITCS 1212/1212L, 1215, 2214, 3160, and 3688; PHIL 1105 and ITIS 2211; 3 hours of approved ITIS or ITCS courses numbered 3000 or above. Required English and Communications courses include ENGL 1101 and ENGL 1102 (or ENGL 1103), ENGL 2116, and COMM 2105. The mathematics and statistics requirements can be fulfilled by completing one of two course sequences:

- MATH 1120 and 2164; and STAT 1220 and 2223
- MATH 1241, 1242, and 2164; and STAT 2122

In addition, each student must complete at least 15 semester hours in a concentration of courses that form a coherent body of study related to developing applications of information systems. At least six of the 15 hours must be upper division courses. These courses must be completed in a major outside the College of Information Technology and require approval of the student's academic advisor.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS

(Web Development Concentration)

| <i>Fall</i> | Freshman Year | <i>Spring</i> | |
|-------------------------|----------------------|----------------|----------|
| ITIS 1210 | 3 | ITCS 1215 | 3 |
| ITCS 1212/1212L | 3 | ENGL 1102 | 3 |
| MATH 1120* | 3 | LBST 110x | 3 |
| ENGL 1101 | 3 | STAT 1220* | 3 |
| <u>Science with lab</u> | <u>4</u> | <u>Science</u> | <u>3</u> |
| | 16 | | 15 |

| <i>Fall</i> | Sophomore Year | <i>Spring</i> | |
|-------------------|-----------------------|------------------------------|----------|
| ITIS 2110 | 3 | ITIS 2211† | 3 |
| ITIS 2300 | 3 | ITIS 3105 | 3 |
| ITCS 2214 | 3 | STAT 2223* | 3 |
| PHIL 1105 | 3 | ENGL 2116 | 3 |
| <u>MATH 2164*</u> | <u>3</u> | <u>Outside concentration</u> | <u>3</u> |
| | 15 | | 15 |

| <i>Fall</i> | Junior Year | <i>Spring</i> | |
|------------------------------|--------------------|------------------------------|----------|
| ITIS 3110 | 3 | ITIS 3150 | 3 |
| ITIS 3130 | 3 | ITCS 3160 | 3 |
| ITIS 3200 | 3 | ITCS 3688 | 3 |
| LBST 2101 | 3 | Social Science | 3 |
| <u>Outside concentration</u> | <u>3</u> | <u>Outside concentration</u> | <u>3</u> |
| | 15 | | 15 |

| <i>Fall</i> | Senior Year | <i>Spring</i> |
|-------------|--------------------|---------------|
|-------------|--------------------|---------------|

| | | | |
|------------------------------|----------|-----------------------|----------|
| ITIS 4166 | 3 | ITIS 4170 | 3 |
| ITIS 3300 | 3 | ITIS 4221 | 3 |
| ITIS/ITCS Elective | 3 | LBST 2102 | 3 |
| COMM 2105 | 3 | Outside concentration | 3 |
| <u>Outside concentration</u> | <u>3</u> | <u>Free elective</u> | <u>2</u> |
| | 15 | | 14 |

Total Hours 120

*A mathematics option consisting of MATH 1241, 1242, and 2164, and STAT 2122 may be selected as an alternate to the math courses listed.

†Also fulfills the General Education requirement for an LBST 22XX course in ethics and cultural critique.

Software Engineering Concentration. This concentration requires 120 credit hours total including 54 hours of major courses, 12 hours of English and Communications courses, 12 hours in mathematics and statistics, 10 hours of sciences, 6 hours of critical thinking and ethics, and 11-14 hours of general education courses and free electives. Required major courses include: ITIS 1210, 2110, 2300, 3130, 3150, 3200, 3300, 3310, 3320, 4155; ITCS 1212/1212L, 1215, 2175, 2214, 2215, 3160, and 3688; PHIL 1105 and ITIS 2211; 3 hours of approved ITIS or ITCS courses numbered 3000 or above. Required English and Communications courses include ENGL 1101 and ENGL 1102 (or ENGL 1103), ENGL 2116, and COMM 2105. The mathematics and statistics requirements can be fulfilled by completing one of two course sequences:

- MATH 1120 and 2164; and STAT 1220 and 2223
- MATH 1241, 1242, and 2164; and STAT 2122

In addition, each student must complete at least 15 semester hours in a concentration of courses that form a coherent body of study related to developing applications of information systems. At least six of the 15 hours must be upper division courses. These courses must be completed in a major outside the College of Information Technology and require approval of the student's academic advisor.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS
(Software Engineering Concentration)

| <i>Fall</i> | Freshman Year | <i>Spring</i> |
|---------------------------|----------------------|------------------------|
| ITIS 1210 3 | | ITCS 1215 3 |
| ITCS 1212/1212L 3 | | ENGL 1102 3 |
| MATH 1120* 3 | | LBST 110x 3 |
| ENGL 1101 3 | | STAT 1220* 3 |
| <u>Science with lab</u> 4 | | <u>Science</u> 3 |
| 16 | | 15 |

| <i>Fall</i> | Sophomore Year | <i>Spring</i> |
|------------------------|-----------------------|--------------------------------|
| ITIS 2110 3 | | ITIS 2211† 3 |
| ITIS 2300 3 | | ITCS 2175 3 |
| ITCS 2214 3 | | ITCS 2215 3 |
| PHIL 1105 3 | | STAT 2223* 3 |
| <u>MATH 2164*</u> 3 | | <u>Outside concentration</u> 3 |
| 15 | | 15 |

| <i>Fall</i> | Junior Year | <i>Spring</i> |
|--------------------------------|--------------------|--------------------------------|
| ITIS 3200 3 | | ITIS 3150 3 |
| ITIS 3130 3 | | ITCS 3160 3 |
| ENGL 2116 3 | | ITCS 3688 3 |
| LBST 2101 3 | | Social Science 3 |
| <u>Outside concentration</u> 3 | | <u>Outside concentration</u> 3 |

| | | | |
|------------------------------|----------|--------------------|-------------------------------|
| | 15 | | 15 |
| <i>Fall</i> | | Senior Year | <i>Spring</i> |
| ITIS 3300 | 3 | | ITIS 3320 3 |
| ITIS 3310 | 3 | | ITIS 4155 3 |
| LBST 2102 | 3 | | ITIS/ITCS Elective 3 |
| COMM 2105 | 3 | | Outside concentration 3 |
| <u>Outside concentration</u> | <u>3</u> | | <u>Free elective</u> <u>2</u> |
| | 15 | | 14 |
| Total Hours 120 | | | |

*A mathematics option consisting of MATH 1241, 1242, and 2164, and STAT 2122 may be selected as an alternate to the math courses listed.

†Also fulfills the General Education requirement for an LBST 22XX course in ethics and cultural critique.

Information Technology Concentration. This concentration requires 120 credit hours total including 45 hours of major courses, 21 hours of English and Communications courses, 6 hours in mathematics and statistics, 10 hours of sciences, 6 hours of critical thinking and ethics, and 11-14 hours of general education courses and free electives. Required major courses include: ITIS 1210, 2110, 2300, 3110, 3130, 3200, 3300, 3320; ITCS 1212/1212L, 1215, 3160, and 3688; INFO 3211; PHIL 1105 and ITIS 2211; and 6 hours of approved ITIS or ITCS courses numbered 3000 or above. The required mathematics and statistics courses are MATH 1100 (or MATH 1103) and STAT 1220. Required English and Communications courses include ENGL 1101 and ENGL 1102 (or ENGL 1103), ENGL 2116, COMM 2100, COMM 2105, a choice of ENGL 4181 or ENGL 4183, and a choice of ENGL 4182 or COMM 3141.

In addition, each student, in consultation with his or her academic advisor, must complete at least 21 semester hours by either:

- Completing the requirements for a minor chosen by the student even if doing so requires more than 21 hours (if the minor can be completed in less than 21 hours, the remaining hours become free electives) or
- Completing a series of courses in a major that does not offer a minor. These courses must form a coherent body of study related to developing applications of information systems. The courses selected must include a minimum of 9 hours of upper division courses.

In completing this requirement, students must comply with all prerequisites and other applicable academic regulations for courses offered by any department, even if doing so requires exceeding the 120 hour minimum necessary for graduation.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS

(Information Technology Concentration)

| <i>Fall</i> | | Freshman Year | | <i>Spring</i> |
|-------------------------|----------|----------------------|----------------|---------------|
| ITIS 1210 | 3 | | ITCS 1215 | 3 |
| ITCS 1212/1212L | 3 | | ENGL 1102 | 3 |
| MATH 1100 ¹ | 3 | | STAT 1220 | 3 |
| ENGL 1101 | 3 | | Minor-1 | 3 |
| <u>Science with lab</u> | <u>4</u> | | <u>Science</u> | <u>3</u> |
| | 16 | | | 15 |

| <i>Fall</i> | | Sophomore Year | | <i>Spring</i> |
|----------------|----------|-----------------------|----------------|---------------|
| ITIS 2300 | 3 | | ITIS 2110 | 3 |
| PHIL 1105 | 3 | | ITIS 2211† | 3 |
| LBST 110x | 3 | | ITIS 3130 | 3 |
| Social science | 3 | | COMM 2100 | 3 |
| <u>Minor-2</u> | <u>3</u> | | <u>Minor-3</u> | <u>3</u> |
| | 15 | | | 15 |

| <i>Fall</i> | Junior Year | <i>Spring</i> |
|----------------|--------------------|------------------|
| ITIS 3110 | 3 | ITCS 3160 3 |
| ITIS 3200 | 3 | ITCS 3688 3 |
| LBST 2101 | 3 | LBST 2102 3 |
| COMM 2105 | 3 | ENGL 2116 3 |
| <u>Minor-4</u> | <u>3</u> | <u>Minor-5</u> 3 |
| | 15 | 15 |

| <i>Fall</i> | Senior Year | <i>Spring</i> |
|---------------------|--------------------|-----------------------|
| ITIS 3300 | 3 | ITIS 3320 3 |
| ITIS/ITCS Elective | 3 | ITIS/ITCS Elective 3 |
| INFO 3211 | 3 | ENGL 4182/COMM 3141 3 |
| ENGL 4181/ENGL 4183 | 3 | Free elective 2 |
| <u>Minor-6</u> | <u>3</u> | <u>Minor-7</u> 3 |
| | 15 | 14 |

Total Hours 120

¹ MATH 1103 may be substituted for MATH 1100.

Financial Services Informatics Concentration. This concentration requires 120 credit hours total including 36 hours of informatics courses, 27 hours in financial services courses, 6 hours of financial services capstone courses, 9 hours of mathematics and statistics, 10 hours of sciences, 6 hours of critical thinking and ethics, and 23-26 hours of general education courses and free electives. The required Informatics core consists of ITCS 1212, ITCS 1212L, ITCS 1215, ITIS/ITCS 2301, ITCS 3155, ITCS 3160, and ITCS 3688; ITIS 1210, ITIS 2300, ITIS 3130, ITIS 3200, ITIS 3300, and ITIS 4220. The required Financial Services core consists of ACCT 2121, ACCT 2122, ECON 2101, ECON 2102, FINN 3120, FINN 3221, FINN 3226, ITIS/ITCS 1301, and ITIS/ITCS 3301.

A 6-hour, two-semester capstone sequence of courses is required. There are nine hours of mathematics and statistics courses, including MATH 1120, STAT 1220, and STAT 2223. Six hours of courses, PHIL 1105 and LBST 2211 (Ethics designated sections), are dedicated to critical thinking and technology ethics. Finally, there is a requirement for 6 hours of COMM 2105 and ENGL 2116. The remaining courses complete the General Education course required of all students.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS

(Financial Services Informatics Concentration)

| <i>Fall</i> | | Freshman Year | <i>Spring</i> | |
|------------------|----------|----------------------|------------------|----------|
| ITCS 1212/1212L | 3 | | ITCS 1215 | 3 |
| ITIS/ITCS 1301 | 3 | | ITIS 1210 | 3 |
| ENGL 1101 | 3 | | ENGL 1102 | 3 |
| MATH 1120 | 3 | | STAT 1220 | 3 |
| <u>LBST 110x</u> | <u>3</u> | | <u>PHIL 1105</u> | <u>3</u> |
| | 15 | | | 15 |

| <i>Fall</i> | | Sophomore Year | <i>Spring</i> | |
|------------------|----------|-----------------------|------------------|----------|
| ITIS 2300 | 3 | | ITIS/ITCS 2301 | 3 |
| ACCT 2121 | 3 | | ACCT 2122 | 3 |
| ECON 2301 | 3 | | ECON 2102 | 3 |
| STAT 2223 | 3 | | LBST 2211 | 3 |
| <u>COMM 2105</u> | <u>3</u> | | <u>ENGL 2116</u> | <u>3</u> |
| | 15 | | | 15 |

| <i>Fall</i> | | Junior Year | <i>Spring</i> | |
|-------------|---|--------------------|---------------|---|
| ITIS 3200 | 3 | | ITIS 3300 | 3 |

| | | | |
|------------------|----------|----------------------|----------|
| ITIS/ITCS 3301 | 3 | ITCS 3155 | 3 |
| FINN 3120 | 3 | FINN 3221 | 3 |
| Social Science | 3 | ITIS/ITCS 4640 | 3 |
| <u>LBST 2102</u> | <u>3</u> | <u>Free elective</u> | <u>3</u> |
| | 15 | | 15 |

| <i>Fall</i> | | Senior Year | | <i>Spring</i> | |
|-------------------------|----------|--------------------|--|----------------------|----------|
| ITCS 3160 | 3 | | | ITCS 3688 | 3 |
| ITIS 3130 | 3 | | | ITIS 4220 | 3 |
| FINN 3326 | 3 | | | LBST 2101 | 3 |
| ITIS/ITCS 4641 | 3 | | | Science | 3 |
| <u>Science with lab</u> | <u>4</u> | | | <u>Free elective</u> | <u>2</u> |
| | 16 | | | | 14 |

Total Hours 120

MEMORANDUM

TO: Interim Dean Bill Chu, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: October 28, 2008

RE: Request to establish a concentration in Financial Services Informatics

The request to establish a concentration in Financial Services Informatics was approved by the Chair of the Undergraduate Course and Curriculum Committee on October 20, 2008 for implementation Spring Semester 2009.

Catalog Copy:

Bachelor of Arts: Financial Services Informatics Concentration

The Financial Services Informatics Concentration consists of 27 hours in financial services courses that include ACCT 2121, ACCT 2122, ECON 2101, ECON 2102, FINN 3120, FINN 3221, FINN 3226, ITCS/ITIS 1301, and ITCS/ITIS 3301; 36 hours of courses in informatics. These include ITCS 1212, ITCS 1212L, ITCS 1215, ITCS/ITIS 2301, ITCS 3155, ITCS 3160, and ITCS 3688; ITIS 1210, ITIS 2300, ITIS 3130, ITIS 3200, ITIS 3300, and ITIS 4220. There is a 6 hour component in Financial Services Informatics Industry Foundations Capstone I and II. There are nine hours of mathematics and statistics courses, including MATH 1120, STAT 1220, and STAT 2223. A 6 hour block is dedicated to PHIL 1105 and LBST 2211 (Ethics designated sections). Finally, there is a requirement for 6 hours of COMM 2105 and ENGL 2116.

New Courses:

ITCS 1301. Introduction to the Financial Services Industry. (3) Crosslisted as ITIS 1301. The objective of this course is to provide the student with an overview of the financial services industry, to include such areas as the industry components; regulatory considerations and their impact; and relations with other institutions. *(Fall, Summer) (Evenings)*

ITCS 2301. Financial Services Computing Environment. (3) Crosslisted as ITIS 2301. Prerequisite: ITCS/ITIS 1301. The objective is for the student to gain insights on several key components in financial computing environments and the enabling technologies. *(Spring, Summer) (Evenings)*

ITCS 3301. Introduction to the Regulatory Environment for Financial Services Firms. (3) Crosslisted as ITIS 3301. Prerequisite: ITCS/ITIS 2301. Using case studies, enable the student to understand the compliance and regulatory environment that currently exists for Financial Services firms. *(Fall, Summer) (Evenings)*

ITCS 4640. Financial Services Informatics Industry Foundations Capstone I. (3) Crosslisted as ITIS 4640. Prerequisite: Senior standing. An individual or group project in the theory, teaching, or application of Financial Services Informatics under the direction of a faculty member. Projects must be approved before they may be initiated. *(Fall, Spring, Summer) (Evenings)*

ITCS 4641. Financial Services Informatics Industry Foundations Capstone II. (3) Crosslisted as ITIS 4641. Prerequisite: ITCS/ITIS 4640. A continuation of ITCS/ITIS 4640. *(Fall, Spring, Summer) (Evenings)*

ITIS 1301. Introduction to the Financial Services Industry. (3) Crosslisted as ITCS 1301. The objective of this course is to provide the student with an overview of the financial services industry, to include such areas as the industry components; regulatory considerations and their impact; and relations with other institutions. *(Fall, Summer) (Evenings)*

ITIS 2301. Financial Services Computing Environment. (3) Crosslisted as ITCS 2301. Prerequisite: ITCS/ITIS 1301. The objective is for the student to gain insights on several key components in financial computing environments and the enabling technologies. *(Spring, Summer) (Evenings)*

ITIS 3301. Introduction to the Regulatory Environment for Financial Services Firms. (3) Crosslisted as ITCS 3301. Prerequisite: ITCS/ITIS 2301. Using case studies, enable the student to understand the compliance and regulatory environment that currently exists for Financial Services firms. *(Fall, Summer) (Evenings)*

ITIS 4640. Financial Services Informatics Industry Foundations Capstone I. (3) Crosslisted as ITCS 4640. Prerequisite: Senior standing. An individual or group project in the theory, teaching, or application of Financial Services Informatics under the direction of a faculty member. Projects must be approved before they may be initiated. *(Fall, Spring, Summer) (Evenings)*

ITIS 4641. Financial Services Informatics Industry Foundations Capstone II. (3) Crosslisted as ITCS 4641. Prerequisite: ITCS/ITIS 4640. A continuation of ITCS/ITIS 4640. *(Fall, Spring, Summer) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: April 25, 2008

RE: Request to revise undergraduate curriculum & add new courses

The request to revise undergraduate curriculum & add new courses was approved by the chair of the Undergraduate Course and Curriculum Committee on April 8, 2008 for implementation Spring Semester 2009.

Catalog Copy:

BACHELOR OF ARTS: COMPUTER SCIENCE

The Computer Science Concentration consists of 39-42 hours in computer science, 3-9 additional hours of ITCS/ITIS at 3000 or above, and 12 hours in mathematics and statistics. Courses included are: ITCS 1212, 1212L, 1215, 2175, 2214, 2215, 3146, 3160, 3688, 12 hours in one of the CS focus areas listed below, 3-6 hours of ITCS 4155, 4232, 4650, 4651, 4990, or 4991 for capstone experience; MATH 1120, 2164, STAT 1220, 2223; or MATH 1241, 1242, 2164, STAT 2122. PHIL 1105 and ENGL 2116 are also required.

A component of 21-24 semester hours of approved non-computer science courses forming an integrated program of secondary focus must be included. A three-hour bridge course is included in the 21-24 hours. This course bridges between CS and the secondary focus discipline, which can be an ITCS course or a course in the other discipline. The secondary focus in business consists of ACCT 2121, 2122, ECON 2101, 2102, INFO 3231, 3234, 3236/3240 plus ITCS/INFO 2231 as a required bridge course. The secondary focus in cognitive science consists of PSYC 3115, 3116, PHIL 3245, ITIS 3130, and any two

from ITIS 3131, ENGL 4161, 4167, 4263, PHIL 3235, 3265, PSYC 3122, 3313, 4316 with ITCS 3216 as a required bridge course. In general, a secondary focus consists of 9 hours at the 3000-level or above, plus an additional 12 hours of approved non-ITCS courses, forming an integrated program in a complementary (or applied) area to computer science, possibly forming a minor in that discipline area.

BACHELOR OF SCIENCE: COMPUTER SCIENCE

The Computer Science Concentration consists of 45-48 hours of computer science, 6-9 additional hours of ITCS/ITIS at 3000 or above, and 12 hours in mathematics and statistics.

Courses included are: ITCS 1212, 1212L, 1215, 2175, 2214, 2215, 3146, 3160, 3181, 3688, 4102, 12 hours in one of the CS focus areas listed below, 3-6 hours of ITCS 4155, 4232, 4650, 4651, 4990, or 4991 for capstone experience; MATH 1241, 1242, 2164, STAT 2122. PHIL 1105 and ENGL 2116 are also required.

A component of 15 semester hours of approved non-computer science courses forming an integrated program of outside concentration must be included. The business outside concentration consists of a prescribed set of courses from the College of Business and one 3000-level course from a restricted set of choices. The mathematics outside concentration consists of 9 semester hours of approved mathematics courses at the 3000 level or above (6 hours of additional electives must be selected in this case). In general, an outside concentration consists of 6 hours at the 3000-level or above, plus an additional 9 hours of approved non-ITCS courses, forming an integrated program of secondary strength.

FOCUS AREAS

Computing Systems

ITCS 3110 Compiler Construction

ITCS 3112 Design and Implementation of Object-Oriented Systems

ITCS 3143 Operating Systems

ITCS 3155 Software Engineering

ITCS 3166 Introduction to Computer Networks

ITCS 4141 Computer Organization and Architecture

Game Design and Development

ITCS 4120 Introduction to Computer Graphics

ITCS 4230 Introduction to Game Design and Development

ITCS 4231 Advanced Game Design and Development

ITCS 4235 Game Engine Construction

ITCS 4236 Artificial Intelligence for Computer Games

ITCS 4237 Audio Processing for Entertainment Computing

Graphics and Visualization

ITCS 3134 Digital Image Processing

ITCS 4120 Introduction to Computer Graphics

ITCS 4121 Information Visualization

ITCS 4122 Visual Analytics

ITCS 4123 Visualization and Visual Communication

Intelligent Systems

ITCS 3134 Digital Image Processing

ITCS 3152 Symbolic Programming

ITCS 3153 Introduction to Artificial Intelligence

ITCS 4151 Intelligent Robotics

ITCS 4152 Computer Vision

Networking and Distributed Computing

ITCS 3166 Introduction to Computer Networks

ITCS 4141 Computer Organization and Architecture

ITCS 4145 Parallel Computing

ITCS 4146 Grid Computing

ITIS 3200 Introduction to Information Security and Privacy

BACHELOR OF SCIENCE: COMPUTER SCIENCE, COMPUTER ENGINEERING CONCENTRATION

The Computer Engineering Concentration consists of 42-45 hours of computer science, 6 hours of technical electives at 3000 or above, 15 hours of mathematics and statistics, 11 hours of electrical and computer engineering. These include: ITCS 1212, 1212L, 1215, 2175, 2214, 2215, 3146, 3181, 3183, 3688, 4102, 4141, 4145, an additional ITCS 3xxx/4xxx approved by the advisor, 3-6 hours of ITCS

4155, 4681, 4682, 4990, or 4991 for capstone experience; MATH 1241, 1242, 2164, 2171, STAT 2122; ECGR 2111, 2112, 2155, 2156, 3131. PHIL 1105 and ENGL 2116 are also required.

Students must also complete PHYS 2101, 2101L, 2102, 2102L, and 3141, CHEM 1251 and 1251L and ECON 2101.

Computer Science Minor

Requirements for the minor in Computer Science include completion of 24 hours of computer science: ITCS 1212, 1212L, 1215, 2175, 2214, 2215, 3146, 3160, and 3688.

Information Science Minor

Requirements for the minor in Information Science include completion of 24 hours of computer science: ITCS 1212, 1212L, 1215, 2175, 2214, 3112, 3146, 3155, and 3160.

Certificate Program in Computer Programming

The Department of Computer Science offers a certificate in Computer Programming to non-Computer Science majors. A certificate will be awarded by the Department of Computer Science to post-baccalaureate students (students having earned a bachelor's degree in any field, with one semester of calculus, who have enrolled with the graduate school as a post-baccalaureate student) who have completed the course requirements listed below:

- ITCS 1212 Introduction to Computing I
- ITCS 1212L Programming Lab I
- ITCS 1215 Introduction to Computing II
- ITCS 2175 Logic and Algorithms
- ITCS 2214 Data Structures
- ITCS 2215 Design and Analysis of Algorithms
- ITCS 3112 Design and Implementation of Object-Oriented Systems
- ITCS 3155 Software Engineering
- ITCS 3160 Database Design and Implementation

or

ITCS 4145 Parallel Computing

Certificate Program in Computer Architecture

The Department of Computer Science offers a certificate in Computer Architecture to non-Computer Science majors. A certificate will be awarded by the Department of Computer Science to post-baccalaureate students (students having earned a bachelor's degree in any field, with one semester of calculus, who have enrolled with the graduate school as a post-baccalaureate student), who have completed the course requirements listed below:

ITCS 1212 Introduction to Computing I

ITCS 1212L Programming Lab I

ITCS 1215 Introduction to Computing II

ITCS 2214 Data Structures

ITCS 3146 Operating Systems and Networks

ITCS 3181 Logic and Computer Systems

ITCS 3183 Hardware Systems Design

ITCS 4145 Parallel Computing

ITCS 4181 Microcomputer Interfacing

CURRICULUM OUTLINE: B.A. DEGREE IN COMPUTER SCIENCE

Freshman Year

| Fall | | | Spring | | |
|-------------|----------|--|------------|----|----------|
| ITCS 1212/L | 3 | | ITCS 1215 | 3 | |
| MATH 1120* | 3 | | ITCS 2175 | 3 | |
| PHIL 1105 | 3 | | STAT 1220* | 3 | |
| ENGL 1101 | 3 | | ENGL 1102 | 3 | |
| LBST 110x | <u>3</u> | | Science | | <u>4</u> |
| | 15 | | | 16 | |

Sophomore Year

| Fall | | | Spring | | |
|-----------------|----------|--|-----------------|----------|--|
| ITCS 2214 | 3 | | ITCS 2215 | 3 | |
| STAT 2223* | 3 | | MATH 2164* | 3 | |
| Secondary Focus | 3 | | Secondary Focus | 3 | |
| LBST 2101 | 3 | | LBST 2102 | 3 | |
| ENGL 2116 | <u>3</u> | | Social Science | <u>3</u> | |
| | 15 | | | 15 | |

Junior Year

| Fall | | | Spring | | |
|-----------------|----------|--|-----------------|----------|---|
| ITCS 3146 | 3 | | ITCS 3160 | 3 | |
| Focus Area | 3 | | Focus Area | 3 | |
| LBST 221x | 3 | | Science | | 3 |
| Secondary Focus | 3 | | Secondary Focus | 3 | |
| Secondary Focus | <u>3</u> | | Elective | <u>3</u> | |

15

15

Senior Year

| Fall | | Spring | |
|-------------------|----------|-------------------|----------|
| ITCS 3688 | 3 | Capstone | 3 |
| Focus Area | 3 | Focus Area | 3 |
| ITCS/IS 3xxx/4xxx | 3 | ITCS/IS 3xxx/4xxx | 3 |
| Secondary Focus | 3 | Secondary Focus | 3 |
| Elective | <u>3</u> | Elective | <u>2</u> |
| | 15 | | 14 |

Total Hours 120

* A mathematics option consisting of MATH 1241, 1242, and 2164, and STAT 2122 may be selected as an alternate to the math courses listed.

CURRICULUM OUTLINE: B.S. DEGREE IN COMPUTER SCIENCE

Freshman Year

| Fall | | | Spring | | |
|-------------|----------|--|-----------|---|----------|
| ITCS 1212/L | 3 | | ITCS 1215 | 3 | |
| PHIL 1105 | 3 | | ITCS 2175 | 3 | |
| MATH 1241 | 3 | | MATH 1242 | 3 | |
| ENGL 1101 | 3 | | ENGL 1102 | 3 | |
| LBST 110x | <u>3</u> | | Science | | <u>4</u> |
| | 15 | | | | 16 |

Sophomore Year

| Fall | | | Spring | | |
|-----------|----------|--|-----------------------|----------|---|
| ITCS 2214 | 3 | | ITCS 2215 | 3 | |
| STAT 2122 | 3 | | MATH 2164 | 3 | |
| LBST 2101 | 3 | | LBST 2102 | 3 | |
| LBST 221x | 3 | | Science | | 3 |
| ENGL 2116 | <u>3</u> | | Outside Concentration | <u>3</u> | |
| | 15 | | | 15 | |

Junior Year

| Fall | | | Spring | | |
|-----------------------|---|--|------------|---|---|
| ITCS 3181 | 3 | | ITCS 3146 | 3 | |
| Focus Area | 3 | | ITCS 3160 | 3 | |
| ITCS/IS 3xxx/4xxx | 3 | | ITCS 3688 | 3 | |
| Outside Concentration | 3 | | Focus Area | | 3 |

| | | | |
|----------------|----------|-----------------------|----------|
| Social Science | <u>3</u> | Outside Concentration | <u>3</u> |
| | 15 | | 15 |

Senior Year

| Fall | | Spring | |
|-----------------------|----------|-----------------------|----------|
| ITCS 4102 | 3 | Capstone | 3 |
| Focus Area | 3 | Focus Area | 3 |
| ITCS/IS 3xxx/4xxx | 3 | ITCS/IS 3xxx/4xxx | 3 |
| Outside Concentration | 3 | Outside Concentration | 3 |
| Electives | <u>3</u> | Electives | <u>2</u> |
| | 15 | | 14 |

Total Hours 120

CURRICULUM OUTLINE: B.S. DEGREE, COMPUTER ENGINEERING CONCENTRATION

Freshman Year

| Fall | | | Spring | | |
|-------------|----|----------|------------|----|----------|
| ITCS 1212/L | 3 | | ITCS 1215 | 3 | |
| PHIL 1105 | 3 | | ITCS 2175 | 3 | |
| MATH 1241 | 3 | | MATH 1242 | 3 | |
| CHEM 1251 | 3 | | PHYS 2101 | 3 | |
| CHEM 1251L | 1 | | PHYS 2101L | 1 | |
| ENGL 1101 | | <u>3</u> | ENGL 1102 | | <u>3</u> |
| | 16 | | | 16 | |

Sophomore Year

| Fall | | | Spring | | |
|------------|----|----------|-----------|----|----------|
| ITCS 2214 | 3 | | ITCS 2215 | 3 | |
| MATH 2164 | 3 | | MATH 2171 | 3 | |
| STAT 2122 | 3 | | ENGL 2116 | 3 | |
| PHYS 2102 | 3 | | ECGR 2111 | 3 | |
| PHYS 2102L | 1 | | ECGR 2155 | 1 | |
| LBST 110x | | <u>3</u> | LBST 2102 | | <u>3</u> |
| | 16 | | | 16 | |

Junior Year

| Fall | | | Spring | | |
|-----------|---|--|-----------|---|--|
| ITCS 3181 | 3 | | ITCS 3688 | 3 | |
| ITCS 3146 | 3 | | ITCS 4141 | 3 | |
| ECON 2101 | 3 | | PHYS 3141 | 3 | |
| LBST 2101 | 3 | | LBST 221x | 3 | |

| | | | |
|-----------|----------|-----------|----------|
| ECGR 2112 | 3 | ECGR 3131 | <u>3</u> |
| ECGR 2156 | <u>1</u> | | |
| | 16 | | 15 |

Senior Year

| | Fall | | Spring |
|--------------------|----------|--------------------|----------|
| ITCS 3183 | 3 | Capstone | 3 |
| ITCS 4102 | 3 | ITCS/IS 3xxx/4xxx | 3 |
| ITCS 4145 | 3 | Technical Elective | 3 |
| Technical Elective | <u>3</u> | Free Electives | <u>4</u> |
| | 12 | | 13 |

Total Hours 120

New Courses:

ITCS 3146. Operating Systems and Networking. (3) Prerequisite: ITCS 2215 or permission of the department. Introduces the fundamentals of operating systems together with the basics of networking and communications. Topics include: processes, thread, cache, memory management, virtual memory, concurrency, assembly language, network architecture and protocols, web and HTTP, UDP and TCP, internet routing. *(Fall, Spring) (Evenings)*

ITCS 3181. Logic and Computer Systems. (3) Prerequisites ITCS 2175 and ITCS 2215; corequisite: ITCS 3181L. Fundamental layers of digital computer systems: Switch level network structure; digital logic level including ALU, registers, buses; microprogramming level; conventional Instruction Set Architecture level and assembly language; memory organization and architecture; pipelining and functional parallelism. *(Fall, Spring, Summer) (Evenings)*

ITCS 3181L Computer Systems Lab and Recitation. (0) Corequisite: ITCS 3181. Meets two hours per week. Guided laboratory exercises and recitation for design of multilevel computer systems: combinational and sequential logic networks; Arithmetic and Logic Unit; pipeline design; microprogramming and assembly language practice; computer simulation practice. *(Fall, Spring, Summer) (Evenings)*

ITCS 4155. Software Development Projects. (3) Prerequisites: ITCS 2215, one of ITCS 3155, ITIS 3300, ITIS 3310, or permission of the instructor, and Senior Standing or permission of the Department. In this course, students will learn advanced software engineering concepts. The course will explore the entire software development process, emphasizing requirements engineering, design, implementation, test, deployment, and evolution. In addition, students will be introduced to advanced topics in software engineering, such as object-oriented modeling, software architecture, architectural styles, design patterns, middleware frameworks, and programming paradigms. Students will apply these concepts, along with concepts from introductory programming courses, data structures and algorithms courses, and introductory software engineering courses, to a team software development project that will result in an executable software system prototype. *(Spring)*

ITCS 4991. Undergraduate Thesis. (3) Prerequisite: ITCS 4155, 4232, 4650, 4681, or 4990, and permission of the department. A thesis student will explore a subject in computer science chosen for thesis research and present a written thesis to the student's thesis committee consisting of the thesis advisor and at least two other faculty members. *(Fall, Spring)*

Existing courses with minor modification in prerequisites:

ITCS 1215. Introduction to Computer Science II. (3) Prerequisite: ITCS 1212 with a grade of C or better, or permission of the department. An advanced study of programming based on object oriented concepts. Extends the fundamentals studied in ITCS 1212. Includes a study of software design tools and advanced programming constructs, such as UML diagrams, decision tables, recursion, and dynamic storage allocation. Concepts are taught by means of an in-depth study of an object oriented language. *(Fall, Spring, Summer) (Evenings) (Internet)*

ITCS 2175. Logic and Algorithms. (3) Prerequisites: ITCS 1212 and (MATH 1120 or MATH 1241). Introduction to propositional calculus, predicate calculus, algorithms, logic functions, finite-state machines; logic design. *(Fall, Spring, Summer) (Evenings) (Internet)*

ITCS 2181. Computer Logic and Design. (3) Prerequisite: ITCS 1212 or permission of the department. Logic design; logic circuits; state diagrams; Karnaugh maps; memories; tri-state devices; bus structures; and data control concepts. *(Fall, Spring, Summer) (Evenings)*

ITCS 4232. Game Design and Development Studio. (3) Prerequisite: (ITCS 3155, ITCS 4120, ITCS 4231, and one approved game elective) or permission of instructor, and (senior standing or permission of the department). Application of advanced concepts and techniques for electronic game design and development. Teams will use engineering techniques to incorporate game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence into an electronic game. Individuals will develop a complete portfolio of prior work and the class project. *(Spring) (Odd years) (Evenings)*

ITCS 4650. Senior Project. (3) Prerequisites: senior standing and two ITCS/ITIS 3xxx/4xxx courses with a grade of C or better, or permission of the department. An individual or group project in the teaching, theory, or application of computer science under the direction of a faculty member. Projects must be approved by the Department before they can be initiated. *(Fall, Spring) (Evenings)*

ITCS 4681. Senior Design I. (3) Prerequisites: senior standing and two ITCS/ITIS 3xxx/4xxx courses with a grade of C or better, or permission of the department. An individual or group computer engineering design project under the direction of a faculty member. Projects must be approved by the department before they can be initiated. *(Fall, Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 9, 2008

RE: Request to establish ITCS 5161 (Intellectual Property Aspects of Computing)

The request to establish ITCS 5161 (Intellectual Property Aspects of Computing) was approved by the Graduate Council on April 1, 2008 and by the Faculty Council on the April 23, 2008 Consent Calendar for implementation Spring Semester 2009.

Catalog Copy:

ITCS 5161. Intellectual Property Aspects of Computing. (3) Prerequisite: Graduate standing. This course explores the broad field of intellectual property and the many aspects related to computing. Topics covered include software copyrights, software patents, trademarks and service marks, employment contracts, non-compete agreements, software licenses, software development contracts, preservation of digital evidence, protection of trade secrets, cyberspace law and the use of mediation in IP disputes. *(Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: April 4, 2008

RE: Request to change ITCS 1214 to ITCS 1212 + ITCS 1212L

The request to change ITCS 1214 to ITCS 1212 + ITCS 1212L was approved by the chair of the Undergraduate Course and Curriculum Committee on March 11, 2008 for implementation Spring Semester 2009.

Catalog Copy:

ITCS 1212. Introduction to Computer Science. (3) Corequisite: ITCS 1212L; Prerequisites or co-requisites: MATH 1100 or MATH 1103 or MATH 1120 or MATH 1241. Introduction to algorithmic problem solving strategies and algorithm development; basic concepts and terminology of computers; study of data representation and number systems; use of computers to implement numerical and symbolic algorithms. General programming concepts will be taught through the use of a high level language. The course grade includes the student's performance in ITCS 1212L. *(Fall, Spring, Summer) (Evenings) (Internet)*

ITCS 1212L. Programming Lab I. (0) Corequisite: ITCS 1212. Guided laboratory exercises dealing with programming mechanics; algorithm development; and the use of computers in problem solving. One laboratory period of three hours per week. Performance in ITCS 1212L will be counted as portion of the ITCS 1212 grade. Graded on a Pass/No Credit basis. *(Fall, Spring, Summer) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: March 17, 2008

RE: Request to establish ITCS 4161

The request to establish ITCS 4161 was approved by the chair of the Undergraduate Course and Curriculum Committee on March 11, 2008 for implementation Fall Semester 2008.

Catalog Copy:

ITCS 4161. Intellectual Property Aspects of Computing. (3) Prerequisite: Senior standing or permission of the department. This course explores the broad field of intellectual property and the many aspects related to computing. Topics covered include software copyrights, software patents, trademarks and service marks, employment contracts, non-compete agreements, software licenses, software development contracts, preservation of digital evidence, protection of trade secrets, cyberspace law and the use of mediation in IP disputes. (*Spring*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: January 29, 2008

RE: Request to cross list ITIS 6500/8500 as ITCS 6500/8500

The request to cross list ITIS 6500/8500 as ITCS 6500/8500 was approved by the Chair of the Graduate Council on January 22, 2008 for implementation Fall Semester 2008.

Catalog Copy:

ITCS 6500/8500. Complex Adaptive Systems. (3) Crosslisted as ITIS 6500/8500. Prerequisite: Permission of instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organizations of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. This course will cover those and similar topics in an interactive manner. Examples of our current research effort will be provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 8, 2007

RE: Request to establish a Graduate Certificate in Game Design and Development

The request to establish a Graduate Certificate in Game Design and Development was approved by the Graduate Council on May 16, 2007 and by the Faculty Council on the May 25, 2007 Consent Calendar for implementation Spring Semester 2008.

Catalog Copy:

Graduate Certificate in Game Design and Development (GDD).

The purpose of the GDD certificate is to provide graduate students with the opportunity to reach a demonstrated level of competence in game design and development. Course-work towards the certificate in GDD can be used towards the Master's degree in Computer Science. However, its primary purpose is to provide a well-defined target for students who want to advance their knowledge of modern game design and development techniques and work with a variety of professionals, from artists to writers, to bring the vision for an interactive game or media product to life. The certificate may be pursued concurrently with any of the graduate degree programs at UNC Charlotte.

Completion Requirements:

The certificate will be awarded upon completion of five graduate level courses (15 credits) in the area of game design and development. The cumulative GPA must be at least 3.0 and at most one course with a grade of C may be allowed toward the certificate. Course substitutions may be made at the discretion of the GDD Certificate Coordinators.

To obtain the certificate a student needs to:

1. Take the following four compulsory courses:

- ITCS 5230 Introduction to Game Design and Development
- ITCS 5231 Advanced Game Design and Development
- ITCS 5232 Game Design and Development Studio
- ITCS 5120/6120 Computer Graphics

2. Take one elective course from the following:

- ITCS 5235 Game Engine Construction
- ITCS 5236 Artificial Intelligence for Computer Games
- ITCS 5237 Audio Processing for Entertainment Computing

- Another game-related course (generally from ITCS/ITIS at the 5000 level or above) approved by the GDD coordinators.

Admission Requirements:

The certificate in GDD is open to all students who hold a Bachelor's degree in any scientific, engineering or business and either

- Are enrolled and in good standing in a graduate degree program at UNC Charlotte or
- Have a GPA above 2.8 overall and 3.0 Jr/Sr.

In addition, the program expects a current working knowledge of two higher level languages, including at least one procedural language, and a familiarity with computer applications. The following minimal background in mathematics is compulsory: two semesters of calculus and one semester of discrete structures. Individuals who have worked at a high professional level in the computer industry may be able to substitute work experience for specific subject area admission requirements. Application for the GDD certificate program is made through the Graduate Admissions Office of the University.

Courses used to satisfy requirements of a previous degree are not acceptable. Students with significant game-related work at the undergraduate level may be allowed to substitute advanced game courses for compulsory courses at the discretion of the GDD certificate coordinators.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 8, 2007

RE: Request to establish ITIS 6150/8150: Software Assurance

The request to establish ITIS 6150/8150: Software Assurance was approved by the Graduate Council on May 16, 2007 and by the Faculty Council on the May 25, 2007 Consent Calendar for implementation Spring Semester 2008.

Catalog Copy:

ITIS 6150/8150. Software Assurance. (3) Prerequisite: ITIS/ITCS 6112, ITIS/ITCS 8112, ITIS 6177, ITIS 8177, or consent of the department. This course will be an introduction to software assurance education and research. Topics discussed will include the security of software across the development life cycle that addresses trustworthiness, predictable execution and conformance. Various aspects of secure software requirements, design, construction, verification, and validation, process and engineering management will be focused as they relate to secure software development. Students will gain hands-on experience in various techniques and tools as part of a semester-long project in addition to other assignments. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 8, 2007

RE: Request to establish ITIS 6510/8510: Software Agent Systems

The request to establish ITIS 6510/8510: Software Agent Systems was approved by the Graduate Council on May 16, 2007 and by the Faculty Council on the May 25, 2007 Consent Calendar for implementation Spring Semester 2008.

Catalog Copy:

ITIS 6510/8510. Software Agent Systems. (3) Prerequisite: Full graduate standing, or consent of the department. This course will be an introduction to centralized and distributed software agent systems. Topics discussed will include agent cooperation in cooperative and competitive environments, agent architectures, game theoretical models, market mechanisms, multi-agent learning, mixed-initiative computing and single and multi-agent applications. The students will gain hands-on experience by building a multi-agent system as part of a semester-long project in addition to shorter assignments. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 8, 2007

RE: Request to establish ITIS 6410/8410: Personalization Recommender Systems

The request to establish ITIS 6410/8410: Personalization Recommender Systems was approved by the Graduate Council on May 16, 2007 and by the Faculty Council on the May 25, 2007 Consent Calendar for implementation Spring Semester 2008.

Catalog Copy:

ITIS 6410/8410. Personalization and Recommender Systems. (3) Prerequisite: Full graduate standing, or consent of the department. This course is an introduction to the application of personalization and recommender systems techniques in information systems. Topics include: historical, individual and commercial perspectives; underlying approaches to content-based and collaborative recommendation techniques for building user models; acceptance issues; and case-studies drawn from research prototypes and commercially deployed systems. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Program Assistant to Faculty Governance

DATE: May 29, 2007

RE: Request to establish a Professional Science Master's in Bioinformatics

The request to establish a Professional Science Master's in Bioinformatics was approved by Board of Governors on May 11, 2007 for implementation August 2007.

Catalog copy:

BIOINFORMATICS

Bioinformatics Program

Cameron Applied Research Center, Room 206

704-687-8541

<http://www.bioinformatics.uncc.edu/>

Degrees

Professional Science Masters in Bioinformatics

Ph.D. in Information Technology (Bioinformatics Track)

Program Director

Dr. Lawrence Mays

Graduate Faculty

Anthony Fodor, Assistant Professor

Cynthia Gibas, Associate Professor

Dennis Livesay, Associate Professor

Lawrence Mays, Professor

Zhengchang Su, Assistant Professor

PROFESSIONAL SCIENCE MASTERS IN BIOINFORMATICS

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for study toward the Professional Science Masters (PSM) in Bioinformatics:

Under most circumstances, students admitted to the program will have:

1. A baccalaureate degree from an accredited college or university in Biology, Biochemistry, Chemistry, Physics, Mathematics, Statistics, Computer Science, or another related field that provides a sound background in life sciences, computing, or both.
2. A minimum undergraduate GPA of 3.0 (4.0 scale) and 3.0 in the major.
3. A minimum combined score of 1000 on the verbal and quantitative portions of the GRE, and acceptable scores on the analytical and discipline-specific sections of the GRE.
4. A combined TOEFL score of 220 (computer-based) or 557 (paper-based) is required if the previous degree was from a country where English is not the common language.
5. Positive letters of recommendation.

Degree Requirements

The Professional Science Masters (PSM) in Bioinformatics degree requires a minimum of 37 graduate credit hours, and a minimum of 33 credit hours of formal course work. A minimum of 24 credit hours presented toward a PSM in Bioinformatics must be numbered 6000 or higher. A maximum of 6 hours of graduate credit may be transferred from other institutions.

1. Total hours required.

The program requires 37 post-baccalaureate credit hours. Because of the interdisciplinary nature of this program, which is designed to provide students with a common graduate experience during their professional preparation for the PSM in Bioinformatics degree, all students will be required to take a general curriculum that includes a two-year sequence of courses as described below:

2. Core Requirements.

a. Fundamentals Courses

The **Fundamentals** course sequences are intensive graduate-level courses designed to provide accelerated training in a second discipline that complements the student's undergraduate training. Students entering the program are expected to have achieved proficiency in either Biological Sciences or Computing, and to require at most two of the **Fundamentals** courses.

Fundamental Biology track: This course sequence is designed for students entering with a degree in Computer Science or another quantitative science discipline. The Fundamental Biology course sequence provides accelerated training in Genetics, Cell and Molecular Biology, and Biochemistry for students entering Bioinformatics from computer science or quantitative science. BINF 6100, 6101.

Fundamental Computing track: The Fundamental Computing track is designed for students entering with a degree in a life science discipline. The Fundamental

Computing course sequence provides accelerated training in programming and data structures for students entering Bioinformatics from life sciences. BINF 6111, 6112.

b. Core Bioinformatics Courses

Fundamentals courses prepare students for the required **Core Bioinformatics** courses. Students must take BINF 6200, Statistics for Bioinformatics, and 9 additional credit hours of **Core Bioinformatics** courses, which include four core methods courses, BINF 6201, Molecular Sequence Analysis, BINF 6202, Computational Structural Biology, BINF 6203, Genomics, Transcriptomics & Proteomics, and BINF 6204, Mathematical Systems Biology, as well as two core computational skills courses, BINF 6210, Numerical Methods for Bioinformatics, and BINF 6211, Design and Implementation of Bioinformatics Databases.

c. Professional Preparation Requirement

Students are required to take at least 3 credit hours of an elective designed to prepare them to function effectively and ethically in a professional environment. Some recommended electives in this category include PHIL 6050/8050, Research Ethics, and ITIS 6362, Information Technology Ethics, Policy, and Security. Additional elective choices that may fulfill this requirement can be identified by the student and the student's Advisory Committee.

d. The remaining credit hours of formal course work can be completed in additional **Core Bioinformatics** courses and/or other recommended program electives. The student's Advisory Committee will review the student's plan of study each semester.

Bioinformatics Electives: Any courses with BINF numbers, with the exception of **Fundamentals** courses that share common subject matter with the student's undergraduate degree, are open to PSM students seeking to complete their coursework requirements.

Recommended Electives offered by other units: A wide range of courses in Biology, Chemistry, Computer Science, Software and Information Systems, and other departments may be appropriate electives for PSM in Bioinformatics students. As course offerings change frequently, the Bioinformatics Program maintains a list of

current recommended electives, which can be found on the Professional Science Masters in Bioinformatics home page at

<http://www.bioinformatics.uncc.edu/psm/>.

e. Other requirements

In addition to 30 hours formal coursework, students are required to enroll in the Bioinformatics Program seminar (BINF 6600) for at least one semester (1 credit hour) and to enroll in either an approved internal or external internship (BINF 6400) or a faculty-supervised original research project leading to a thesis (BINF 6900).

2. Grades required.

An accumulation of three C grades will result in suspension of the student's enrollment in the graduate program. If a student makes a grade of U in any course, enrollment in the program will be suspended.

3. Amount of transfer credit accepted.

A maximum of 6 credit hours of coursework from other institutions will count toward the PSM in Bioinformatics degree requirements. Only courses with grades of A or B from accredited institutions are eligible for transfer credit.

Ph.D. in INFORMATION TECHNOLOGY (BIOINFORMATICS TRACK)

The Bioinformatics Program admits students seeking the Ph.D. degree under the Ph.D. in Information Technology (Bioinformatics Track). All requirements for the Ph.D. in Information Technology are described (on page ### of this catalog). The Bioinformatics Track follows all of the common requirements of the Information Technology Ph.D. program with the exception stated below.

Bioinformatics Track Requirements

Students will be required to demonstrate competence, by coursework, examinations, or projects, in the areas of biochemistry, cellular and molecular biology, genetics, statistics, and computer science related to core concepts in bioinformatics. The student's advisor and at least one other dissertation committee member must be faculty in the Bioinformatics Program. Students in this track must also take at least 6 hours of Pre-dissertation Research (ITSC 8990) under the direction of Bioinformatics track faculty members. A major goal of this course will be to prepare the student for the Qualifying Examination.

Core Requirements

Plans of Study for Bioinformatics Ph.D. students are developed on an individual basis, by the student and his or her advisory committee. However, Bioinformatics Ph.D. students and their advisors may wish to consult the Professional Science Masters Core Requirements, above, for guidance in selecting the initial Plan of Study to complement the student's undergraduate background. 8000-numbered versions of course offerings are open to Ph.D. students.

COURSES IN BIOINFORMATICS

BINF 6100. Biological Basis of Bioinformatics. (3) Prerequisites: Admission to graduate standing in Bioinformatics and undergraduate training in Computer Science or other non-biological discipline. Provides a foundation in molecular genetics and cell biology focusing on foundation topics for graduate training in bioinformatics and genomics. *(Fall)*

BINF 6101. Energy and Information in Biological Modeling. (3) Prerequisites: Admission to graduate standing in Bioinformatics. This course covers: the major organic and inorganic chemical features of biological macromolecules, the physical forces that shape biological molecules, assemblies and cells, the chemical driving forces that govern living systems, the molecular roles of biological macromolecules and common metabolites, and the pathways of energy generation and storage. Each section of the course builds upon the relevant biology and chemistry to explain the most common mathematical and physical abstractions used in modeling in the relevant context. *(Spring)*

BINF 6111. Bioinformatics Programming I. (3) Prerequisites: Admission to graduate standing in Bioinformatics. Students in this course will learn how to use object-oriented programming to solve common problems in bioinformatics. Topics covered will include creation and manipulation of relational databases and interfacing with standard bioinformatics programs such as CLUSTAL, BLAST and HMMer. Emphasis will be placed on the creation of memory and time efficient algorithms to handle the large data sets of post-genomic biology. *(Fall)*

BINF 6112. Bioinformatics Programming II. (3) Prerequisite: BINF 6111. This is a continuation of Bioinformatics Programming I (BINF 6111). While the previous course emphasized fundamentals of Bioinformatics programming, this course emphasizes efficiency in speed, data structures and file size. Students will learn how to optimize code and databases so that the demanding analyses of modern biology can be performed in acceptable amounts of time while minimizing hardware requirements. Topics covered will include algorithm optimization, optimization of database queries and parallel processing to allow bioinformatics calculations to be performed on clusters. *(Spring)*

BINF 6200. Statistics for Bioinformatics. (3) Prerequisite: BINF 6100 and 6111 or equivalents. The aim of this 3-credit course is to introduce students to statistical methods used in further more technical courses. Basic relevant concepts from probability, stochastic processes, information theory, statistics and experimental design will be introduced and illustrated by examples from molecular biology, genomics and population genetics with an outline of algorithms and software. R is introduced as the programming language for homework. *(Fall)*

BINF 6201. Molecular Sequence Analysis. (3) Prerequisite: BINF 6100 or equivalent. Introduction to bioinformatics methods that apply to molecular sequence. Intro to biological databases online. Sequence databases, molecular sequence data formats, sequence data preparation and database submission. Local and global sequence alignment, multiple alignment, alignment scoring and alignment algorithms for protein and nucleic acids, gene finding and feature finding in sequence, models of molecular evolution, phylogenetic analysis, comparative modeling. *(Fall)*

BINF 6202. Computational Structural Biology. (3) Prerequisite: BINF 6101, 6201 or equivalents. This course will cover: **(a)** the fundamental concepts of structural biology (chemical building blocks, structure, superstructure, folding, etc.); **(b)** software for visualization, visualization styles, publication quality images; **(c)** the hierarchical

nature of biomacromolecular structure classification; **(d)** computational methods to evaluate and compare biomacromolecular structure; **(e)** inferring structure/function relationships from structure; and **(f)** computational prediction of protein and nucleic acid structure from sequence. *(Fall)*

BINF 6203. Genomics, Transcriptomics & Proteomics. (3) Prerequisite: BINF 6100 or equivalent, and BINF 6201. This course surveys the application and interpretation of high-throughput molecular biology and analytical biochemistry methods used to produce the kinds of high-volume biological data most commonly encountered by bioinformaticians. The relationship between significant biological questions, modern biotechnology methods, and the bioinformatics solutions that enable interpretation of complex data is emphasized. Topics include: Genome sequencing and assembly, genome annotation, genome comparison. Genome evolution. Function prediction and gene ontologies. Microarray assay design, data acquisition, data analysis. Proteomics and methods and data analysis. Methods for identification of molecular interactions. Metabolic databases, pathways and models. *(Spring)*

BINF 6204. Mathematical Systems Biology. (3) Prerequisites: BINF 6200 and 6210 or equivalents. Introduction to concepts and common methods in systems biology. The class emphasizes molecular networks, models and applications, and covers the following topics: complexity and robustness of cellular systems; hierarchy and modularity of molecular interaction networks; biological data acquisition for system level modeling; introduction to systems biology markup language (SBML); Bayesian inference of biological systems; stoichiometric and constraint-based modeling; modeling molecular interaction networks with nonlinear ordinary differential equations; quantitative approaches to the analysis of genetic regulatory networks; stochastic modeling of intracellular kinetics; multilevel modeling. *(Spring)*

BINF 6210. Numerical Methods in Bioinformatics. (3) Prerequisites: Ability to program in a high-level language (Perl, Java, C#, Python, Ruby, C/C++). Calculus. This course will focus on mathematically complex problems and show students how to implement efficient numerical methods to solve those problems. The focus on the class will depend on instructor expertise but may include: applying linear models and principal component analysis to analysis of microarrays, application of ordinary and partial differential equations to modeling cellular pathways, applying Markov Chains to gene finding and gene predictions algorithms and application of stochastic models and Monte Carlo simulations to molecular dynamics and protein folding. *(Fall)*

BINF 6211. Design and Implementation of Bioinformatics Databases.

(3) Prerequisite: BINF 6111 and 6112 or equivalent. Students will acquire skills needed to exploit public biological databases and establish and maintain personal databases that support their own research; such skills include learning underlying data models and the basics of DBMS, and SQL. Particular topics will include formats and schemas in important bioinformatics databases (Genbank, EMBL, PDB), XML schema and XML exchange methods, using CGI for the query interface, using generic database tools to browse and manage databases (Tomcat and Padmin), relevant database applications of SOAP and CORBA, the types of models used in designing databases, and how ontologies (such as GO) affect database design and queries. *(Spring)*

BINF 6310. Analysis of Microarray Data. (3) This course focuses on recent literature concerning algorithms for analysis of microarray data. The course will start with a review of normal statistics (t-test, ANOVA, etc.) and their non-parametric, robust equivalents. We then turn to primary literature for a survey of the techniques of analyzing microarray data: background subtraction, normalization across samples, assignment of p-values, evaluation of algorithms on control data sets, clustering algorithms, self organizing maps, bootstrap estimations of significance and over-representation of gene ontology terms. Special attention will be given to the problem of appropriate correction of significance for multiple measurements. Students should have fluency in a high-level programming language (PERL, Java, C# or equivalent) and will be expected in assignments to manipulate and analyze large public data sets. The course will utilize the R statistical package with the bioconductor extension. *(On demand)*

BINF 6311. Biophysical Modeling. (3) This course will cover: (a) overview of mechanical force fields; (b) energy minimization; (c) dynamics simulations (molecular and coarse-grained); (d) Monte-Carlo methods; (e) systematic conformational analysis (grid searches); (f) classical representations of electrostatics (Poisson-Boltzmann, Generalized Born and Colomnic); (g) free energy decomposition schemes; and (h) hybrid quantum/classical (QM/MM) methods. *(On demand)*

BINF 6312. Computational Comparative Genomics. (3) Prerequisite: BINF 6210 or equivalent. Computational methods for comparative genomics analysis. The course covers the following topics: the architecture of prokaryotic and eukaryotic genomes; the evolutionary concept in genomics. databases and resources for comparative genomics; principles and methods for sequence analysis; evolution of genomes; comparative gene function annotation; evolution of the central metabolic pathways and regulatory networks; genomes and the protein universe; cis-regulatory binding site prediction;

operon and regulon predictions in prokaryotes; regulatory network mapping and prediction. *(On demand)*

BINF 6313. Structure, Function, and Modeling of Nucleic

Acids. (3) Prerequisite: BINF 6100-6101 or equivalent. The course covers the following topics: atomic structure, macromolecular structure-forming tendencies and dynamics of nucleic acids; identification of genes which code for functional nucleic acid molecules, cellular roles and metabolism of nucleic acids; 2D and 3D abstractions of nucleic acid macromolecules and methods for structural modeling and prediction; modeling of hybridization kinetics and equilibria; hybridization-based molecular biology protocols, detection methods and molecular genetic methods, and the role of modeling in designing these experiments and predicting their outcome. *(On demand)*

BINF 6400. Internship Project. (1-3) Prerequisites: Admission to graduate standing in Bioinformatics. Project chosen and completed under the guidance of an industry partner, which results in an acceptable technical report. *(Fall, Spring)*

BINF 6600. Seminar. (1) Prerequisites: Admission to graduate standing in Bioinformatics. Departmental seminar. Weekly seminars will be given by bioinformatics researchers from within UNCC and across the world. *(Fall, Spring)*

BINF 6601. Journal Club. (1) Prerequisites: Admission to graduate standing in Bioinformatics. Each week, a student in the class is assigned to choose and present a paper from the primary bioinformatics literature. *(Fall, Spring)*

BINF 6900. Masters' Thesis. (1-3) Prerequisites: Twelve graduate credits and permission of instructor. Project chosen and completed under the guidance of a graduate faculty member, which results in an acceptable master's thesis and oral defense. *(On demand)*

ITSC 8100. Biological Basis of Bioinformatics. (3) Prerequisites: Admission to graduate standing in Bioinformatics and undergraduate training in Computer Science or other non-biological discipline. Provides a foundation in molecular genetics and cell

biology focusing on foundation topics for graduate training in bioinformatics and genomics. *(Fall)*

ITSC 8101. Energy and Information in Biological Modeling. (3) Prerequisites: Admission to graduate standing in Bioinformatics. This course covers: the major organic and inorganic chemical features of biological macromolecules, the physical forces that shape biological molecules, assemblies and cells, the chemical driving forces that govern living systems, the molecular roles of biological macromolecules and common metabolites, and the pathways of energy generation and storage. Each section of the course builds upon the relevant biology and chemistry to explain the most common mathematical and physical abstractions used in modeling in the relevant context. *(Spring)*

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ITSC 8112. Bioinformatics Programming II. (3) Prerequisite: ITSC 8111. This is a continuation of Bioinformatics Programming I (ITSC 8111). While the previous course emphasized fundamentals of Bioinformatics programming, this course emphasizes efficiency in speed, data structures and file size. Students will learn how to optimize code and databases so that the demanding analyses of modern biology can be performed in acceptable amounts of time while minimizing hardware requirements. Topics covered will include algorithm optimization, optimization of database queries and parallel processing to allow bioinformatics calculations to be performed on clusters. *(Spring)*

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ITSC 8201. Molecular Sequence Analysis. (3) Prerequisite: ITSC 8100 or equivalent. Introduction to bioinformatics methods that apply to molecular sequence. Intro to biological databases online. Sequence databases, molecular sequence data formats, sequence data preparation and database submission. Local and global sequence alignment, multiple alignment, alignment scoring and alignment algorithms for protein and nucleic acids, genefinding and feature finding in sequence, models of molecular evolution, phylogenetic analysis, comparative modeling. *(Fall)*

ITSC 8202. Computational Structural Biology. (3) Prerequisite: ITSC 8101, 8201 or equivalents. This course will cover: (a) the fundamental concepts of structural biology (chemical building blocks, structure, superstructure, folding, etc.); (b) software for visualization, visualization styles, publication quality images; (c) the hierarchical nature of biomacromolecular structure classification; (d) computational methods to evaluate and compare biomacromolecular structure; (e) inferring structure/function relationships from structure; and (f) computational prediction of protein and nucleic acid structure from sequence. *(Fall)*

ITSC 8203. Genomics, Transcriptomics & Proteomics. (3) Prerequisite: ITSC 8100 or equivalent, and ITSC 8201. This course surveys the application and interpretation of high-throughput molecular biology and analytical biochemistry methods used to produce the kinds of high-volume biological data most commonly encountered by bioinformaticians. The relationship between significant biological questions, modern biotechnology methods, and the bioinformatics solutions that enable interpretation of complex data is emphasized. Topics include: Genome sequencing and assembly, genome annotation, genome comparison. Genome evolution. Function prediction and gene ontologies. Microarray assay design, data acquisition, data analysis. Proteomics and methods and data analysis. Methods for identification of molecular interactions. Metabolic databases, pathways and models. *(Spring)*

ITSC 8204. Mathematical Systems Biology. (3) Prerequisites: ITSC 8200 and 8210 or equivalents. Introduction to concepts and common methods in systems biology. The class emphasizes molecular networks, models and applications, and covers the following topics: complexity and robustness of cellular systems; hierarchy and modularity of molecular interaction networks; biologically data acquisition for system level modeling; introduction to systems biology markup language (SBML); Bayesian inference of biological systems; stoichiometric and constraint-based modeling; modeling molecular interaction networks with nonlinear ordinary differential equations;

quantitative approaches to the analysis of genetic regulatory networks; stochastic modeling of intracellular kinetics; multilevel modeling. (*Spring*)

ITSC 8210. Numerical Methods in Bioinformatics. (3) Prerequisites: Ability to program in a high-level language (Perl, Java, C#, Python, Ruby, C/C++). Calculus. This course will focus on mathematically complex problems and show students how to implement efficient numerical methods to solve those problems. The focus on the class will depend on instructor expertise but may include: applying linear models and principal component analysis to analysis of microarrays, application of ordinary and partial differential equations to modeling cellular pathways, applying Markov Chains to gene finding and gene predictions algorithms and application of stochastic models and Monte Carlo simulations to molecular dynamics and protein folding. (*Fall*)

ITSC 8211. Design and Implementation of Bioinformatics Databases.

(3) Prerequisite: ITSC 8111 and 8112 or equivalent. Students will acquire skills needed to exploit public biological databases and establish and maintain personal databases that support their own research; such skills include learning underlying data models and the basics of DBMS, and SQL. Particular topics will include formats and schemas in important bioinformatics databases (Genbank, EMBL, PDB), XML schema and XML exchange methods, using CGI for the query interface, using generic database tools to browse and manage databases (Tomcat and Pgadmin), relevant database applications of SOAP and CORBA, the types of models used in designing databases, and how ontologies (such as GO) affect database design and queries. (*Spring*)

ITSC 8310. Analysis of Microarray Data. (3) This course focuses on recent literature concerning algorithms for analysis of microarray data. The course will start with a review of normal statistics (t-test, ANOVA, etc.) and their non-parametric, robust equivalents. We then turn to primary literature for a survey of the techniques of analyzing microarray data: background subtraction, normalization across samples, assignment of p-values, evaluation of algorithms on control data sets, clustering algorithms, self organizing maps, bootstrap estimations of significance and over-representation of gene ontology terms. Special attention will be given to the problem of appropriate correction of significance for multiple measurements. Students should have fluency in a high-level programming language (PERL, Java, C# or equivalent) and will be expected in assignments to manipulate and analyze large public data sets. The course will utilize the R statistical package with the bioconductor extension. (*On demand*)

ITSC 8311. Biophysical Modeling. (3) This course will cover: (a) overview of mechanical force fields; (b) energy minimization; (c) dynamics simulations (molecular and coarse-grained); (d) Monte-Carlo methods; (e) systematic conformational analysis (grid searches); (f) classical representations of electrostatics (Poisson-Boltzmann, Generalized Born and Colombic); (g) free energy decomposition schemes; and (h) hybrid quantum/classical (QM/MM) methods. *(On demand)*

ITSC 8312. Computational Comparative Genomics. (3) Prerequisite: ITSC 8210 or equivalent. Computational methods for comparative genomics analysis. The course covers the following topics: the architecture of prokaryotic and eukaryotic genomes; the evolutionary concept in genomics. databases and resources for comparative genomics; principles and methods for sequence analysis; evolution of genomes; comparative gene function annotation; evolution of the central metabolic pathways and regulatory networks; genomes and the protein universe; cis-regulatory binding site prediction; operon and regulon predictions in prokaryotes; regulatory network mapping and prediction. *(On demand)*

ITSC 8313. Structure, Function, and Modeling of Nucleic Acids. (3) Prerequisite: ITSC 8100-8101 or equivalent. The course covers the following topics: atomic structure, macromolecular structure-forming tendencies and dynamics of nucleic acids; identification of genes which code for functional nucleic acid molecules, cellular roles and metabolism of nucleic acids; 2D and 3D abstractions of nucleic acid macromolecules and methods for structural modeling and prediction; modeling of hybridization kinetics and equilibria; hybridization-based molecular biology protocols, detection methods and molecular genetic methods, and the role of modeling in designing these experiments and predicting their outcome. *(On demand)*

ITSC 8600. Seminar. (1) Prerequisites: Admission to graduate standing in Bioinformatics. Departmental seminar. Weekly seminars will be given by bioinformatics researchers from within UNCC and across the world. *(Fall, Spring)*

ITSC 8601. Journal Club. (1) Prerequisites: Admission to graduate standing in Bioinformatics. Each week, a student in the class is assigned to choose and present a paper from the primary bioinformatics literature. *(Fall, Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 9, 2007

RE: Request to establish an Undergraduate Certificate in Game Design and Development

The request to establish an Undergraduate Certificate in Game Design and Development was approved by the Undergraduate Course and Curriculum Committee on April 6, 2007 and by the Faculty Council on the April 25, 2007 Consent Calendar for implementation Spring Semester 2008.

Catalog Copy:

Undergraduate Certificate in Game Design and Development (GDD)

The purpose of the GDD certificate is to provide undergraduate students with the opportunity to reach a demonstrated level of competence in game design and development. Course-work towards the certificate in GDD can be used for credit towards the Bachelor's degree in Computer Science. However, its primary purpose is to provide a well-defined target for students who want to advance their knowledge of modern game design and development techniques and work with a variety of professionals, from artists to writers, to bring the vision for an interactive game or media product to life. The certificate may be pursued concurrently with any of the undergraduate degree programs at UNC Charlotte.

Completion Requirements:

The certificate will be awarded upon completion of five to six undergraduate level courses (15-18 credits) in the area of game design and development. Up to a maximum of six transfer credits may be applied to the certificate. Course substitutions may be made at the discretion of the GDD Certificate Coordinators. The Certificate requires all courses taken for the certificate to be passed at the C level or above, and a GPA in all certificate courses of 2.5 or above.

To obtain the certificate a student needs to:

1. Take the following four compulsory courses:

- ITCS 4230 Introduction to Game Design and Development
- ITCS 4231 Advanced Game Design and Development
- ITCS 4232 Game Design and Development Studio
- ITCS 4120 Introduction to Computer Graphics

2. Take one two-course sequence from:

Graphics (15 credits total)

- ITCS 4120 Introduction to Computer Graphics
- ITCS 4235 Game Engine Construction

Artificial Intelligence (18 credits total)

- ITCS 3153 Introduction to Artificial Intelligence *and*
- ITCS 4236 Artificial Intelligence for Computer Games

Computation (18 credits total)

- ITCS 4237 Audio Processing for Entertainment Computing *and*
- A computation-related course approved by the Certificate Coordinators

Networking (18 credits total)

- ITCS 3166 Introduction to Computer Networks *and*
- A game-networking related course approved by the Certificate Coordinators

Other (15-18 credits total)

- A sequence of two related courses (generally from ITCS/ITIS at the 3000 level or above) approved by the GDD Certificate Coordinators.

Admission Requirements:

To be admitted into the Undergraduate Certificate in Game Design and Development, students must meet the general University requirements for admission into Undergraduate Certificate Programs. These University-level requirements include:

1. An undergraduate degree or admission to an undergraduate degree program at UNC Charlotte.
2. An application submitted to the Registrar if applicant already holds an undergraduate degree, or to the department offering the program if applicant does not hold an undergraduate degree.
3. Official transcripts for previous degree(s) and course work
4. A Declaration of Program form listing the certificate program.

In addition, the program expects a current working knowledge of two higher-level languages, including at least one procedural language; and a familiarity with computer applications. The following minimal background in mathematics is also required: two semesters of calculus and one semester of discrete structures. Individuals who have worked at a high professional level in the computer industry may be able to substitute work experience for specific subject area admission requirements.

Students who anticipate applying Certificate courses toward an undergraduate degree program should seek advice from that program prior to enrolling. Admission to an undergraduate degree program does not ensure admission into a discipline-related certificate program.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance
DATE: March 16, 2007
RE: Request to establish a Professional Science Master's (PSM) in
Bioinformatics

The request to establish a Professional Science Master's (PSM) in Bioinformatics was approved by the Graduate Council on March 1, 2007 and by the Faculty Council on the March 2, 2007 Consent Calendar for forwarding to General Administration.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and
Informatics
FROM: Julie Putnam, Secretary to Faculty Governance
DATE: March 16, 2007
RE: Request to revise the Computer Science MS program curriculum

The request to revise the Computer Science MS program curriculum was approved by the Graduate Council on February 15, 2007 and by the Faculty Council on the March 1, 2007 Consent Calendar for implementation Fall Semester 2007.

Catalog Copy:

MS Degree Requirements

The Master of Science program in Computer Science requires 30 graduate credit hours, which may optionally include 6 hours of thesis. At least 21 hours of the courses applied to the degree must be from the Department of Computer Science. At least 15 hours must be 6000 level or above courses. No more than 6 hours may be in Individual Study. A maximum of 6 hours of graduate credit may be transferred from other institutions.

I. Core Requirement

All students must take two courses from the Core Category:

ITCS 5102 Survey of Programming Languages

ITCS 5141 Computer Organization and Architecture or ITCS 6182 Advanced
Computer Architecture

ITCS 6112 Software System Design and Implementation

ITCS 6114 Algorithms & Data Structures

II. Breadth Requirements

All students must take three courses, each from a different Course Category, to satisfy the breadth requirements.

Course Categories are:

- Data Management

ITCS 6155 Knowledge Based Systems

ITCS 6157 Visual Databases

ITCS 6160 Database Systems

ITCS 6161 Advanced Topics in Database Systems

ITCS 6162 Knowledge Discovery in Databases

ITCS 6163 Data Warehousing

- Networked Systems

ITCS 5145 Parallel Computing

ITCS 5146 Grid Computing

ITCS 6132 Modeling & Analysis of Communication Networks

ITCS 6166 Computer Networks

ITCS 6167 Advanced Networking Protocols

ITCS 6168 Wireless Communications

- Visualization and Computer Graphics

ITCS 5120 Introduction to Computer Graphics

ITCS 5121 Information Visualization

ITCS 5122 Visual Analytics

ITCS 5123 Visualization and Visual Communication

ITCS 6124 Illustrative Visualization

ITCS 6126 Large Scale Information Visualization

ITCS 6127 Real-time Rendering Engines

ITCS 6128 3D Display and Advanced Interfaces

ITCS 6140 Data Visualization

- Intelligent & Interactive Systems

ITCS 5152 Computer Vision

ITCS 6050 Topics in Intelligent Systems

ITCS 6111 Evolutionary Computation

ITCS 6125 Virtual Environments

ITCS 6134 Digital Image Processing

ITCS 6150 Intelligent Systems

ITCS 6151 Intelligent Robotics

ITCS 6156 Machine Learning

ITCS 6158 Natural Language Processing

ITCS 6267 Intelligent Information Retrieval

- Applications (includes all application area specific courses such as Medical Informatics, and Game Design)

ITCS 5133 Numerical Computation Methods and Analysis

ITCS 5230 Introduction to Game Design and development

ITCS 5231 Advanced Game Design and Development

ITCS 5232 Game Design and Development Studio

ITCS 5235 Game Engine Construction

ITCS 5236 Artificial Intelligence for Computer Games

ITCS 5237 Audio Processing for Entertainment Computing

ITCS 6153 Neural Networks

ITCS 6159 Intelligent Tutoring Systems

ITCS 6165 Coding and Information Theory

ITCS 6222 Biomedical Signal Processing

ITCS 6224 Biomedical Image Processing

ITCS 6226 Bioinformatics

ITCS 6228 Medical Informatics

III. Area of Concentration

Each student must take at least three related courses (9 hours) to form an area of concentration. The area of concentration may differ from the Course Categories; students are encouraged to have their areas of concentration aligned with faculty research areas. The three courses forming the student's area of concentration must have the written approval of the student's academic advisor. Only one breadth course can be included in the area of concentration courses. Core courses can not be used in area of concentration. At least two of the three courses forming an area of concentration should be from the Department of Computer Science.

Minimum Background Requirements for Admission

Applicants to MS program in Computer Science must have had a computing background equivalent to two years of undergraduate training in Computer Science, including at least an introductory course on programming, a course on data structures, and a course either in operating systems or computer architecture. In addition, background in Mathematics to include courses in Linear Algebra or Statistics, Discrete Mathematics, and at least one year of Calculus is also required. Students without sufficient background in Computer Science or Mathematics may be admitted to the Program but must complete background courses determined by the MS Program Director in the first year.

New Courses:

ITCS 4121. Information Visualization. (3) Prerequisites: ITCS 1215 or approval of the instructor. Information visualization concepts, theories, design principles, popular techniques, evaluation methods, and information visualization applications. (Spring) (Evenings)

ITCS 5121. Information Visualization. (3) Prerequisites: graduate standing. Information visualization concepts, theories, design principles, popular techniques, evaluation methods, and information visualization applications. (Spring) (Evenings)

ITCS 4122. Visual Analytics. (3) Prerequisites: any of STAT 1220, 1221, 1222, 2122, or 2223, or approval of the instructor. This course introduces the new field of visual analytics, which integrates interactive analytical methods and visualization.. Topics include: critical thinking, visual reasoning, perception/cognition, statistical and other analysis techniques, principles of interaction, and applications. (Fall) (Evenings)

ITCS 5122. Visual Analytics. (3) Prerequisites: any of STAT 1220, 1221, 1222, 2122, or 2223, or approval of the instructor. This course introduces the new field of visual analytics, which integrates interactive analytical methods and visualization.. Topics include: critical thinking, visual reasoning, perception/cognition, statistical and other analysis techniques, principles of interaction, and applications. (Fall) (Evenings)

ITCS 4123. Visualization and Visual Communication. (3) Prerequisites: none. Understanding the relatively technical field of visualization from the point of view of visual communication, this course draws connections with photography, design, illustration, aesthetics, and art. Both technical and theoretical aspects of the various fields are covered, and the connections between them are investigated. (Spring) (Evenings)

ITCS 5123. Visualization and Visual Communication. (3) Prerequisites: none. Understanding the relatively technical field of visualization from the point of view of visual communication, this course draws connections with photography, design, illustration, aesthetics, and art. Both technical and theoretical aspects of the various fields are covered, and the connections between them are investigated. (Spring) (Evenings)

ITCS 4133. Numerical Computation Methods and Analysis.(3) Prerequisites: ITCS 2214 and either MATH 1120 or MATH 1241. Introduction to principles and techniques behind numerical methods and algorithms that underlie modern scientific and engineering applications. Roots of equations; linear systems (direct methods, LU/QR factorization, iterative methods); Eigen values and vectors; Interpolation, Approximation; Numerical Differentiation/Integration, ODEs and PDEs. (On Demand).

ITCS 5133. Numerical Computation Methods and Analysis.(3) Prerequisite: ITCS 2214 and either MATH 1120 or MATH 1241. Introduction to principles and techniques behind numerical methods and algorithms that underlie modern scientific and engineering applications. Roots of equations; linear systems (direct methods, LU/QR factorization, iterative methods); Eigen values and vectors; Interpolation, Approximation; Numerical Differentiation/Integration, ODEs and PDEs. (On Demand).

ITCS 4146. Grid Computing. (3) Prerequisite: ITCS 1215. Grid computing software components, standards, web services, security mechanisms, schedulers and resource brokers, workflow editors, grid portals, grid computing applications. (Spring)

ITCS 5146. Grid Computing. (3) Prerequisite: ITCS 1215 or Graduate Standing. Grid computing software components, standards, web services, security mechanisms, schedulers and resource brokers, workflow editors, grid portals, grid computing applications. (*Spring*)

ITCS 4232. Game Design and Development Studio. (3) Prerequisite: ITCS 4120, ITCS 4231, and consent of instructor. Application of advanced concepts and techniques for electronic game design and development. Teams will use engineering techniques to incorporate game programming and scripting, networking, graphics, physics, audio, game data structures

and algorithms, and artificial intelligence into an electronic game. Individuals will develop a complete portfolio of prior work and the class project. (*Spring*) (*Evenings*)

ITCS 5232. Game Design and Development Studio. (3) Prerequisite: ITCS 5120, ITCS 5231, and consent of instructor. Application of advanced concepts and techniques for electronic game design and development. Teams will use engineering techniques to incorporate game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence into an electronic game. Individuals will develop a complete portfolio of prior work and the class project. *(Spring) (Evenings)*

ITCS 4235. Game Engine Construction. (3) Prerequisite: ITCS 4120 or Permission of Department. Introduction to principles and techniques behind modern computer and console game engines. Graphics Rendering Pipeline (transformations, lighting, shading); 2D/3D Texture Mapping; Image Based Rendering; Spatial Structures and Acceleration Algorithms; Level of Detail; Collision Detection, Culling and Intersection Methods; Vertex/Pixel Shaders; Pipeline Optimization; Rendering Hardware. *(Spring, Alternate Years) (Evenings)*

ITCS 5235. Game Engine Construction. (3) Prerequisite: ITCS 5120 or Permission of Department. Introduction to principles and techniques behind modern computer and console game engines. Graphics Rendering Pipeline (transformations, lighting, shading); 2D/3D Texture Mapping; Image Based Rendering; Spatial Data Structures and Acceleration Algorithms; Level of Detail; Collision Detection, Culling and Intersection Methods; Vertex/Pixel Shaders; Pipeline Optimization; Rendering Hardware. *(Spring, Alternate Years) (Evenings)*

ITCS 4236. Artificial Intelligence for Computer Games. (3) Prerequisite: ITCS 3153. Application of advanced concepts and techniques in artificial intelligence for electronic game design and development. An investigation of the artificial intelligence techniques necessary for an agent to act, or appear to act, intelligently in interactive virtual worlds. Topics include uncertainty reasoning, machine learning, perception, knowledge representation, search, and planning. Emphasis will be on implementation and experimentation with the goal of building robust intelligent agents in interactive entertainment domains. Elements of multi-agent collaboration and the use of cognitive architectures in interactive computer games will also be discussed. *(On demand)*

ITCS 5236. Artificial Intelligence for Computer Games. (3) Prerequisite: ITCS 6150 or permission of instructor. Application of advanced concepts and techniques in artificial intelligence for electronic game design and development. An investigation

of the artificial intelligence techniques necessary for an agent to act, or appear to act, intelligently in interactive virtual worlds. Topics include uncertainty reasoning, machine learning, perception, knowledge representation, search, and planning. Emphasis will be on implementation and experimentation with the goal of building robust intelligent agents in interactive entertainment domains. Elements of multi-agent collaboration and the use of cognitive architectures in interactive computer games will also be discussed. (*On demand*)

ITCS 4237. Audio Processing for Entertainment Computing. (3) Prerequisite: MATH 1242, MATH 2164, and ITCS 2215 or equivalents. Introduction to the principles and applications of audio (digital signal) processing focusing on entertainment domains. Topics include: analysis of signals, transforms, digital filter design techniques, audio engine development, file encoding/decoding, spatial sound rendering, optimization, and advanced audio techniques. (*On demand*)

ITCS 5237. Audio Processing for Entertainment Computing. (3) Prerequisite: MATH 1242, MATH 2164, and ITCS 6114 or equivalents. Introduction to the principles and applications of audio (digital signal) processing focusing on entertainment domains. Topics include: analysis of signals, transforms, digital filter design techniques, audio engine development, file encoding/decoding, spatial sound rendering, optimization, and advanced audio techniques. (*On demand*)

ITCS 6124. Illustrative Visualization. (3) Prerequisites: ITCS 4120 or ITCS 5120. This course focuses on advanced concepts and techniques related to the design, implementation, integration, and management of illustrative visualization and computer graphics. Topics include various advanced visualization topics: feature extraction, non-photorealistic rendering, point-based rendering, hardware-accelerated rendering, segmentation, image generation, animation, evaluation, design, and interaction. (Spring) (Evenings)

ITCS 8124. Illustrative Visualization. (3) Prerequisites: ITCS 4120 or ITCS 5120. This course focuses on advanced concepts and techniques related to the design, implementation, integration, and management of illustrative visualization and computer graphics. Topics include various advanced visualization topics: feature extraction, non-photorealistic rendering, point-based rendering, hardware-accelerated rendering, segmentation, image generation, animation, evaluation, design, and interaction. (Spring) (Evenings)

ITCS 6126. Large Scale Information Visualization. (3) Prerequisites: ITCS 4121 or ITCS 5121 Information Visualization. Concept, theory, design principles, data processing techniques, and visual metaphors and interaction techniques for massive, multi-dimensional, multi-source, time-varying information exploration. (Fall) (Evenings)

ITCS 8126. Large Scale Information Visualization.(3) Prerequisites: ITCS 4121 or ITCS 5121 Information Visualization. Concept, theory, design principles, data processing techniques, and visual metaphors and interaction techniques for massive, multi-dimensional, multi-source, time-varying information exploration. (Fall) (Evenings)

ITCS 6127. Real-Time Rendering Engines. (3G). Prerequisites: ITCS 5120 or ITCS 6120. This course focuses on advanced concepts and techniques employed in building real-time rendering systems that support a high level of realism as well as handle large geometric models. Topics include: modern graphics hardware, programmable shaders, shadow and environment mapping, image-based modeling and rendering, large data models (simplification, level of detail), high quality interactive rendering. *(On demand)*

ITCS 8127. Real-Time Rendering Engines. (3G). Prerequisites: ITCS 5120 or ITCS 6120. This course focuses on advanced concepts and techniques employed in building real-time rendering systems that support a high level of realism as well as handle large geometric models. Topics include: modern graphics hardware, programmable shaders, shadow and environment mapping, image-based modeling and rendering, large data models (simplification, level of detail), high quality interactive rendering. *(On demand)*

ITCS 6128. 3D Display and Advanced Interfaces. (3G). Prerequisites: ITCS 4120 or ITCS 6120. The course covers the fundamentals of 3D display hardware and software technology. Topics include: human visual spatial perception of natural and synthetic 3D images, 3D display hardware, human computer interface algorithms for effective stereoscopic display, 3D display rendering techniques. *(On demand)*

ITCS 8128. 3D Display and Advanced Interfaces. (3G). Prerequisites: ITCS 4120 or ITCS 6120. The course covers the fundamentals of 3D display hardware and software technology. Topics include: human visual spatial perception of natural and synthetic 3D images, 3D display hardware, human computer interface algorithms for effective stereoscopic display, 3D display rendering techniques. (*On demand*)

ITCS 6159. Intelligent Tutoring Systems. (3) Prerequisite: Graduate standing or permission of the instructor. This course introduces the issues relevant to creating adaptive learning systems using artificial intelligence and includes a project to build a small Intelligent Tutoring System (ITS). Topics include: representation of knowledge and cognition, ITS design, adaptive user interfaces, design and evaluation of feedback, experimental methods, educational data mining, history of intelligent tutoring, tutor authoring, and issues for implementation. (Fall, alternate years) (Evenings)

ITCS 8159. Intelligent Tutoring Systems. (3) Prerequisite: Graduate standing or permission of the instructor. This course introduces the issues relevant to creating adaptive learning systems using artificial intelligence and includes a project to build a small Intelligent Tutoring System (ITS). Topics include: representation of knowledge and cognition, ITS design, adaptive user interfaces, design and evaluation of feedback, experimental methods, educational data mining, history of intelligent tutoring, tutor authoring, and issues for implementation. (Fall, alternate years) (Evenings)

ITCS 6167. Advanced Networking Protocols. (3) Prerequisites: ITCS 6166 or ITCS 6168. This course focuses on advanced networking concepts and protocols related to the design, implementation, integration, and management of networking and communication systems. Topics include: topology control protocols, ad hoc routing protocols, power management protocols, distributed data processing protocols for various networking systems (Internet, wireless mesh networks, ad hoc networks, sensor networks, peer-to-peer networks). (Spring) (Evenings)

ITCS 8167. Advanced Networking Protocols. (3) Prerequisites: ITCS 6166 or ITCS 8166 or ITCS 6168 or ITCS 8168. This course focuses on advanced networking concepts and protocols related to the design, implementation, integration, and management of networking and communication systems. Topics include: topology control protocols, ad hoc routing protocols, power management protocols, distributed data processing protocols for various networking systems

(Internet, wireless mesh networks, ad hoc networks, sensor networks, peer-to-peer networks). (Spring) (Evenings)

ITCS 6228. Medical Informatics (3) Prerequisites: Graduate Standing. This course focuses on methods and techniques used in storage, communication, processing, analysis, integration, management, and distribution of medical information. The course emphasizes the applications of telemedicine and intelligent computer-aided decision making systems in different medical and surgical systems. The course also discusses the computational methods to accept or reject a new drug or a new treatment for a given disease. (Fall, Alternate years) (Evenings)

ITCS 8228. Medical Informatics (3) Prerequisites: Graduate Standing. This course focuses on methods and techniques used in storage, communication, processing, analysis, integration, management, and distribution of medical information. The course emphasizes the applications of telemedicine and intelligent computer-aided decision making systems in different medical and surgical systems. The course also discusses the computational methods to accept or reject a new drug or a new treatment for a given disease. (Fall, Alternate years) (Evenings)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: February 26, 2007

RE: Request to cross-list ITCS 1102 as ITIS 1102

The request to cross-list ITCS 1102 as ITIS 1102 was approved by the Chair of the Undergraduate Course & Curriculum Committee on February 15, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

ITIS 1102. Advanced Internet Concepts. (3) Crosslisted as ITCS

1102. Prerequisite: ITCS 1101 or permission of the department. This course is an advanced study of the Internet environment. This course is designed for any student who is familiar with office productivity tools and a user of Internet technologies; it addresses advanced concepts of computer literacy. Topics include: concepts of website design and how to evaluate websites; proper use of synchronous and asynchronous communication tools (e.g., chat, email, IM); issues of copyright and cyber-ethics; using the Internet to do research; and publishing via the Internet. Other topics may be added to keep the content current and relevant. Students will complete extensive Internet oriented projects to demonstrate mastery of the skills discussed in class. (May not be taken for credit by ITIS majors.) (Fall, Spring)(Internet)

ITCS 1102. Advanced Internet Concepts. (3) Crosslisted as ITIS 1102. Prerequisite ITCS 1101 or consent of the department. This course is an advanced study of the Internet environment. This course is designed for any student who is familiar with office productivity tools and a user of Internet technologies; it addresses advanced concepts of computer literacy. Topics include: concepts of website design and how to evaluate websites; proper use of synchronous and asynchronous communication tools (e.g. chat, email, IM...); issues of copyright and cyber-ethics; using the Internet to do research; and publishing via the Internet. Other topics may be added to keep the content current and relevant. Students will complete extensive Internet oriented projects to demonstrate mastery of the skills discussed in class. (May not be taken for credit by ITIS majors.) (Fall, Spring)(Internet)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: February 16, 2007

RE: Request to establish a new track (Information Technology) in the B.A. in Software & Information Systems

The request to establish a new track (Information Technology) in the B.A. in Software & Information Systems was approved by the Chair of the Undergraduate Course & Curriculum Committee on February 16, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

Information Technology Track

This track requires 120 credit hours total including 45-48 hours of major courses, 21 hours of English and communications courses, 6 hours in mathematics and statistics, 10 hours of sciences, and 14-17 hours of general education courses and free electives. Required major courses include: ITIS 1203, 1210, 2300, 3100, 3130, 3200, 3300, 3320; ITCS 1214, 1215, 3160, 3166 (or ITIS 4166, and 3688; INFO 3211; 3 semester hours of approved ITIS or ITCS courses numbered 3000 or above, and 3 hours of computer competency or free electives. Students must demonstrate competency in standard office applications such as word processing, spreadsheets, and presentation software or take ITCS 1101. The required mathematics and statistics courses are MATH 1100 (or MATH 1102 or MATH 1103) and STAT 1220.

In addition, each student, in consultation with his or her academic advisor, must complete at least 21 semester hours of courses by either:

- Completing the requirements for a minor chosen by the student even if doing so requires more than 21 hours (if the minor can be completed in less than 21 hours, the remaining hours become free electives) or
- Completing a series of courses in a major that does not offer a minor. These courses must form a coherent area of study related to developing applications of information systems. The courses selected must include a minimum of 9 hours of upper division courses.

In completing this requirement, students must comply with prerequisites and other applicable academic regulations for courses offered by any department, even if doing so requires exceeding the 120 hour minimum necessary for graduation.

SAMPLE SCHEDULE: B.A. DEGREE, SOFTWARE AND INFORMATION SYSTEMS

(Information Technology Track)

Freshman Year

| Fall | | | Spring | | |
|------|-------------------------|---|----------|-----------------------|---|
| 1210 | ITIS 1203 | 3 | 3 | ITIS | |
| 1215 | ITCS 1214 | 3 | 3 | ITCS | |
| 1102 | MATH 1100 ¹ | 3 | 3 | ENGL | |
| | ENGL 1101 | | 3 | Elective ² | 3 |
| | <u>Science with lab</u> | | <u>4</u> | <u>Social</u> | |
| | science | 3 | | | |
| 15 | | | 16 | | |

Sophomore Year

| Fall | | | Spring | | |
|------|----------------|---|----------|---------------|--|
| 3130 | ITIS 2300 | 3 | 3 | ITIS | |
| 3200 | LBST 1XXX | 3 | 3 | ITIS | |
| 2116 | COMM 2100 | 3 | 3 | ENGL | |
| 2105 | STAT 1220 | 3 | 3 | COMM | |
| 2 | <u>Minor-1</u> | | <u>3</u> | <u>Minor-</u> | |
| | | 3 | | | |
| 15 | | | 15 | | |

Junior Year

| Fall | | | Spring | | |
|------|-----------|---|--------|------|--|
| 3160 | ITIS 3300 | 3 | 3 | ITCS | |

| | | | | |
|------|----------------|----------|----|----------------|
| 3320 | LBST 2101 | 3 | 3 | ITIS |
| 4181 | LBST 2102 3 | | 3 | ENGL 4183/ENGL |
| 4 | Science | 3 | 3 | Minor- |
| 5 | <u>Minor-3</u> | <u>3</u> | 3 | <u>Minor-</u> |
| 15 | | | 15 | |

Senior Year

| Fall | | | | Spring |
|----------|--------------------------|----------|----|----------------|
| 3100 | ITCS 3166/ITIS 4166 3 | 3 | 3 | ITIS |
| Elective | ITCS 3688 3 | | 3 | ITIS/ITCS |
| 3141 | INFO 3211 3 | | 3 | ENGL 4182/COMM |
| 221X | Free Elective 3 | | 2 | LBST |
| 7 | <u>Minor-6</u> | <u>3</u> | 3 | <u>Minor-</u> |
| 15 | | | 14 | |

Total Hours 120

¹ MATH 1102 or MATH 1103 may be substituted for MATH 1100.

² If competency in office applications can be demonstrated. Otherwise, ITCS 1101 is required.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: February 16, 2007

RE: Request to make a change in prerequisite and editorial change to ITCS 6182

The request to make a change in prerequisite and editorial change to ITCS 6182 was approved by the Chair of the Graduate Council on January 26, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

ITCS 6182. Advanced Computer Architecture. (3) Prerequisite: ITCS 5141 or Computer Science Graduate Standing or permission of the Department. Survey of existing and proposed architectures; pipelined, dataflow, and interconnection network architectures. Impact of VLSI on architecture. *(Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: February 19, 2007

RE: Request to make a change in prerequisite and editorial change to ITCS 8182

The request to make a change in prerequisite and editorial change to ITCS 8182 was approved by the Chair of the Graduate Council on January 26, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

ITCS 8182. Advanced Computer Architecture. (3) Prerequisite: ITCS 5141 or Computer Science Graduate Standing or permission of the Department. Survey of existing and proposed architectures; pipelined, dataflow, and interconnection network architectures. Impact of VLSI on architecture. *(Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: February 2, 2007

RE: Request to establish ITIS/ITCS 1203

The request to establish ITIS/ITCS 1203 was approved by the Chair of the Undergraduate Course & Curriculum Committee on January 29, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

ITIS 1203. Survey of Computing. (3) Crosslisted as ITCS 1203. Introductory course that explores the broad field of computing as it applies to daily life. Topics cover computers of all sizes from handheld devices to super computers; the role of software from operating systems to applications; the software development process; issues of security and privacy on the Internet and the World Wide Web; and possible fields of study within the broad field of information technology. *(Fall, Spring)*

ITCS 1203. Survey of Computing. (3) Crosslisted as ITIS 1203. Introductory course that explores the broad field of computing as it applies to daily life. Topics cover

computers of all sizes from handheld devices to super computers; the role of software from operating systems to applications; the software development process; issues of security and privacy on the Internet and the World Wide Web; and possible fields of study within the broad field of information technology. (*Fall, Spring*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: January 31, 2007

RE: Request to establish ITCS 4121, 4122, 4123, 4133, 4146, 4232, 4235, 4236, & 4237

The request to establish ITCS 4121, 4122, 4123, 4133, 4146, 4232, 4235, 4236, & 4237 was approved by the Chair of the Undergraduate Course & Curriculum Committee on January 24, 2007 for implementation Fall Semester, 2007.

Catalog Copy:

ITCS 4121. Information Visualization. (3) Prerequisites: ITCS 1215 or approval of the instructor. Information visualization concepts, theories, design principles, popular techniques, evaluation methods, and information visualization applications. (*Spring*) (*Evenings*)

ITCS 4122. Visual Analytics. (3) Prerequisite: any of STAT 1220, 1221, 1222, 2122, or 2223, or approval of the instructor. This course introduces the new field of visual analytics, which provides tools for the interactive visual analysis of large and complex data sets in many application areas. Topics include: visual representation, perception, the analysis process, critical thinking, data transformations, color, interaction, and applications. (*Fall*) (*Evenings*)

ITCS 4123. Visualization and Visual

Communication. (3) Prerequisites: none. Understanding the relatively technical field of visualization from the point of view of visual communication; this course draws connections with photography, design, illustration, aesthetics, and art. Both technical and theoretical aspects of the various fields are covered, and the connections between them are investigated. *(Spring) (Evenings)*

ITCS 4133. Numerical Computation Methods and

Analysis. (3) Prerequisites: ITCS 2214 and either MATH 1120 or MATH 1241. Introduction to principles and techniques behind numerical methods and algorithms that underlie modern scientific and engineering applications. Roots of equations: linear systems (direct methods, LU/QR factorization, iterative methods); Eigen values and vectors; Interpolation, Approximation; Numerical Differentiation/Integration, ODEs and PDEs. *(On demand)*

ITCS 4146. Grid Computing. (3) Prerequisite: ITCS 1215. Grid computing software components, standards, web services, security mechanisms, schedulers and resource brokers, workflow editors, grid portals, grid computing applications. *(Spring)*

ITCS 4232. Game Design and Development Studio. (3) Prerequisites: ITCS 4120, ITCS 4231, and consent of instructor. Application of advanced concepts and techniques for electronic game design and development. Teams will use engineering techniques to incorporate game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence into an electronic game. Individuals will develop a complete portfolio of prior work and the class project. *(Spring) (Evenings)*

ITCS 4235. Game Engine Construction. (3) Prerequisite: ITCS 4120 or permission of Department. Introduction to principles and techniques behind modern computer and console game engines. Graphics Rendering Pipeline (transformations, lighting, shading); 2D/3D Texture Mapping; Image Based Rendering; Spatial Structures and Acceleration Algorithms; Level of Detail; Collision Detection, Culling and Intersection Methods; Vertex/Pixel Shaders; Pipeline Optimization; Rendering Hardware. *(Spring) (Alternate Years) (Evenings)*

ITCS 4236. Artificial Intelligence for Computer Games. (3) Prerequisite: ITCS 3153. Application of advanced concepts and techniques in artificial intelligence for electronic game design and development. An investigation of the artificial intelligence techniques necessary for an agent to act, or appear to act, intelligently in interactive virtual worlds. Topics include uncertainty reasoning, machine learning, perception, knowledge representation, search, and planning. Emphasis will be on implementation and experimentation with the goal of building robust intelligent agents in interactive entertainment domains. Elements of multi-agent collaboration and the use of cognitive architectures in interactive computer games will also be discussed. *(On demand)*

ITCS 4237. Audio Processing for Entertainment Computing. (3) Prerequisite: MATH 1242, MATH 2164, and ITCS 2215 or equivalents. Introduction to the principles and applications of audio (digital signal) processing focusing on entertainment domains. Topics include: analysis of signals, transforms, digital filter design techniques, audio engine development, file encoding/decoding, spatial sound rendering, optimization, and advanced audio techniques. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: December 5, 2006

RE: Request to edit prerequisites for ITCS 2215

The request to edit prerequisites for ITCS 2215 was approved by the Chair of the Undergraduate Course & Curriculum Committee on November 28, 2006 for implementation Fall Semester, 2007.

Catalog Copy:

ITCS 2215. Design and Analysis of Algorithms. (3) Prerequisites: (MATH 1120 or 1241) and (ITCS 2175 or **MATH 1165**) and ITCS 2214. Introduction to the design and analysis of

algorithms. Design techniques: divide-and-conquer, greedy approach, dynamic programming. Algorithm analysis: asymptotic notation, recurrence relation, time space complexity and tradeoffs. Study of sorting, searching, hashing, and graph algorithms. (*Fall, Spring, Summer*)(*Evenings*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: November 3, 2006

RE: Request to establish ITCS 5230: Introduction to Game Design & Development & ITCS 5231: Advanced Game Design & Development

The request to establish ITCS 5230: Introduction to Game Design & Development & ITCS 5231: Advanced Game Design & Development was approved by the Graduate Council on October 5, 2006 and by Faculty Council on the October 10, 2006 Consent Calendar for implementation Fall Semester, 2007.

Catalog Copy:

ITCS 5230. Introduction to Game Design and Development. (3) Prerequisite: ITCS 2215 or equivalent, or permission of the instructor. Basic concepts and techniques for electronic game design and development. Topics include: game history and genres, game design teams and processes, what makes a game fun, level and model design, game scripting and programming including computer graphics and animation, artificial intelligence, industry issues, and gender and games. (*Fall*)

ITCS 5231. Advanced Game Design and Development. (3) Prerequisite: ITCS 5230. Advanced concepts and techniques for electronic game design and development. This course is a project-centered course where students explore complex gameplay and interactivity. This course explores topics from the introductory course in more depth, such as: applying software engineering techniques to developing games,

advanced game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence. (*Spring*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing and Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: November 3, 2006

RE: Request to establish ITIS 6500/8500 (Complex Adaptive Systems)

The request to establish ITIS 6500/8500 (Complex Adaptive Systems) was approved by the Graduate Council on September 29, 2006 and by Faculty Council on the October 10, 2006 Consent Calendar for implementation Fall Semester, 2007.

Catalog Copy:

ITIS 6500. Complex Adaptive Systems. (3) Crosslisted as ITIS 8500. Prerequisites: Consent of the instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), non-linear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. This course will cover those and similar topics in an interactive manner. Examples of our current research effort will be provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity. (*On demand*)

ITIS 8500. Complex Adaptive Systems. (3) Crosslisted as ITIS 6500.

Prerequisites: Consent of the instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), non-linear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. This course will cover those and similar topics in an interactive manner. Examples of our current research effort will be provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Computing & Informatics

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: October 18, 2006

RE: Request to establish ITIS 6400 & ITIS 8400

The request to establish ITIS 6400 & ITIS 8400 was approved by the Graduate Council on September 20, 2006 and by the Faculty Council on October 18, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 6400. Principles of Human Computer Interaction. (3) Prerequisite: Full graduate standing, or consent of the department. This course will be an introduction to Human-computer Interaction practice and research. The course will include topics on the perceptual, cognitive, and social characteristics of people, as well as methods for learning more about people and their use of computing systems. We will cover the process of interface design, methods of design, and ways to evaluate and improve a design. The course will also highlight a number of current and cutting-edge research topics in Human-Computer Interaction. The course will be a balance of design, sociological/psychological, and information systems elements. *(Spring)*

ITIS 8400. Principles of Human Computer Interaction. (3) Prerequisite: Full graduate standing, or consent of the department. This course will be an introduction to Human-computer Interaction practice and research. The course will include topics on the perceptual, cognitive, and social characteristics of people, as well as methods for learning more about people and their use of computing systems. We will cover the process of interface design, methods of design, and ways to evaluate and improve a design. The course will also highlight a number of current and cutting-edge research topics in Human-Computer Interaction. The course will be a balance of design, sociological/psychological, and information systems elements. *(Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 28, 2006

RE: Request to renumber ITCS 3102 as ITCS 4102

The request to renumber ITCS 3102 as ITCS 4102 **(and replace previous ITCS 4102)** was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 5, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITCS ~~3102~~ 4102. Programming Languages. (3) Prerequisite: ITCS 2215. Formal definition of programming languages, including specification of syntax and semantics. Evolution of programming languages and language design principles. Structural organization, control structures, data structures and types, name visibility, binding times, parameter passing modes, subroutines, co-routines, and tasks. Functional programming, list processing, logic programming, object-oriented programming systems. *(Fall, Spring, Summer) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: August 8, 2006

RE: Request to modify catalog copy for Computer Science Department

The request to modify catalog copy for Computer Science Department was approved by the Chair of the Undergraduate Course and Curriculum Committee on July 25, 2006 for implementation Spring Semester, 2007.

Catalog Copy (New text is blue; ~~deleted text is struck through~~):

Information Science Minor

Requirements for the minor in Information Science include completion of 21 hours of computer science: ITCS 1214, 1215, **2175**, 2214, 3112, 3143, 3155 and 3160, ~~plus MATH 1165~~.

Computer Science Minor

Requirements for the minor in computer Science include completion of 21 hours of computer science: ITCS 1214, 1215, **2175**, 2214, 3112, 3143, 3155, 3160, and 3688, ~~plus MATH 1165~~.

Certificate Program in Computer Programming

The Department of Computer Science offers a certificate in Computer Programming. A certificate will be awarded by the Department of Computer Science to post-baccalaureate students (students having earned a bachelor's degree in any field, with one semester of calculus), who have completed the course requirements listed below:

ITCS 1214 Introduction to Computing I
ITCS 1215 Introduction to Computing II
ITCS 2175 Logic and Algorithms
ITCS 2214 Data Structures
ITCS 2215 Design and Analysis of Algorithms
ITCS 3112 Design & Implementation/Object-Oriented Systems
ITCS 3155 Software Engineering
ITCS 3160 Data Base Design and Implementation

or

ITCS ~~3145~~ **4145** ~~Introduction to~~ **Parallel Computing**

~~MATH 1165 Introduction to Discrete Structures~~

ITCS 1214. Introduction to Computer Science. (3)

Prerequisite or co-requisite: **MATH 0900** or MATH 1100 or MATH 1103 or MATH 1120 or MATH 1241. Introduction to algorithmic problem solving strategies and algorithm development; basic concepts and terminology of computers; study of data representation and number systems; use of computers to implement numerical and symbolic algorithms. General programming concepts will be taught through the use of a high level language. (*Fall, Spring, Summer*) (*Evenings*) (*Internet*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: August 8, 2006

RE: Corrections to memo dated 6/28/06: Typographical error, ITIS 4490 should read **ITIS 4990**.

Catalog Copy (New text is blue; deleted text is struck through.):

ITIS 4490 4990. Undergraduate Research. (3) Prerequisite: Consent of the Department. This course consists of undergraduate research under the supervision and direction of a faculty member. Courses may be repeated in subsequent terms for a maximum of 6 hours total. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 28, 2006

RE: Request to change the prerequisite for ITIS 3320 by removing ITCS 2214 and adding ITIS 3200 and ITIS 3300

The request to change the prerequisite for ITIS 3320 by removing ITCS 2214 and adding ITIS 3200 and ITIS 3300 was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 3320. Introduction to Software Testing and Assurance. (3) Prerequisite: **ITIS 3200 and ITIS 3300 or consent of the Department.** Methods of evaluating software for correctness, and reliability including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. (*Fall, Spring*) (*Evenings*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 28, 2006

RE: Request to establish ITIS 4490: Undergraduate Research

The request to establish ITIS 4490: Undergraduate Research was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 4490. Undergraduate Research. (3) Prerequisite: Consent of the Department. This course consists of undergraduate research under the supervision and direction of a faculty member. Course may be repeated in subsequent terms for a maximum of 6 hours total. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 28, 2006

RE: Request to change the prerequisite for ITIS 3100 by removing ITCS 2214 and adding ITIS 2300

The request to change the prerequisite for ITIS 3300 by removing ITCS 2214 and adding ITIS 2300 was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 3100. Introduction to IT Infrastructure Systems. (3) Prerequisite: [ITIS 2300](#). This course discusses methodologies, tools, and technologies that are important for understanding various IT infrastructure systems such as file storage services, email services, and web services. Focus will be placed on understanding widely-used network infrastructure services and systems, and acquiring basic knowledge in design practices and management of such systems. *Can serve as a prerequisite course for ITIS 3200, ITIS 4220. (Fall, Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 28, 2006

RE: Request to change the prerequisite for ITIS 3130 by removing **ITIS 2300** and adding the prerequisite of "Sophomore standing"

The request to change the prerequisite for ITIS 3130 by removing **ITIS 2300** and adding the prerequisite of "Sophomore standing" was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 3130. Human-Computer Interaction. (3) Prerequisite: [Sophomore standing](#). Concepts of the design of the human-machine environment, with special emphasis on human-computer interaction and how people acquire, store, and use data from the environment and from computers. Topics include: analysis, creation and improvement of equipment and environment to make them compatible with human capabilities and expectation; analysis of existing equipment with respect to user usability and interfacing capabilities. *(Fall) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology
FROM: Julie Putnam, Secretary to Faculty Governance
DATE: June 28, 2006
RE: Request to renumber ITCS 3102 as ITCS 4102

The request to renumber ITCS 3102 as ITCS 4102 was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 5, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITCS ~~3102~~ 4102. Programming Languages. (3) Prerequisite: ITCS 2215. Formal definition of programming languages, including specification of syntax and semantics. Evolution of programming languages and language design principles. Structural organization, control structures, data structures and types, name visibility, binding times, parameter passing modes, subroutines, co-routines, and tasks. Functional programming, list processing, logic programming, object-oriented programming systems. *(Fall, Spring, Summer) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology
FROM: Julie Putnam, Secretary to Faculty Governance
DATE: June 19, 2006
RE: Request to change the prerequisite for ITIS 3300 by removing ITCS 2214 and adding ITIS 2300

The request to change the prerequisite for ITIS 3300 by removing ITCS 2214 and adding ITIS 2300 was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 3300. Software Requirements and Project Management. (3) Prerequisite: [ITIS 2300](#) or consent of the Department. Introduction to requirement engineering and project management methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development model; risk management models; software engineering maturity model; project planning and milestones; cost estimation; team organizations and behavior. Case studies will be used. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: June 19, 2006

RE: Request to change the prerequisite for ITIS 4166 by adding ITIS 3200 in addition to ITIS 2300

The request to change the prerequisite for ITIS 4166 by adding ITIS 3200 in addition to ITIS 2300 was approved by the Chair of the Undergraduate Course & Curriculum Committee on June 1, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITIS 4166. Network-based Application Development. (3) Prerequisite: [ITIS 2300](#) and [ITIS 3200](#) or consent of the Department. This course examines the issues related to network based application development. Topics include introduction to computer networks, web technologies and standards, network based programming methodologies, languages, tools and standards. *(Fall, Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 25, 2006

RE: Request to modify the MSIT Program catalog copy

The request to modify the MSIT Program catalog copy was approved by the Chair of the Graduate Council on May 10, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

Master of Science Information Technology

Department, Location: Woodward Hall 341

Phone Number 704-687-8659

Web Address: www.sis.uncc.edu

Degree (abbreviation/full name): MSIT

Coordinator: William J. Tolone

Graduate Faculty:

Professors

Bei-Tseng "Bill" Chu

Yuliang Zheng

Associate Professor

Gail-Joon Ahn

William J. Tolone

Assistant Professors

Brent Hoon Kang

Seok-Won Lee

Zhaoyu "Alex" Liu

Anita Raja

Heather Richter

Yongge Wang

David Wilson

Adjuncts

J. Foley, T. Inskeep, T. Kitrick, F. Williams, J. Zhao

Program of Study

The objective of the information technology program leading to the Master of Science degree is to provide advanced skills and knowledge in the planning, design,

implementation, testing, and management of applications of computing and communication technologies for business, industry, government, and other organizations.

The primary areas of interest are: information security and privacy, information and infrastructure assurance, information integration, software engineering, intelligent information environments, and pervasive computing applications, and knowledge management.

Additional admission requirements beyond University/Graduate School admission requirements:

- 1) The program requires applicants to have completed undergraduate course work, or equivalent, in an object-oriented programming language (e.g., C++, C#, or Java) and in data structures with a minimum grade point average of 3.0 on a 4.0 scale.
- 2) The program requires applicants to have an undergraduate grade point average of at least 2.8 (on a 4.0 point scale) and a junior/senior GPA of at least 3.0.
- 3) The program requires a satisfactory score on the Graduate Record Examination or Graduate Management Admission Test.

Degree Requirements

A total of 30 graduate credit hours are required. No more than 12 hours of non-ITIS coursework can be applied to this degree. The following requirements will become effective for students entering the program in Fall 2006. Current students can opt into this program with permission from their advisor.

Core Requirements: Each student must complete six core program requirements – eighteen (18) credit hours. These requirements may be satisfied by the following coursework.

ITIS 5160 Applied Databases

ITIS 6342 Information Technology Project Management

ITIS 6200 Principles of Information Security and Privacy

ITIS 6112 Software System Design and Implementation

ITIS 6177 System Integration

**Note – ITCS 6160 can be a substitute for ITIS 5160*

Concentration Requirements: Each student must also complete an approved concentration area – **nine (9) credit hours**. Details on concentration requirements are available on the department website and at the department office. Current concentration areas include:

- 1) Advanced Data and Knowledge Discovery
- 2) **Human-Computer Interaction**
- 3) Information Security and Privacy
- 4) Information Technology Management
- 5) Software Systems Design and Engineering
- 6) **Thesis Option**

Other concentration areas are possible with the approval of the MSIT Program Coordinator. In addition, the MSIT Program Coordinator can approve substitution of courses within approved concentration areas.

Students satisfy remaining program requirements by completing approved IT elective coursework.

Master's Thesis Option

Students may elect to complete a master thesis. [When a student elects this option, the student's thesis topic becomes the student's approved concentration \(six credit hours of thesis research and three credit hours of approved related coursework\).](#)

Admission to Candidacy Requirements:

Assistantships:

Financial assistance for qualified students is available on a competitive basis in the form of graduate teaching and research assistantships. The deadline for graduate teaching assistantship applications is March 31 for the following academic year.

Practica:

Students can elect to participate in a practica (ITIS 6198).

Core Courses:

ITIS 5156 Computer-Aided Instruction. (3) Prerequisite: consent of the department. History of CAI; study of current CAI systems; development of man-machine dialogue; programming tools for CAI; information structures for computer-oriented learning. Advantages/disadvantages/costs of CAI. (On demand)

ITIS 5160 Applied Databases. (3) Prerequisites: full graduate standing, or consent of department. Identification of business database needs; requirements specification; relational database model; SQL; E-R modeling; database design, implementation, and verification; distributed databases; databases replication; object-oriented databases; data warehouses; OLAP; data mining; security of databases; vendor selection; DBMS product comparison; database project management; tools for database development, integration, and transaction control. (Fall) (Evening)

ITIS 5166 Network-Based Application Development. (3) Prerequisite: Full graduate standing or consent of the department. This course examines the issues related to network based application development. Topics include introduction to computer networks, web technologies and standards, network based programming methodologies, languages, tools and standards (Spring) (Evening)

ITIS 5220 Vulnerability Assessment and System Assurance. (3) Prerequisites consent of the Department. This course discusses methodologies, tools, and technologies that are important for vulnerability assessment and systems assurance. Topics covered include: ethical hacking techniques, vulnerability assessment, risk assessment/management, finding new exploits, discovering vulnerabilities, penetrating network perimeters, bypassing auditing systems, and assured administration of systems as well as evaluating systems assurance levels. Focus will be placed on 1) understanding current penetration techniques for networks, operating systems, services and applications; 2) investigating mitigation and defense strategies; and 3) studying legal and ethical considerations. The course is based on case studies with a strong lab component. (On demand)

ITIS 5250 Computer Forensics. (3) Prerequisite: Enrollment in MS IT or Consent of the Department. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment. (On demand)

ITIS 6010. Topics in Software and Information Systems. (3) Prerequisite: consent of the department. Topics in software and information systems selected to supplement the regular course offerings. May be repeated for credit as topics vary. (On demand)

ITIS 6112 Software System Design and Implementation. (3) Prerequisite: consent of the department. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software;

software documentation; choosing a language for software system. (Fall) (Spring) (Evenings) This course is cross-listed with ITCS 6112.

ITIS 6130 Software Requirements Engineering for Information Systems. (3) Prerequisite: Full graduate standing, or consent of the Department. Introduction to requirement engineering methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development models; risk management models; software engineering maturity model. (On demand)

ITIS 6140 Software Testing and Quality Assurance. (3) Prerequisite: ITIS 6112 or consent of the Department. Methods for evaluating software for correctness and reliability including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. Software engineering maturity model. (On demand)

ITIS 6148 Advanced OO Design and Implementation. (3) Prerequisites: ITIS 6112, or equivalent courses. This course focuses on issues related to the design, implementation, integration, and management of large object-oriented systems. Topics include: object models, object modeling, frameworks, persistent and distributed objects, and object-oriented databases. (*Spring*) (*Alternate Years*) This course is cross-listed with ITCS 6148.

ITIS 6162 Knowledge Discovery in Databases. (3) Prerequisite: ITCS 6160, full graduate standing, or consent of the department. The entire knowledge discovery process is covered in this course. Topics include: setting up a problem, data preprocessing and warehousing, data mining in search for knowledge, knowledge evaluation, visualization and application in decision making. A broad range of systems, such as OLAP, LERS, DatalogicR+, C4.5, AQ15, Forty-Niner, CN2, QRAS, and discretization algorithms will be covered. (Summer) (Evenings)

ITIS 6163 Data Warehousing. (3) Prerequisite: ITCS 6160 or equivalent. Topics include: use of data in discovery of knowledge and decision making; the limitations of relational databases and SQL queries; the warehouse data models: multidimensional,

star, snowflake; architecture of data warehouse and the process of warehouse construction; data consolidation from various sources; optimization; techniques for data transformation and knowledge extraction; relations with enterprise modeling. (On demand) This course is cross-listed as ITCS 6163.

ITIS 6164 Online-Info Systems. (3) Prerequisites: ITCS 6114 or consent of the department. The fundamental concepts and philosophy of planning and implementing an on-line computer system. Characteristics of on-line systems; hardware requirements; modeling of on-line systems; performance measurement; language choice for on-line systems; organization techniques, security requirements; resource allocation. (On demand)

ITIS 6167 Network and Information Security. (3) Prerequisite: ITCS 6166 or ITIS 5166 or equivalent. This course examines the issues related network and information security. Topics include concepts, security attacks and risks, security architectures, security policy management, security mechanisms, cryptographic algorithms, security standards, security system interoperation and case studies of the current major security systems. (Fall) (Evening)

ITIS 6177 System Integration. (3) Prerequisite: ITIS 5166 and ITIS 5160, or equivalents. This course examines the issues related to system integration. Topics include: data integration, business process integration, integration architecture, middleware, system security, and system management. (Fall) (Evening)

ITIS 6198 IT Internship Project. (3) Prerequisite: consent of the department. Complete a team-based project that is originated from an IT organization and approved by the department.

ITIS 6200 Principles of Information Security and Privacy. (3) Prerequisite: Consent of the department. Topics include security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; basic cryptography and its applications; intrusion detection and prevention; information systems assurance; anonymity and privacy issues for information systems. (Fall, Spring) (Evening)

ITIS 6210 Access Control and Security Architecture. (3) Prerequisite: ITIS 6200.

This course discusses objectives, formal models, and mechanisms for access control; and access control on commercial off-the-shelf (COTS) systems. This course also examines the issues related to security architectures and technologies for authorization. Topics include cryptographic infrastructure, distributed systems security architectures, Internet security architectures, network security architectures and e-commerce security architectures. (Spring) (Evening)

ITIS 6230 Information Infrastructure Protection. (3) Prerequisite: ITIS 6200. This course discusses methodologies, tools, and technologies that are important for protecting information systems and information infrastructures. Topics covered include: techniques, processes and methodologies for information security risk assessment and management, tools and technologies for critical infrastructure protection, methodologies for continuous operation and recovery from disasters. (On Demand)

ITIS 6240 Applied Cryptography. (3) Prerequisite: Full graduate standing or consent of the department. This course provides students with an understanding of modern cryptographic techniques, algorithms and protocols that are of fundamental importance to the design and implementation of security critical applications. The course not only covers standard cryptographic techniques, but also exposes students to the latest advances in applied cryptography. Topics include secret and public key ciphers, stream ciphers, one-way hashing algorithms, authentication and identification, digital signatures, key establishment and management, secret sharing and data recovery, public key infrastructures, and efficient implementation. (On demand)

ITIS 6342 Information Technology Project Management. (3) Prerequisite: Consent of the department. Introduce the student to problems associated with managing information technology projects involving, particularly, integration of systems, development of client-specific solutions, and project justification. The course will move beyond the classic techniques of project management and integrate communication software/systems, multi-site, multi-client facilities projects, cultural issues involved with managing interdisciplinary teams, and the effect of rapid technological obsolescence on project justification, funding and continuance. (Spring)

ITIS 6362 Information Technology Ethics, Policy, and Security. (3) Prerequisite: HADM 6152 or MBAD 6121 or MPAD 6120. Management of Information technology involves understanding the broader issues of ethics, Policy and Security. The growth in Internet usage and E-commerce require IT professionals to consider issues pertaining

to data protection, regulation, and appropriate use and dissemination of information. The course is designed to be team-taught by professionals in the field. (Fall)

ITIS 6880 Individual Study. (1-3) Prerequisites: At least 9 graduate ITCS/ITCS hours and consent of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects. May be repeated for credit. (On demand)

ITIS 6991 Information Technology Thesis. (1-6) Prerequisite: full standing in the Master of Science in Information Technology program and consent of the department. Graduate thesis research. A detailed exploration of an area of information technology chosen for thesis research. May be repeated for credit but no more than six hours may be applied to the M.S. degree requirements. (Fall, Spring, Summer)

Transfer Credit (information beyond university requirements): A maximum of six semester hours of graduate credit may be transferred from other institutions.

Program Certifications/Accreditation(s):

National Security Agency Recognized Center of Academic Excellence in Information Assurance Education.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 29, 2006

RE: Request to establish ITCS 4230 (Introduction to Game Design and Development) and ITCS 4231 (Advanced Game Design and Development)

The request to establish ITCS 4230 (Introduction to Game Design and Development) and ITCS 4231 (Advanced Game Design and Development) was approved by the Chair of the Undergraduate Course & Curriculum Committee on May 26, 2006 for implementation Spring Semester, 2007.

Catalog Copy:

ITCS 4230. Introduction to Game Design and Development. (3) Prerequisite: ITCS 2215. Basic concepts and techniques for electronic game design and development. Topics include: game history and genres, game design teams and processes, what makes a game fun, level and model design, game scripting and programming including computer graphics and animation, artificial intelligence, industry issues, and gender and games. *(Fall)*

ITCS 4231. Advanced Game Design and Development. (3) Prerequisite: ITCS 4230. Advanced concepts and techniques for electronic game design and development. This course is a project-centered course where students explore complex gameplay and interactivity. The course explores topics from the introductory course in more depth, such as: applying software engineering techniques to developing games, advanced game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, William States Lee College of Engineering

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 29, 2006

RE: Request to renumber the Senior Projects and change the capstone requirement

The request to renumber the Senior Projects and change the capstone requirement was approved by the Chair of the Undergraduate course & Curriculum Committee on May

18, 2006 for implementation Spring Semester, 2007. **Note: Implementation term of Fall 2006 for the degree requirement changes incorporating the re-numberings.**

Catalog Copy:

ITCS ~~3650~~ 4650. Senior Project. (3) Prerequisites: ~~senior standing and~~ two ITCS/ITIS 3xxx/4xxx courses with a grade of C or better or consent of the Department. An individual or group project in the teaching, theory, or application of computer science under the direction of a faculty member. Projects must be approved by the Department before they can be initiated. *(Fall, Spring, Evenings)*

ITCS ~~3651~~ 4651. Senior Project. (3) Prerequisite: ITCS ~~3350~~ 4650. A continuation of ITCS ~~3650~~ 4650. *(Fall, Spring, Evenings)*

ITCS ~~3681~~ 4681. Senior Design I. (3) Prerequisites: ~~senior standing and~~ two ITCS/ITIS 3xxx/4xxx courses with a grade of C or better or consent of the Department. An individual or group computer engineering design project under the direction of a faculty member. Projects must be approved by the Department before they can be initiated. *(Fall, Spring, Evenings)*

ITCS ~~3682~~ 4682. Design II. (3) Prerequisite: ITCS ~~3681~~ 4681. A continuation of ITCS ~~3681~~ 4681. *(Fall, Spring, Evenings)*

BACHELOR OF ARTS: COMPUTER SCIENCE

The Computer Science Concentration consists of ~~51~~ 48 hours in computer science, and 12 hours in mathematics. Courses included are: ITCS 1214, 1215, 2163, 2175, 2214, 2215, 3102, 3155, 3160, 3166, ~~3650, 3651~~, 3688, ~~and~~ nine semester hours of approved ITCS or ITIS courses numbered 3000 or above, and six semester hours of approved ITCS courses numbered 4000 or above; ENGL 2116 and COMM 2105; MATH 1120, 2164, STAT 1220, ~~1223~~, 2223; or MATH 1241, 1242, 2164, STAT 2122.

BACHELOR OF SCIENCE: COMPUTER SCIENCE

The Computer Science Concentration consists of 54 hours of computer science and 12 hours in mathematics. Courses included are: ITCS 1214, 1215, 2175, 2181, 2214, 2215, 3102, 3143, 3155, 3160, 3166, 3182, 3688, ~~4650, 4651~~, and nine semester hours of approved ITCS or ITIS courses numbered 3000 or above, and six semester hours of approved ITCS courses numbered 4000 or above; MATH 1241, 1242, 2164, STAT 2122.

BACHELOR OF SCIENCE: COMPUTER SCIENCE, COMPUTER ENGINEERING CONCENTRATION

The Computer Science Concentration consists of 42 hours of computer science, 15 hours of mathematics, 12 hours of Technical electives, and ENGL 2116. These include: ITCS 1214, 1215, 2175, 2181, 2214, 2215, 3102, 3143, 3155, 3182, 3183, 3688, ~~4681, 4682~~, and six semester hours of approved ITCS courses numbered 4000 or above; MATH 1241, 1242, 2164, 2171, STAT 2122. Technical Electives: Twelve hours of ITCS/ITIS and ECGR courses that must be approved by the Department.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 15, 2006

RE: Request to clean up catalog copy for ITCS courses

The request to clean up catalog copy for ITCS courses was approved by the Chair of the Undergraduate Course & Curriculum Committee on May 8, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITCS 2215. Design and Analysis of Algorithms. (3) Prerequisites: (MATH 1120 or MATH 1241) and **ITCS 2175 MATH 1165** and ITCS 2214. Introduction to the design and analysis of algorithms. Design techniques: divide-and-conquer, greedy approach, dynamic programming. Algorithm analysis: asymptotic notation, recurrence relation, time space complexity and tradeoffs. Study of sorting, searching, hashing, and graph algorithms. *(Fall, Spring, Summer) (Evenings)*

ITCS 3182. Computer Organization and Architecture. (3) Prerequisite: ITCS 2181 or **ECGR 2181** ~~or consent of the Department~~. Machine level representation of data; von **Neumann** architecture; instruction sets and types; addressing types; assembly and machine language programming; control unit and microprogramming; alternate architectures. *(Fall, Spring, Summer) (Evenings)*

ITCS 3688. Computers and Their Impact on Society. (3) (O, W) Prerequisite: Junior standing and consent of the Department. A study of current topics (software piracy, hacking, professional conduct) in computer science and the impact of computers on various subsets (home, government, and education) of society. *(Fall, Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: May 12, 2006

RE: Request to make the Senior Project courses (ITIS/ITCS 3650 & 3651) electives rather than required and to permit students to substitute upper division ITIS or ITCS courses (including independent study) in their place.

The request to make the Senior Project courses (ITIS/ITCS 3650 & 3651) electives rather than required and to permit students to substitute upper division ITIS or ITCS courses (including independent study) in their place was approved by the Chair of the Undergraduate Course & Curriculum Committee on April 27, 2006 for implementation Fall Semester, 2007.

Catalog Copy:

This program requires 120 credit hours. In addition to the general education requirements for the University, the BA degree requires 48 hours of major courses: ITCS 1214, 1215, 2175, 2214, 2215, 3143, 3160, 3166, and 3688; ITIS 2300, 3200, 3300, 3310, and 3320 plus twelve hours of approved ITCS or ITIS courses numbered 3000 or above; plus ENGL 2116 and COMM 2105. 12 hours in mathematics in one of the following mathematics options are also required:

- MATH 1120, 2164, and STAT 1220, 1223
- MATH 1241, 1242, 2164, and STAT 2122

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: April 7, 2006

RE: Request to revise the requirements for the M.S. degree in Information Technology

The request to revise the requirements for the M.S. degree in Information Technology was approved by the Graduate Council on March 20, 2006 and by the Faculty Council on the March 24, 2006 Consent Calendar for implementation Spring Semester, 2007.

Catalog Copy:

Program name: Master of Science in Information Technology

Department, Location: Woodward Hall 341

Phone Number 704-687-8659

Web Address: www.sis.uncc.edu

Degree (abbreviation/full name): MSIT

Coordinator: William J. Tolone

Graduate Faculty:

Professors

Bei-Tseng "Bill" Chu

Yuliang Zheng

Associate Professor

Gail-Joon Ahn

William J. Tolone

Assistant Professors

Brent Hoon Kang

Seok-Won Lee

Zhaoyu "Alex" Liu

Anita Raja

Heather Richter

Yongge Wang

David Wilson

Adjuncts

J. Foley, T. Inskeep, T. Kitrick, F. Williams, J. Zhao

Program of Study

The objective of the information technology program leading to the Master of Science degree is to provide advanced skills and knowledge in the planning, design, implementation, testing, and management of applications of computing and communication technologies for business, industry, government, and other organizations.

The primary areas of interest are: information security and privacy, information and infrastructure assurance, information integration, software engineering, intelligent information environment and pervasive computing applications, and knowledge management.

Additional admission requirements beyond University/Graduate School admission requirements:

- 1) The program requires applicants to have completed undergraduate course work, or equivalent, in an object-oriented programming language (e.g., C++, C#, or Java) and in data structures with a minimum grade point average of 3.0 on a 4.0 scale.
- 2) The program requires applicants to have an undergraduate grade point average of at least 2.8 (on a 4.0 point scale) and a junior/senior GPA of at least 3.0.
- 3) The program requires a satisfactory score on the Graduate Record Examination or Graduate Management Admission Test.

Degree Requirements

A total of 30 graduate credit hours are required. No more than 12 hours of non-ITIS coursework can be applied to this degree. The following requirements will become effective for students entering the program in Fall 2006. Current students can opt into this program with permission from their advisor.

Required courses include:

ITIS 5166 Network-Based Application Development

ITIS 5160 Applied Databases (please note that ITCS 6160 can be a substitute for ITIS 5160)

ITIS 6342 Information Technology Project Management

ITIS 6200 Principles of Information Security and Privacy

ITIS 6112 Software System Design and Implementation

ITIS 6177 System Integration

Each student must also complete a three-course (nine credit hours) sequence in an approved concentration area. Other concentration areas are possible with the approval of the MSIT Program Coordinator. In addition, the MSIT Program Coordinator can approve substitution of courses within approved concentrations. Details on concentration requirements are available on the department website and at the department office. Current concentrations include:

- 1) Advanced Data and Knowledge Discovery
- 2) Financial Service
- 3) Information Security and Privacy
- 4) Information Technology Management
- 5) Management
- 6) Marketing

7) Software Systems Design and Engineering

Master's Thesis Option

Students may elect to complete a master thesis (6 credit hours).

Admission to Candidacy Requirements:

Assistantships:

Financial assistance for qualified students is available on a competitive basis in the form of graduate teaching and research assistantships. The deadline for graduate teaching assistantship applications is March 31 for the following academic year.

Practica:

Students can elect to participate in a practica (ITIS 6198).

Core Courses:

ITIS 5156. Computer-Aided Instruction. (3) Prerequisite: consent of the department. History of CAI; study of current CAI systems; development of man-machine dialogue; programming tools for CAI; information structures for computer-oriented learning. Advantages/disadvantages/costs of CAI. (*On demand*)

ITIS 5160. Applied Databases. (3) Prerequisites: full graduate standing, or consent of department. Identification of business database needs; requirements specification; relational database model; SQL; E-R modeling; database design, implementation, and verification; distributed databases; databases replication; object-oriented databases; data warehouses; OLAP; data mining; security of databases; vendor selection; DBMS

product comparison; database project management; tools for database development, integration, and transaction control. *(Fall) (Evening)*

ITIS 5166. Network-Based Application Development. (3) Prerequisite: Full graduate standing or consent of the department. This course examines the issues related to network based application development. Topics include introduction to computer networks, web technologies and standards, network based programming methodologies, languages, tools and standards *(Spring) (Evening)*

ITIS 5220. Vulnerability Assessment and System Assurance. (3) Prerequisites consent of the Department. This course discusses methodologies, tools, and technologies that are important for vulnerability assessment and systems assurance. Topics covered include: ethical hacking techniques, vulnerability assessment, risk assessment/management, finding new exploits, discovering vulnerabilities, penetrating network perimeters, bypassing auditing systems, and assured administration of systems as well as evaluating systems assurance levels. Focus will be placed on 1) understanding current penetration techniques for networks, operating systems, services and applications; 2) investigating mitigation and defense strategies; and 3) studying legal and ethical considerations. The course is based on case studies with a strong lab component. *(On demand)*

ITIS 5250. Computer Forensics. (3) Prerequisite: Enrollment in MS IT or Consent of the Department. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment. *(On demand)*

ITIS 6010. Topics in Software and Information Systems. (3) Prerequisite: consent of the department. Topics in software and information systems selected to supplement the regular course offerings. May be repeated for credit as topics vary. *(On demand)*

ITIS 6112. Software System Design and Implementation. (3) Crosslisted as ITCS 6112. Prerequisite: consent of the department. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human

interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software; software documentation; choosing a language for software system. *(Fall) (Spring) (Evenings)*

ITIS 6130. Software Requirements Engineering for Information Systems. (3) Prerequisite: Full graduate standing, or consent of the Department. Introduction to requirement engineering methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development models; risk management models; software engineering maturity model. *(On demand)*

ITIS 6140. Software Testing and Quality Assurance. (3) Prerequisite: ITIS 6112 or consent of the Department. Methods for evaluating software for correctness and reliability including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. Software engineering maturity model. *(On demand)*

ITIS 6148. Advanced OO Design and Implementation. (3) Crosslisted as ITCS 6148. Prerequisites: ITIS 6112, or equivalent courses. This course focuses on issues related to the design, implementation, integration, and management of large object-oriented systems. Topics include: object models, object modeling, frameworks, persistent and distributed objects, and object-oriented databases. *(Spring) (Alternate years)*

ITIS 6162. Knowledge Discovery in Databases. (3) Prerequisite: ITCS 6160, full graduate standing, or consent of the department. The entire knowledge discovery process is covered in this course. Topics include: setting up a problem, data preprocessing and warehousing, data mining in search for knowledge, knowledge evaluation, visualization and application in decision making. A broad range of systems, such as OLAP, LERS, DatalogicR+, C4.5, AQ15, Forty-Niner, CN2, QRAS, and discretization algorithms will be covered. *(Summer) (Evenings)*

ITIS 6163. Data Warehousing. (3) Crosslisted as ITCS 6163. Prerequisite: ITCS 6160 or equivalent. Topics include: use of data in discovery of knowledge and decision making; the limitations of relational databases and SQL queries; the warehouse data models: multidimensional, star, snowflake; architecture of data warehouse and the process of warehouse construction; data consolidation from various sources; optimization; techniques for data transformation and knowledge extraction; relations with enterprise modeling. *(On demand)*

ITIS 6164. Online-Info Systems. (3) Prerequisites: ITCS 6114 or consent of the department. The fundamental concepts and philosophy of planning and implementing an on-line computer system. Characteristics of on-line systems; hardware requirements; modeling of on-line systems; performance measurement; language choice for on-line systems; organization techniques, security requirements; resource allocation. *(On demand)*

ITIS 6167. Network and Information Security. (3) Prerequisite: ITCS 6166 or ITIS 5166 or equivalent. This course examines the issues related network and information security. Topics include concepts, security attacks and risks, security architectures, security policy management, security mechanisms, cryptographic algorithms, security standards, security system interoperation and case studies of the current major security systems. *(Fall) (Evening)*

ITIS 6177. System Integration. (3) Prerequisite: ITIS 5166 and ITIS 5160, or equivalents. This course examines the issues related to system integration. Topics include: data integration, business process integration, integration architecture, middleware, system security, and system management. *(Fall) (Evening)*

ITIS 6198. IT Internship Project. (3) Prerequisite: consent of the department. Complete a team-based project that is originated from an IT organization and approved by the department.

ITIS 6200. Principles of Information Security and Privacy. (3) Prerequisite: Consent of the department. Topics include security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; basic cryptography and its applications; intrusion detection and prevention; information

systems assurance; anonymity and privacy issues for information systems. (*Fall, Spring*) (*Evening*)

ITIS 6210. Access Control and Security Architecture. (3) Prerequisite: ITIS 6200.

This course discusses objectives, formal models, and mechanisms for access control; and access control on commercial off-the-shelf (COTS) systems. This course also examines the issues related to security architectures and technologies for authorization. Topics include cryptographic infrastructure, distributed systems security architectures, Internet security architectures, network security architectures and e-commerce security architectures. (*Spring*) (*Evening*)

ITIS 6230. Information Infrastructure Protection. (3) Prerequisite: ITIS 6200. This

course discusses methodologies, tools, and technologies that are important for protecting information systems and information infrastructures. Topics covered include: techniques, processes and methodologies for information security risk assessment and management, tools and technologies for critical infrastructure protection, methodologies for continuous operation and recovery from disasters. (*On demand*)

ITIS 6240. Applied Cryptography. (3) Prerequisite: Full graduate standing or consent

of the department. This course provides students with an understanding of modern cryptographic techniques, algorithms and protocols that are of fundamental importance to the design and implementation of security critical applications. The course not only covers standard cryptographic techniques, but also exposes students to the latest advances in applied cryptography. Topics include secret and public key ciphers, stream ciphers, one-way hashing algorithms, authentication and identification, digital signatures, key establishment and management, secret sharing and data recovery, public key infrastructures, and efficient implementation. (*On demand*)

ITIS 6342. Information Technology Project Management. (3) Prerequisite: Consent

of the department. Introduce the student to problems associated with managing information technology projects involving, particularly, integration of systems, development of client-specific solutions, and project justification. The course will move beyond the classic techniques of project management and integrate communication software/systems, multi-site, multi-client facilities projects, cultural issues involved with managing interdisciplinary teams, and the effect of rapid technological obsolescence on project justification, funding and continuance. (*Spring*)

ITIS 6362. Information Technology Ethics, Policy, and Security. (3) Prerequisite: HADM 6152 or MBAD 6121 or MPAD 6120. Management of Information technology involves understanding the broader issues of ethics, Policy and Security. The growth in Internet usage and E-commerce require IT professionals to consider issues pertaining to data protection, regulation, and appropriate use and dissemination of information. The course is designed to be team-taught by professionals in the field. *(Fall)*

ITIS 6880. Individual Study. (1-3) Prerequisites: At least 9 graduate ITCS/ITCS hours and consent of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects. May be repeated for credit. *(On demand)*

ITIS 6991. Information Technology Thesis. (1-6) Prerequisite: full standing in the Master of Science in Information Technology program and consent of the department. Graduate thesis research. A detailed exploration of an area of information technology chosen for thesis research. May be repeated for credit but no more than six hours may be applied to the M.S. degree requirements. *(Fall, Spring, Summer)*

Transfer Credit (information beyond university requirements): A maximum of six semester hours of graduate credit may be transferred from other institutions.

Program Certifications/Accreditation(s): National Security Agency Recognized Center of Academic Excellence in Information Assurance Education.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: March 27, 2006

RE: Request to modify degree requirement for all College of Information Technology undergraduate degree programs by replacing MATH 1165 with ITCS 2175 as a degree requirement

The request to modify degree requirement for all College of Information Technology undergraduate degree programs by replacing MATH 1165 with ITCS 2175 as a degree requirement was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 21, 2006 for implementation **Fall Semester, 2006**.

Catalog Copy:

BACHELOR OF ARTS: COMPUTER SCIENCE

The Computer Science Concentration consists of 51 hours in computer science, and 12 hours in mathematics. Courses included are: ITCS 1214, 1215, 2163, 2175, 2214, 2215, 3102, 3155, 3160, 3166, 3650, 3651, 3688, and nine semester hours of approved ITCS or ITIS courses numbered 3000 or above; ENGL 2116 and COMM 2105; MATH 1120, 2164, STAT 1220, 1223, or MATH 1241, 1242, 2164, STAT 2122.

BACHELOR OF SCIENCE: COMPUTER SCIENCE

The Computer Science Concentration consists of 54 hours in computer science, and 12 hours in mathematics. Courses included are: ITCS 1214, 1215, 2175, 2181, 2214, 2215, 3102, 3143, 3155, 3160, 3166, 3182, 3688, 4650, 4651, and nine semester hours of approved ITCS or ITIS courses numbered 3000 or above; MATH 1241, 1242, 2164, STAT 2122.

BACHELOR OF SCIENCE: COMPUTER SCIENCE

The Computer Science Engineering Concentration consists of 54 hours of computer science, 15 hours of mathematics, 12 hours of Technical electives, and ENGL 2116. These include: ITCS 1214, 1215, 2175, 2181, 2214, 2215, 3102, 3143, 3155, 3182, 3183, 3688, 4681, 4682; MATH 1241, 1242, 2164, 2171, STAT 2122. Technical electives: Twelve hours of ITCS/ITIS and ECGR courses that must be approved by the Department.

BACHELOR OF ARTS: SOFTWARE AND INFORMATION SYSTEMS

This program requires 120 credit hours. In addition to the general education requirements for the University, the BA degree requires 48 hours of major courses: ITCS 1214, 1215, 2175, 2214, 2215, 3143, 3160, 3166, and 3688; ITIS 2300, 3200, 3300, 3310, 3320, 3650, and 3651; plus six hours of approved ITCS or ITIS courses numbered 3000 or above; plus ENGL 2116 and COMM 2105. 12 hours in mathematics in one of the following mathematics options are also required:

MATH 1120, 2164, and STAT 1220, 1223

or

MATH 1241, 1242, 2164, and STAT 2122.

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Secretary to Faculty Governance

DATE: March 27, 2006

RE: Request to re-number ITCS 3175 to ITCS 2175

The request to re-number ITCS 3175 to ITCS 2175 was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 20, 2006 for implementation Fall Semester, 2006.

Catalog Copy ([Changes in blue](#)):

ITCS ~~3175~~ 2175. Logic and Algorithms. (3) Prerequisites: ITCS 1214 and **MATH ~~1242~~ MATH 1120 or MATH 1241**. Introduction to propositional calculus; predicate calculus; algorithms; logic functions; finite-state machines; logic design. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: March 8, 2006

RE: Request to revise catalog copy to include ENGL 2116 and COMM 2105 as required courses

The request to revise catalog copy to include ENGL 2116 and COMM 2105 as required courses was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 3, 2006 for implementation Fall Semester, 2006.

Catalog Copy ([Revisions in blue](#)):

BACHELOR OF ARTS: COMPUTER SCIENCE

The Computer Science Concentration consists of 45 hours in computer science, and 15 hours in mathematics. Courses included are: ITCS 1214, 1215, 2163, 2214, 2215, 3102, 3155, 3160, 3166, 3650, 3651, 3688, and nine semester hours of approved ITCS or ITIS courses numbered 3000 or above; **ENGL 2116 and COMM 2105**, MATH 1120, 1165, 2164, STAT 1220, 1223; or MATH 1241, 1242, 1165, 2164, STAT 2122.

BACHELOR OF SCIENCE: COMPUTER SCIENCE, COMPUTER ENGINEERING CONCENTRATION

The Computer Engineering Concentration consists of 39 hours of computer science, 18 hours of mathematics, 12 hours of Technical electives, **and ENGL 2116**. These include: ITCS 1214, 1215, 2181, 2214, 2215, 3102, 3143, 3155, 3182, 3183, 3681, 3682, 3688. MATH 1241, 1242, 1165, 2164, 2171, STAT 2122. Technical

electives: Twelve hours of ITCS/ITIS and ECGR courses that must be approved by the Department.

BACHELOR OF ARTS: SOFTWARE AND INFORMATION SYSTEMS

This program requires 120 hours. In addition to the general education requirements for the University, the BA degree requires 45 hours of major courses: ITCS 1214, 1215, 2214, 2215, 3143, 3160, 3166, and 3688; ITIS 2300, 3200, 3300, 3310, 3320, 3650, and 3651; plus six hours of approved ITCS or ITIS courses numbered 3000 or above; **plus ENGL 2116 and COMM 2105**. 15 hours in mathematics in one of the following mathematics options are also required:

MATH 1120, 1165, 2164, and STAT 1220, 1223
MATH 1165, 1241, 1242, 2164, and STAT 2122

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: March 8, 2006

RE: Request to establish ITCS 4990: Undergraduate Research

The request to establish ITCS 4990: Undergraduate Research was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 3, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITCS 4990. Undergraduate Research. (3) Prerequisite: Permission of the Department. This course consists of undergraduate research as part of a joint undergraduate/graduate research project using existing research laboratory facilities and materials. Course may be repeated in subsequent terms for a maximum of 6 hours total. *(Fall, Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: March 8, 2006

RE: Request to establish ITCS 1102: Advanced Internet Concepts

The request to establish ITCS 1102: Advanced Internet Concepts was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 3, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITCS 1102: Advanced Internet Concepts. (3) Prerequisite: ITCS 1101. This course is an advanced study of the Internet environment. This course is designed for any student who is familiar with office productivity tools and a user of Internet technologies; it addresses advanced concepts of computer literacy. Topics include: concepts of website design and how to evaluate websites; proper use of synchronous and asynchronous communication tools (e.g. chat, email, IM...); issues of copyright and cyber-ethics; using the Internet to do research; and publishing via the Internet. Other topics may be added to keep the content current and relevant. Students will complete extensive Internet oriented projects to demonstrate mastery of the skills discussed in class. *(Fall, Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance
DATE: March 7, 2006
RE: Request to edit the catalog copy for Computer Science classes

The request to edit the catalog copy for Computer Science classes was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 3, 2006 for implementation Fall Semester, 2006.

Catalog Copy (Revisions in blue):

ITCS 1101. Introduction to Computer Concepts. (3) Prerequisite **OR** co-requisite: ~~MATH 1100, 1101, or 1103.~~ **MATH 1100 OR MATH 1101 OR MATH 1103 OR MATH 1120 OR MATH 1241.** Introductory course ~~for non-ITCS majors~~ that gives an overview of computer hardware and software. Primary emphasis is on productivity software (word processing, spreadsheet, and graphical presentation). These applications are taught through a series of projects/assignments. Aspects of Internet research are also covered. ~~May not be taken while a Computer Science major (or minor).~~ (Fall, Spring, Summer) (Internet)

ITCS 1214. Introduction to Computer Science. (3) Prerequisite **OR** co-requisite: ~~MATH 1100, 1101, 1103, 1120, 1241 or consent of Department.~~ **MATH 1100 OR MATH 1103 OR MATH 1120 OR MATH 1241.** Introduction to algorithmic problem solving strategies and algorithm development; basic concepts and terminology of computers; study of data representation and number systems; use of computers to implement numerical and symbolic algorithms. General programming concepts will be taught through the use of **a** high level language. (Fall, Spring, Summer) (Evenings) (Internet)

ITCS 2050. Topics in Computer Science. (1-3) Prerequisite: Consent of the Department. Topics in computer science selected to supplement the regular course offerings at the 2000 level. (May be repeated for credit with the consent of the Department. **A student may register for multiple sections of the course with different topics in the same semester or in different semesters.**) (On demand)

ITCS 2215. Design and Analysis of Algorithms. (3) Prerequisites: ~~ITCS 2214, MATH 1165, and either MATH 1120 or 1241.~~ **(MATH 1120 OR MATH 1241) AND MATH 1165 AND ITCS 2214.** Introduction to the design and analysis of algorithms. Design techniques: divide-and-conquer, greedy approach, dynamic programming. Algorithm analysis: asymptotic notation, recurrence relation, time space complexity and tradeoffs. Study of sorting, searching, hashing, and graph algorithms. *(Fall, Spring, Summer) (Evenings)*

ITCS 3050. Topics in Computer Science. (1-3) Prerequisite: Consent of the Department. Topics in computer science selected to supplement the regular course offerings at the 3000 level. (May be repeated for credit with the consent of the Department. **A student may register for multiple sections of the course with different topics in the same semester or in different semesters.**) *(On demand)*

ITCS 3112. Design and Implementation of Object-Oriented Systems. (3) Prerequisites: ~~ITCS 1215 or consent of the Department.~~ **ITCS 2215.** In-depth exploration of object-oriented programming and system development. Topics include: evolution of object-oriented methodology; concept of the object-oriented approach; object-oriented programming languages; object-oriented analysis and design; the design of software for reuse; and incremental software development. *(Spring) (Evenings)*

ITCS 3123. Introduction to Numerical Methods. (3) Prerequisites: ~~ITCS 1215 and MATH 1142.~~ **ITCS 2214 AND (MATH 1241 or MATH 1120).** General concepts of scientific computing and their applications to such areas as non-linear equations, numerical integration, spline and polynomial interpolation, and initial value problems. *(On demand)*

ITCS 3145. Introduction to Parallel Programming. (3) Prerequisite: ~~ITCS 1215~~ **ITCS 2214.** Programming parallel computers and networks of workstations, parallel strategies, algorithms, and applications. *(Fall) (Evenings)*

ITCS 3175. Logic and Algorithms. (3) Prerequisites: ~~ITCS 1215 and MATH 1242~~ **ITCS 1214 and (MATH 1120 or MATH 1241).** Introduction to propositional

calculus, predicate calculus, algorithms, logic functions, finite-state machines; logic design. (*On demand*)

ITCS 4010. Topics in Computer Science. (1-3) Prerequisite: Consent of the Department. Topics in computer science selected to supplement the regular course offerings at the 4000 level. (May be repeated for credit with the consent of the Department. **A student may register for multiple sections of the course with different topics in the same semester or in different semesters.**) (*On demand*)

ITCS 4107. Formal Languages and Automata. (3) Prerequisite: ~~One semester of discrete structures or consent of the Department~~ **MATH 1165**. Detailed study of abstract models for the syntax of programming languages and information processing devices. Languages and their representation; grammars, finite automata and regular sets; context-free grammars and pushdown automata; Chomsky Hierarchy; closure properties of families of languages; syntax analysis. (*On demand*)

DELETE:

ITCS 4110. Programming Languages and Compiler. (3)

ITCS 4128. Programming Languages and ~~Compilers~~ Compilers.

(3) Prerequisite: ~~Consent of the Department~~ **ITCS 2214**. Introduction to the concepts and techniques used in describing, defining, and implementing programming languages and their compilers. Introduction to parsing and parser construction; LL and LR grammars; syntax directed translation; data object representations; run time structures; intermediate languages; code optimization. (*On demand*)

ITCS 4130. Computer Graphics. (3) Prerequisite: ~~Consent of the Department~~ **ITCS 2215 and MATH 2164**. Implicit and parametric representation; cubic surfaces; advanced reflection models; global illumination models – ray tracing, radiosity; shadow algorithms, texture mapping; volumetric modeling and rendering techniques; animation; advanced modeling techniques; particle systems, fractals. (*On demand*)

ITCS 4145. Parallel Computing. (3) Prerequisites: ~~ITCS 1215~~ **ITCS 2214** and ITCS 3182 ~~or consent of Department~~. Types of parallel computers, programming techniques

for multiprocessor and multicomputer systems, parallel strategies, algorithms, and languages. *(Spring) (Alternate years) (Evenings)*

ITCS 4151. Intelligent Robotics. (3) Prerequisites: ~~ITCS 1215~~ **ITCS 2214 and MATH 2164**. General introduction to spatial descriptions and transformations, and manipulator position and motion. More study on robot planning, programming, sensing, vision, and CAD/CAM. *(On demand)*

ITCS 4152. Computer Vision. (3) Prerequisites: ~~ITCS 1215~~ **ITCS 2215 and MATH 2164**. General introduction to Computer Vision and its application. Topics include low level vision, 2D and 3D segmentation, 2D description, 2D recognition, 3D description and model-based recognition, and interpretation. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: February 13, 2006

RE: Request to rename ITIS 6010 to Topics in Software and Information Systems

The request to rename ITIS 6010 to Topics in Software and Information Systems was approved by the Chair of the Graduate Council on January 31, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITIS 6010. Topics in Software and Information Systems. (3) Prerequisite: consent of the department. Topics in software and information systems selected to supplement the regular course offerings. May be repeated for credit as topics vary. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: February 13, 2006

RE: Request to restore ITCS 5010 Topics in Computer Science to the Graduate Catalog

The request to restore ITCS 5010 Topics in Computer Science to the Graduate Catalog was approved by the Chair of the Graduate Council on January 13, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITCS 5010. Topics in Computer Science. (3) Prerequisite: consent of the department. Topics in computer science selected to supplement the regular course offerings. A student may register for multiple sections of the course with different topics in the same semester or in different semesters. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: January 27, 2006

RE: Request to change the credit hours of ITCS 6490; change the numbering of ITCS 5125 and ITCS 5151; and to delete ITCS 5016 and ITCS 8141

The request to change the credit hours of ITCS 6490; change the numbering of ITCS 5125 and ITCS 5151; and to delete ITCS 5016 and ITCS 8141 was approved by the

Chair of the Graduate Council on January 23, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITCS 6490. Industrial Internship. ~~(1-6)~~ (0-6) Prerequisite: Completion of six hours of graduate coursework. Full or part-time academic year internship in computer science areas complementary to the concentration area of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's internship program must be approved by the supervising faculty, the academic advisor, and the graduate program director. A mid-term report and a final report to be evaluated by the supervising faculty in consultation with off-campus supervisors at the internship organization. The credit hours may not be part of the minimum 30 credit hours for graduation. *(On demand)*

ITCS ~~5425~~ 6125. Virtual Environments. (3) Prerequisite: Graduate Standing. This course will cover the current state of the art in the design and implementation of Virtual Environments. Topics covered will include: position tracking, design of head-traced and head-mounted displays, stereoscopic display, presence in virtual environments, 3D user interface design, and applications of VEs. Previous experience in computer graphics or 3D game design is helpful but not required. *(On demand)*

ITCS ~~5151~~ 6151. Intelligent Robotics. (3) Prerequisites: ITCS 1215 and MATH 2164, or consent of the department. General introduction to spatial descriptions and transformations, and manipulator position and motion. More study on robot planning, programming, sensing, vision, and CAD/CAM. *(Odd, Spring) (Evenings)*

Delete: ITCS 5016 and ITCS 8184

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: January 27, 2006

RE: Request to change the course title and to edit course description for ITIS 6991 from Graduate Master Thesis Research to Information Technology Thesis

The request to change the course title and to edit course description for ITIS 6991 from Graduate Master Thesis Research to Information Technology Thesis was approved by the Chair of the Graduate Council on January 23, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

ITIS 6991. ~~Graduate Master Thesis Research.~~ Information Technology Thesis. (1-2) Prerequisite: full standing in the masters of Science in Information Technology program and consent of the department. Graduate thesis research. A detailed exploration of an area of information technology chosen for thesis research. May be repeated for credit but no more than six hours may be applied to the M.S. degree requirements. (*Fall, Spring, Summer*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: January 27, 2006

RE: Request to delete ITIS 7991 Computer Science Thesis from the system

The request to delete ITIS 7991 Computer Science Thesis from the system was approved by the Chair of the Graduate Council on January 23, 2006 for implementation Fall Semester, 2006.

Catalog Copy:

Delete: ITIS 7991 Computer Science Thesis

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: January 30, 2006

RE: Request to change the course title and to edit course description for ITIS 8010 from Topics in Computer Science to Topics in Software and Information Systems

The request to change the course title and to edit course description for ITIS 8010 from Topics in Computer Science to Topics in Software and Information Systems was approved by the Chair of the Graduate Council on January 13, 2006 for implementation Fall Semester, 2006.

Catalog Copy

ITIS 8010. ~~Topics in Computer Science.~~ Topics in Software and Information Systems. (3)

Prerequisite: consent of the department. Topics in software and information systems selected to supplement the regular course offerings. May be repeated for credit as topics vary. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: January 30, 2006

RE: Request to change the catalog descriptions of ITCS 5010/6010/8010

The request to change the catalog descriptions of ITCS 5010/6010/8010 was approved by the Chair of the Graduate Council on January 12, 2006 for implementation Fall Semester, 2006.

Catalog Copy

ITCS 5010. Topics in Computer Science. (3) Prerequisite: consent of the department. Topics in computer science selected to supplement the regular course offerings. [A student may register for multiple sections of the course with different topics in the same semester or in different semesters.](#) *(On demand)*

ITCS 6010. Topics in Computer Science. (3) Prerequisite: consent of the department. Topics in computer science selected to supplement the regular course offerings. [A student may register for multiple sections of the course with different topics in the same semester or in different semesters.](#) *(On demand)*

ITCS 8010. Topics in Computer Science. (3) Prerequisite: consent of the department. Topics in computer science selected to supplement the regular course offerings. [A student may register for multiple sections of the course with different topics in the same semester or in different semesters.](#) *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: December 7, 2005

RE: Request to establish ITIS 3100: Introduction to IT Infrastructure Systems

The request to establish ITIS 3100: Introduction to IT Infrastructure Systems was approved by the chair of the Undergraduate Course and Curriculum Committee on December 2, 2005 for implementation Spring Semester, 2006.

Catalog Copy [\(deletions in red, changes in blue\)](#)

ITIS 3100. Introduction to IT Infrastructure Systems. (3) Prerequisites: ITIS 2214, or consent of the department. This course discusses methodologies, tools, and technologies that are important for understanding various IT infrastructure systems such as file storage services, email services, and web services. Focus will be placed on understanding widely-used network infrastructure services and systems, and acquiring basic knowledge in design practices and management of such systems. *Can serve as a prerequisite course for ITIS 3200, ITIS 4200. (Fall, Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Julie Putnam, Administrative Assistant to Faculty Governance

DATE: July 21, 2005

RE: Request to change course title of ITIS 3130 to Human-Computer Interactions

The request to change course title of ITIS 3130 to Human-Computer Interactions was approved by the Chair of the Undergraduate Course and Curriculum Committee on July 20, 2005 for implementation.

Catalog Copy:

ITIS 3130. ~~Human and Computer Interfaces~~ Human-Computer Interactions. (3) Prerequisite: IT IS 2300 or consent of the department. Concepts of the design of the human-machine environment, with special emphasis on human-computer interaction and how people acquire, store, and use data from the environment and from computers. Topics include: analysis, creation and improvement of equipment and environment to make them compatible with human capabilities and expectation; analysis of existing equipment with respect to user usability and interfacing capabilities. *(Fall, Alternate Years) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology

FROM: Cathy Sanders, Director of Assessment and Faculty Governance
DATE: May 27, 2005
RE: Request to establish ITIS 5220: Vulnerability Assessment and Systems Assurance

The request to establish ITIS 5220: Vulnerability Assessment and Systems Assurance was approved by the Graduate Council on May 13, 2005 and by the Faculty Council on the May 13, 2005 Consent Calendar for implementation.

Catalog Copy:

ITIS 5220. Vulnerability Assessment and Systems Assurance.

(3) Prerequisite: Enrollment in MS IT or consent of the department. This course discusses methodologies, tools, and technologies that are important for vulnerability assessment and systems assurance. Topics covered include: ethical hacking techniques, vulnerability assessment, risk assessment/management, finding new exploits, discovering vulnerabilities, penetrating network perimeters, bypassing auditing systems, and assured administration of systems as well as evaluating systems assurance levels. Focus will be placed on 1) understanding current penetration techniques for networks, operating systems, services and applications, 2) investigating mitigation and defense strategies, and 3) studying legal and ethical considerations. The course is based on case studies and has a strong lab component. *(On demand)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information Technology
FROM: Cathy Sanders, Director of Assessment and Faculty Governance
DATE: May 27, 2005
RE: Request to establish ITCS 6490: Industrial Internship

The request to establish ITCS 6490: Industrial Internship was approved by the Graduate Council on May 13, 2005 and by the Faculty Council on the May 13, 2005 Consent Calendar for implementation.

Catalog Copy:

ITCS 6490. Industrial Internship. (1-6) Prerequisite: Completion of six hours of graduate coursework. Full or part-time academic year internship in computer science areas complementary to the concentration area of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's internship program must be approved by the supervising faculty, the academic advisor, and the graduate program director. A mid-term report and a final report to be evaluated by the supervising faculty are required. Grading will be on "Pass/No Credit" basis by the supervising faculty in consultation with off-campus supervisor at the internship organization. The credit hours may not be part of the minimum 30 credit hours for graduation. May be repeated for credit hours. (*On demand*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information
Technology

FROM: Cathy Sanders, Director of Assessment and Faculty Governance

DATE: April 20, 2005

RE: Request to Revise the Information Technology Ph.D. Program Curricula

The request to revise the Information Technology Ph.D. program curricula was approved by the Graduate Council on March 2, 2005 and by the Faculty Council on the April 5, 2005 Consent Calendar for implementation.

Catalog Copy:

New Courses:

ITSC 8110 Introduction to Information Technology Research (3) Prerequisites: Good standing in the IT PhD Program. Information Technology has a wide range of research areas encompassing the fields of Business Information Systems, Bioinformatics, Computer Science, and Software and Information Systems. This seminar is intended to give IT PhD students a sound understanding of the different research areas in Information Technology. The seminar is to be taken during the first year of studies and is intended to be the gateway to the fields within Information Technology and will enable students to select the fields matching their interests early in their studies. Through attending weekly in-depth research presentations from faculty in all participating units in the PhD IT program and conducting literature surveys in areas of interest, students are expected to gain the knowledge they need to identify the areas of interest for themselves. *(Fall)*

ITSC 8699 Graduate Research Seminar (1) Prerequisites: Good standing in the IT PhD Program. This seminar is intended to expose IT PhD students to current research in Information Technology through attending weekly research presentations by other students, IT faculty, and invited speakers. Each student is expected to give one or more presentations for the Graduate Research Seminar before graduation. Students must sign up for and receive credit for the Graduate Research Seminar every semester that they are in the IT Ph.D. Program until they are admitted to Ph.D. candidacy. It is graded on Pass/No Credit basis. ITSC 8110 students should not register for ITSC 8699 for the same semester. *(Fall, Spring)*

ITSC 8990 Pre-dissertation Research (1-6) Prerequisites: Good standing in the IT PhD Program. Students conduct research in information technology under the direction of one or more IT PhD faculty. A major goal of this course is to prepare the student for the Qualifying Examination. May be repeated for credit. *(Fall, Spring)*

Program of Study

The Ph.D. in Information Technology program has five options: Bioinformatics (BI), Business Information Systems and Operations Management (BISOM), Computer Science (CS), Software and Information Systems (SIS), and an Interdisciplinary Track (INT). The Program is staffed with a multidisciplinary faculty and offers opportunities for students to develop advanced competencies in a number of IT related fields. Faculty from the Computer Science (<http://www.cs.uncc.edu>), Software & Information Systems (<http://www.sis.uncc.edu>), and Business Information Systems & Operations Management (<http://www.belkcollege.uncc.edu/iom>) Departments form its core.

Students, in cooperation with faculty advisors, design flexible programs of study tailored to address individual career goals.

Students who aspire to academic research and teaching can benefit from a strong research faculty of international stature and exposure to practical applications of their specialties. Others seeking employment in industry, commerce, or government are afforded the opportunity to participate in high-quality applied research.

General Admission Requirements

Admission is competitive. Preference is given to applicants with strong credentials and appropriate academic and/or professional preparation.

Specific admission requirements for the program include:

- 1) A baccalaureate degree from a recognized institution. Students must show evidence of preparation in their chosen field sufficient to ensure profitable graduate study.
- 2) Excellent GRE or GMAT scores.
- 3) Applicants whose native language is not English must score at least 557 (PBT) or 220 (CBT) in the Test of English as a Foreign Language (TOEFL). In addition, they will be required to take an English Proficiency Examination before beginning the first semester of study. Students who do not pass this examination must successfully complete ENGL 1100 (English as a Foreign Language) with a grade of B or higher.
- 4) A one-page essay that addresses the following:
 - a) The applicant's motivation,
 - b) Area(s) of research interest
- 5) Three letters of reference from professionals working in the applicant's field of interest that address the applicant's previous experience and potential to do research.

Further documentation to support the application may include: evidence of scholarly and creative activity, including publication list; awards; results in national or international contests related to information technology, relevant work experience and the like.

Highly qualified individuals who do not meet all the prerequisites may be admitted with a clear agreement to complete them.

Track Specific Additional Admission Requirements

Additional admission requirements for Business Information Systems and Operations Management, Computer Science, & Software and Information Systems tracks include:

- 1) Adequate understanding of software/information systems analysis, design, and implementation.
- 2) Evidence of college-level skills in mathematical logic and data analysis (e.g. Statistics, differential and integral calculus, discrete math, linear algebra).

Admission requirements for the Bioinformatics track will include an adequate preparation in chemistry, biology, mathematics (preferably statistics), and computer science. Strong candidates may be allowed to make up deficiencies in some areas at the discretion of the BI admissions subcommittee.

Application Deadlines

Application deadlines are in accordance with UNC Charlotte graduate school deadlines. However, to ensure full consideration for financial support, applications must be received by September 1st for spring admission and February 15 for fall admission.

Degree Requirements

The Ph.D. Program in Information Technology prepares students to be well-rounded professionals in the broad discipline of Information Technology. The degree of Doctor of Philosophy is granted for performance of original research resulting in significant contributions to the discipline's body of knowledge. Students are admitted into a track within the Program by one of the participating units. Currently these units are:

- 1 Department of Business Information Systems and Operations Management
- 2 Department of Computer Science
- 3 Department of Software and Information Systems
- 4 Program in Bioinformatics

The Ph.D. IT program also has an interdisciplinary track in which IT is applied to different disciplines. Students in the interdisciplinary track are admitted into one unit but are expected to complete some course work in a complementary discipline in addition to

the minimum core requirements of their chosen unit. Students in the interdisciplinary track must have co-advisors from their chosen unit and the complementary discipline.

Minimum Hours

To earn a PhD degree, students in all tracks must complete at least 72 post baccalaureate credit hours. This includes at least 18 hours of dissertation research and at least 9 hours of course work completed at UNC Charlotte. A limited amount of transfer credit is allowed (see below for details). We expect students to acquire a sufficiently broad body of technical knowledge in the discipline as well as a deep understanding of a specialized area. Such courses will be defined by the student's advisor(s). Students are expected to excel in all course work. Graduation requirements mandate that students must achieve a minimum grade point average of 3.0 to graduate. Receiving more than two C grades or a grade of U in any course will result in a suspension from the program.

Introduction to Information Technology Research

First year Students must take ITSC 8110 Introduction to Information Technology at the first Fall semester. This course will be jointly taught by IT PhD Faculty in all the tracks providing new students an overview of the IT research areas and opportunities at UNC Charlotte.

Graduate Research Seminar

Students must sign up for and received credit for the Graduate Research Seminar (ITSC 8699) every semester that they are in the Ph.D. Program until they are admitted to Ph.D. candidacy.

Research Advisor(s) and Qualifying Exam Committee

Each Ph.D. student is assigned a temporary academic advisor(s) within a track when admitted to the Program. Before the end of their fourth semester in the Program students should select a Research Advisor(s) and, in consultation with their Research Advisor(s), form a Qualifying Exam Committee. The Qualifying Exam Committee should include at least three IT Doctoral Faculty members, including the Research Advisor(s) who chairs the Committee. The Qualifying Exam Committee should be approved by the Program Director.

Qualifying Examination

Each student must select a primary area of focus within the chosen track and then pass a qualifying exam in that area, given and evaluated by the student's Qualifying Exam Committee. The purpose of the qualifying exam is to allow the student to demonstrate that they are capable of doing Ph.D. level research leading to a dissertation. The qualifying examination must include an original written research contribution evaluated by the qualifying exam committee.

A student must pass the qualifying exam before the end of their first six semesters of PhD study at UNC Charlotte. The qualifying examination may be taken twice in different semesters. The second failure will result in termination of the student's enrollment in the Ph.D. program.

Requirements for Admission to Ph.D. Candidacy

1. Pass the qualifying exam in the area of proposed research.
2. Set up a Dissertation Committee of at least four graduate faculty members, of which at least three must be from the IT PhD faculty. This Committee may, but is not required to consist of the same faculty members as the Qualifying Exam Committee. Ordinarily, the chair of this committee will be the student's advisor(s), who will insure that the composition of the committee is appropriate. The Dissertation Committee must be approved by the Program Director. In addition, the Graduate School will appoint a graduate faculty representative to the Dissertation Committee.
3. Successful defense of the dissertation proposal.

Ph.D. Candidacy

Each student must present and defend a Ph.D. dissertation proposal no more than three semesters after passing the qualifying exam. The proposal defense will be conducted by the student's Dissertation Committee and will be open to the Ph.D. IT faculty and students. At the discretion of the Dissertation Committee, the defense may include questions that cover the student's program of study and background knowledge in the area of the proposal. A doctoral student advances to Ph.D. candidacy after the dissertation proposal has been successfully defended. The second failed defense of a dissertation proposal will result in termination of the student's enrollment in the Ph.D. program.

Dissertation

Each student must complete a research program approved by the student's Dissertation Advisor(s) that yields a high quality, original and substantial piece of research. The Ph.D. dissertation describes this research and its results. The dissertation defense is a public presentation. A written copy of the dissertation must be made available to each member of the student Ph.D. Dissertation Committee, to the Ph.D. Steering Committee, and to the UNC Charlotte Library at least three weeks before the public defense. The date of the defense must be publicly announced at least three weeks prior to the

defense. The student must present the dissertation and defend it in a manner accepted by the Dissertation Committee. The dissertation will be graded as pass/fail by the Dissertation Committee and must be approved by the Dean of the Graduate School. A student who fails the defense of a dissertation twice will be terminated from the Ph.D. program.

Progress Report and Evaluation

Every January, each student is required to submit a written progress report for the previous calendar year and the advisor(s) is required to submit a written evaluation of the student, both to the track leader with a copy to the Program Director. Failure to make satisfactory progress may result in discontinuation of the student's graduate assistantship and suspension from the Program.

Residency Requirements

Each student must satisfy the residency requirement of one continuous full-time year (i.e., two consecutive semesters with the student being enrolled for at least nine graduate credit hours in each semester) after being admitted to the Ph.D. degree program.

Transfer Credit

In accordance with rules of the UNC Charlotte Graduate School, students are allowed to transfer up to 30 semester hours of graduate credit earned at UNC Charlotte or other recognized graduate programs. In cases of applicants with records of exceptionally high quality, the IT Ph.D. Steering Committee, at its discretion, may request that the Graduate School approve transfer credit beyond the limit set by the Graduate School. To receive transfer credit, students must file a written request and submit all necessary documents to the Program Director.

Track Specific Additional Degree Requirements

Bioinformatics Track

Students will be required to demonstrate competence, by coursework, examinations, or projects, in the areas of biochemistry, cellular and molecular biology, genetics, statistics, and computer science related to core concepts in bioinformatics. The student's advisor and at least one other dissertation committee member must be faculty in the Bioinformatics track. Students in this track must also take at least 6 hours of Pre-dissertation Research (ITSC 8990) under the direction of Bioinformatics track faculty

members. A major goal of this course will be to prepare the student for the Qualifying Examination.

Business Information Systems and Operations Management Track

In addition to the general IT Ph.D. requirements, students must also:

- Take at least 36 hours of coursework approved by the student's Research Advisor(s). At least 9 hours of graduate coursework must be taken at UNC Charlotte (Exceptions to minimum course hour requirements may be granted by the Department's Graduate Affairs Committee upon the recommendation of the student's advisor. Such a request should only be granted based on overwhelming evidence that the student has excellent background knowledge to conduct high quality research in Information Technology. Pre-dissertation research and Graduate Research Seminar hours are not counted in coursework hours.)
- Complete at least 18 hours of dissertation research.

Computer Science Track

In addition to the general IT Ph.D. requirements, students must also:

- Take at least 6 hours of Pre-dissertation Research (ITSC 8990) during the students' first four semesters under the direction of one or more IT Ph.D. Graduate Faculty members.
- Take at least 30 hours of coursework approved by the student's Research Advisor(s). At least 9 hours of graduate coursework must be taken at UNC Charlotte (Exceptions to minimum course hour requirements may be granted by the Department Graduate Committee upon the recommendation of the student's Dissertation Committee. Such a request should only be granted based on overwhelming evidence that the student has excellent background knowledge to conduct high quality research in Information Technology. Pre-dissertation research and Graduate Research Seminar hours are not counted in coursework hours.)
- Complete at least 18 hours of dissertation research.

Interdisciplinary Track

The course work requirements of this track depend on the chosen unit and complementary discipline. Students are required to complete the core requirements of

the chosen unit and select a minimum of two graduate courses from a complementary discipline with the approval of their Advisors.

Software and Information Systems Track

In addition to the general IT Ph.D. requirements, student must also:

- Take at least 6 hours of Pre-dissertation Research (ITSC 8990) during the students' first four semesters under the direction of one or more IT Ph.D. Graduate Faculty members.
- Take at least 30 hours of coursework approved by the student's Research Advisor(s). At least 9 hours of graduate coursework must be taken at UNC Charlotte (Exceptions to minimum course hour requirements may be granted by the Department Graduate Committee upon the recommendation of the student's Dissertation Committee. Such a request should only be granted based on overwhelming evidence that the student has excellent background knowledge to conduct high quality research in Information Technology. Pre-dissertation research and Graduate Research Seminar hours are not counted in coursework hours.)
- Complete at least 18 hours of dissertation research

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information
Technology

FROM: Cathy Sanders, Director of Assessment and Faculty Governance

DATE: March 14, 2005

RE: Request to establish ITIS 1210: Introduction to Web-Based Information
Systems

The request to establish ITIS 1210: Introduction to Web-Based Information Systems was approved by the Chair of the Undergraduate Course and Curriculum Committee on March 3, 2005 for implementation.

Catalog Copy:

ITIS 1210. Introduction to Web-Based Information Systems. (3) Introductory course in developing Web pages for both majors and non-majors. Topics include an introduction to the mechanisms by which the Internet and the World Wide Web operate, general concepts related to Web-based information systems, the design and construction of Web infrastructure including authoring tools, domain registration, legal and ethical considerations, and basic Web security. *(Fall, Spring) (Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic, College of Information
Technology

FROM: Cathy Sanders, Director of Assessment and Faculty Governance

DATE: January 19, 2005

RE: Request to edit course descriptions

The request to edit course descriptions was approved by the Chair of the Undergraduate Course and Curriculum Committee on January 12, 2005 for implementation.

Catalog Copy **(revisions in blue)**:

ITCS 1101. Introduction to Computer Concepts. (3) Prerequisites or co-requisites: MATH 1100, 1101, or 1103. Introductory course for non-ITCS/IIS majors **that gives an overview of computer hardware and software. Primary emphasis is on productivity software (word processing, spreadsheet, and graphical presentation). These applications are taught through a series of projects/assignments. Aspects of Internet research are also covered.** (This course is not the equivalent of ITCS 1214 as a prerequisite for other computer science courses.) May not be taken while a computer science major (or minor). *(Fall, Spring, Summer) (Internet)*

ITCS 1214. Introduction to Computer Science. (3) Prerequisites or co-requisites: MATH 1100, 1103, 1120, 1241 or consent of Department. Introduction to algorithmic problem solving strategies and algorithm development; basic concepts and terminology of computers; **study of data representation and numbers systems; sue of computers to implement numerical and symbolic algorithms. General programming concepts will be taught through the use of high-level language.** (Fall, Spring, Summer) (Evenings) (*Internet*)

ITCS 1215. Introduction to Computer Science II. (3) Prerequisite: ITCS 1214 with a grade of C or better, or permission of the Department. **An advanced study of programming based on object oriented concepts. Extends the fundamentals studied in ITCS 1214.** Includes a study of software design tools and advanced programming constructs, such as **UML** diagrams, decision tables, recursion, and dynamic storage allocation. Concepts are taught by means of an in-depth study of an object oriented language. (Fall, Spring, Summer) (Evenings) (*Internet*)

ITCS 2116. C Programming. (3) Prerequisite: Knowledge of any other computer programming language or consent of the Department. A study of the programming language C. Data types, operators, functions, program structure, **file I/O**, storage classes, exceptions, concurrent programming, and the preprocessor. (Summer Evenings)

ITCS 2181. Computer Logic and Design. (3) Prerequisite: ITCS 1214 or consent of the Department. Logic design; logic circuits; **state diagrams; Karnaugh maps;** memories; tristate devices; bus structures; and data control concepts. (Fall, Spring, Summer) (Evenings)

ITCS 2214. Data Structures. (3) Prerequisite: ITCS 1215 with a grade of C or better, or permission of the Department. **A study of the theory and implementation of abstract data types (ADTs) including stacks, queues, and both general purpose and specialized trees and graphs.** Programming emphasis is on the use of **an object-oriented language** to implement algorithms related to the various data structures **studied including creation, searching, and traversal of ADTs.** (Fall, Spring, Summer) (Evenings) (*Internet*)

MEMORANDUM

TO: Dean Mirsad Hadzikadic

College of Information Technology

FROM: Cathy Sanders

Director of Assessment and Faculty Governance

DATE: November 8, 2004

RE: Request to establish ITIS 4166: Network-based Application
Development

The request to establish ITIS 4166: Network-based Application Development was approved by the chair of the Undergraduate Course and Curriculum Committee on November 3, 2004, for immediate implementation.

Catalog Copy

ITIS 4166. Network-based Application Development. (3)

Prerequisite: ITIS 2300 or consent of the Department. This course examines the issues related to network based application development. Topics include introduction to computer networks, web technologies and standards, network based programming methodologies, languages, tools and standards. *(Fall, Spring)(Evenings)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic

College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: November 8, 2004

RE: Request to establish ITIS 4220: Vulnerability Assessment and Systems Assurance

The request to establish ITIS 4220: Vulnerability Assessment and Systems Assurance was approved by the chair of the Undergraduate Course and Curriculum Committee on November 3, 2004, for immediate implementation.

Catalog Copy

ITIS 4220. Vulnerability Assessment and Systems Assurance. (3)

Prerequisite: ITIS 3200 or consent of the Department. This course discusses methodologies, tools, and technologies that are important for vulnerability assessment and systems assurance. Topics covered include: ethical hacking techniques, vulnerability assessment, risk assessment/management, finding new exploits, discovering vulnerabilities, penetrating network perimeters, bypassing auditing systems, and assured administration of systems as well as evaluating systems assurance levels. Focus will be placed on 1) understanding current penetration techniques for networks, operating systems, services and applications; 2) investigating mitigation and defense strategies; and 3) studying legal and ethical considerations. the course is based on case studies with a strong lab component. *(Fall, Spring)*

MEMORANDUM

TO: Dean Mirsad Hadzikadic

College of Information Technology

FROM: Cathy Sanders

Director of Assessment and Faculty Governance

DATE: August 27, 2004

RE: Request to establish ITIS 7999: Graduate Residency

The request to establish ITIS 7999: Graduate Residency was approved by the chair of the Graduate Council on August 18, 2004 for immediate implementation.

Catalog copy:

ITIS 7999. Graduate Residency. (1)

See department for course description (fall, spring, summer).

cc: Dr. Gerald Ingalls
Dr. Bill Chu

Ms. Stephanie Hodgkin

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Schley Lyons, College of Arts and Sciences
Dean Claude Lilly, The Belk College of Business Administration
Dean Robert Johnson, The William States Lee College of Engineering
Dean Mirsad Hadzikadic, College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: May 1, 2004

RE: Request to revise the name and course descriptions of 15 undergraduate courses
entitled "Cooperative Education" (ACCT 3500, ARSC 3500, BIOL 3500, CHEM
3500,
ECON 3500, ENGR 3590, ESCI 3500, FINN 3500, GEOG 3500, INFO 3500.
MATH 3551,
MGMT 3500, MKTG 3500, OPER 3500, PHYS 3590)

The request to revise the name and course descriptions of 15 undergraduate courses
entitled "Cooperative Education" was approved by the chair of the Undergraduate
Course and Curriculum Committee on April 8, 2004 for immediate implementation.

New catalog copy (changes in blue)

ACCT 3500. Cooperative Education or 49ership Experience. (0)

Prerequisite: Accounting major with Department approval, in conjunction with the University Career Center. Enrollment is required for

students participating in a cooperative education or 49ership position during each semester they are working in a position. Participating students pay a registration fee for transcript notation (co-op and 49ership) and receive full-time student status (co-op only). Assignments

must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For information, contact

the University Career Center. (Fall, Spring, Summer)

ARSC 3500. Cooperative Education or 49ership Experience. (0)

Prerequisites: Departmental GPA and credit hours required and approval by the departmental Co-op Coordinator in conjunction with the University Career Center. Enrollment in this course is required for Arts and Sciences students involved in professional work experiences offered through either the 49ership program, or the parallel co-op (part-time work) or the alternating co-op (full-time work) option of the cooperative education program. Participating students pay a registration fee for transcript notation (49ership and co-op) and receive

full-time student status (co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For information, contact the University Career Center. (Fall, Spring, Summer)

BIOL 3500. Biology Cooperative Education or 49ership Experience. (0)

Prerequisite: approval by the Department and the University Career Center. Required of students participating in the

49ership or Cooperative Education Program during the semesters in which they are working. Participating students pay a registration

fee for transcript notation (49ership and coop) and receive full-time student status (co-op only). Assignments must be arranged and

approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University

Career Center. (Fall, Spring)

CHEM 3500. Chemistry Cooperative Education or 49ership Experience.(0)

Prerequisites: Junior standing, chemistry through 2132 and acceptance into the Experiential Learning Program by the University Career

Center. Enrollment in this course is required for chemistry majors during each semester or summer when they are working on a co-op or 49ership assignment. Participating students pay a registration fee for transcript notation (49ership and co-op) and receive full-time

student status (co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career Center. (*On demand*)

ECON 3500. Cooperative Education or 49ership Experience. (0)

Enrollment in this course is required for the Department's Cooperative Education and 49ership students during each semester they are

working in position. Restricted to majors in the Department of Economics. Participating students pay a registration fee for transcript

notation (49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and approved in

advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career

Center. (*Fall, Spring, Summer*)

ENGR 3590. Engineering Cooperative Education or 49ership Experience.

(0) This course is required of Co-op and 49ership students during the semester they are working. Acceptance into the Experiential

Learning Program by the University Career Center is required. Participating students pay a registration fee for transcript notation

(49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and approved in advance.

Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career Center.

(*Fall, Spring, Summer*)

ESCI 3500. Earth Sciences Cooperative Education or 49ership Experience. (0)

Enrollment in this course is required for the Department's earth sciences cooperative education and 49ership students during each

semester that they are working. Acceptance into the Experiential Learning Program by the University Career Center is required.

Participating students pay a registration fee for transcript notation (49ership and co-op) and receive full-time student status

(co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/

Unsatisfactory. For more information, contact the University Career Center. (Fall, Spring, Summer)

FINN 3500. Cooperative Education or 49ership Experience. (0)

Enrollment in this course is for the University cooperative education and 49ership students during each semester they are working

in a position. Acceptance into the Experiential Learning Program by the University Career Center is required. Participating students

pay a registration fee for transcript notation (49ership and co-op) and receive full-time student status (co-op only). Assignments

must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more

information, contact the University Career Center. (Fall, Spring, Summer)

GEOG 3500. Geography Cooperative Education or 49ership Experience.

(0) Enrollment in this course is required for the Department's geography cooperative education and 49ership students during each

semester that they are working. Acceptance into the Experiential Learning Program by the University Career Center is required.

Participating students pay a registration fee for transcript notation (49ership and co-op) and receive full-time student status

(co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/

Unsatisfactory. For more information, contact the University Career Center. (Fall, Spring, Summer)

INFO 3500. Cooperative Education or 49ership Experience. (0)

Enrollment in this course is required for the Department's cooperative education and 49ership students during any semester they

are working in a position.. Acceptance into the Experiential Learning Program by the University Career Center is required.

Participating students pay a registration fee for transcript notation (49ership and co-op) and receive full-time student status

(co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/

Unsatisfactory. For more information, contact the University Career Center. (Spring, Summer, Fall)

MATH 3551. Mathematics Cooperative Education or 49ership Experience. (0)

Prerequisites: Sophomore standing, a 3.0 GPA in MATH/STAT/OPRS courses and consent of the Department of Mathematics.

Acceptance into the Experiential Learning Program by the University Career Center is required. The student will be employed in

a manner that affords him/her the opportunity of using and enhancing mathematical knowledge and skills through practical

experience of co-op rotation or 49ership experience. Participating students pay a registration fee for transcript notation

(49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and approved in advance.

Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career Center.

After completing MATH 3551, the co-op student must take MATH 3652. MATH 3551 may be repeated with consent of the

Department. Evaluation is Satisfactory/Unsatisfactory. (On demand)

MGMT 3500. Cooperative Education or 49ership Experience. (0)

Enrollment in this course is required for the Department's cooperative education and 49ership students during each semester

they are working in a position. This course is restricted to majors in the Department of Management. Acceptance into the

Experiential Learning Program by the University Career Center is required. Participating students pay a registration fee for

transcript notation (49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and

approved in advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the

University Career Center. (*Fall, Spring, Summer*)

MKTG 3500. Cooperative Education and 49ership Experience. (0)

Enrollment in this course is required for the department's cooperative education and 49ership students during each semester they

are working in a position. This course is restricted to majors in the Department of Marketing. Acceptance into the Experiential

Learning Program by the University Career Center is required. Participating students pay a registration fee for transcript notation

(49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and approved in advance.

Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career Center.

(*Fall, Spring, Summer*)

OPER 3500. Cooperative Education or 49ership Experience. (0)

Prerequisite: major in Management Information Systems or Operations Management. Enrollment in this course is required for the

Department's cooperative education and 49ership students during each semester they are working in a position. Acceptance into the Experiential Learning Program by the University Career Center is required. Participating students pay a registration fee for transcript

notation (49ership and co-op) and receive full-time student status (co-op only). Assignments must be arranged and approved in

advance. Course may be repeated; evaluation is Satisfactory/Unsatisfactory. For more information, contact the University Career

Center. (*Fall, Spring, Summer*)

PHYS 3590. Physics Cooperative Education or 49ership Experience. (0)

Prerequisites: junior standing and consent of Department. Registration in PHYS 3590 is required of students during each of the

semesters they are working. Acceptance into the Experiential Learning Program by the University Career Center is required.

Participating students pay a registration fee for transcript notation (49ership and co-op) and receive full-time student status

(co-op only). Assignments must be arranged and approved in advance. Course may be repeated; evaluation is Satisfactory/

Unsatisfactory. For more information, contact the University Career Center. (Fall, Spring, Summer)

FINANCIAL AID PROGRAMS (p22)

Part-Time Employment Off-Campus.

The University Career Center's Job Location and Development (JLD) Program assists students in obtaining part-time, summer

and temporary employment off-campus. Job listings may be viewed online to registered students in *Campus Professional Jobs*

may include career-related positions in various fields such as education, business, entertainment, engineering and healthcare.

The JLD Program is available to help students earn money for their academic and personal expenses during their enrollment at the

University. Students are encouraged also to participate in career related experiences such as co-op, internships, and 49erships,

which can be arranged through the University Career Center's Experiential Learning Program.

College of Arts and Science

Experiential Learning Opportunities. (p46)

Students are encouraged to participate in professional work experiences in support of their academic and career development

through the cooperative education, 49ership, and internship programs offered to students in the College. The College is working

with the University Career Center to expand experiential learning offerings to enable more students to graduate with career related

experience. For more information about experiential learning programs, contact the University Career Center.

Cooperative Education involves professionally related, paid work experiences in multiple semesters. It does not offer academic

credit, but it is noted on the student's transcript. To participate in this program, students must have a minimum GPA of at least

2.5, meet specific departmental requirements, and pay a participation fee. Approval for enrollment must be arranged before the

student begins the work experience. Most students begin this program during their junior year; transfer students must complete

one semester at UNC Charlotte before making application for the program. Students maintain full-time student status during their

co-op work semesters.

Internships usually involve one semester of a professional experience that allows a student to test his or her career options.

Academic requirements for participation vary by department. Typically, a GPA of at least 2.5 is required. With faculty approval,

students may receive academic credit for their work experience; non-credit internships are available through the University Career

Center. All internships must be arranged in advance.

49erships involve paid or unpaid work in a career-related position for professional experience. A minimum of 80 work hours for

one semester is required to complete the program. Fall and Spring 49erships are part-time. Summer 49erships may be full or part-time.

Full-time students who are in good University standing, have completed their freshman year, and have a 2.0 minimum cumulative

GPA are eligible. It does not offer academic credit, but it is noted on the student's transcript; students pay a participation fee.

Approval for enrollment must be arranged before the student begins the work experience. Students may begin this program during

their sophomore year; transfer students must complete one semester at UNC Charlotte before making application for the program.

For more information, contact the University Career Center.

Service Learning Opportunities through the University Career Center

Service Learning opportunities include 49erships in non-profit and government agencies and organizations, enabling students to

gain career related and community service experience while learning about related social, civic, human service, and political issues. Students work a minimum of 80 hours per semester to complete the program. Fall and spring 49erships are part-time, and summer 49erships may be full or part-time. Students must qualify academically, and pay a registration fee for transcript notation. Employers

(as well as career advisors) assist students in working toward learning objectives and will complete an evaluation on each student

at the end of each term. Students receive transcript notation, but not academic credit.

COOPERATIVE EDUCATION PROGRAM (p 54)

Students majoring in Biology may obtain practical work experience while pursuing their degrees. The cooperative Education Program

allows qualified students either to alternate semesters of academic study with semesters of work experience or to combine academic

study and work during the same semester. The work experience is arranged by the University Career Center and must be approved by

the Department of Biology. Placements are based on a student's academic interests and on the availability of appropriate positions and

are carried out under the supervision of a Biology faculty member who serves as co-op advisor. Work semesters are followed by

participation in the Biology Cooperative Education Seminar.

COOPERATIVE EDUCATION EXPERIENCE (p 60)

Students majoring in Chemistry may obtain practical work experience in chemistry before graduation by participating in the Chemistry Cooperative Education Experience any time after the completion of sophomore year and CHEM 2132. A minimum GPA of 2.5 overall

and 2.5 in chemistry is required. At least two semesters of work assignments must be completed concurrent with enrollment in

CHEM 3500. Advisors will assist students to design a schedule that accommodates both work assignments and the upper division

chemistry courses which are normally offered on alternate semesters. Experiences are arranged in coordination with the University

Career Center.

Cooperative Education in Geography and Earth Sciences. (p 70)

Students in the Geography and Earth Sciences programs may obtain practical work experience while pursuing their degrees by

participating in the Cooperative Education program. The work experience is approved by the Department and is closely related to the

student's field of study. Students interested in learning more about participating in this program should contact the Department of

Geography and Earth Sciences [or the University Career Center](#).

COOPERATIVE EDUCATION PROGRAM (p 80)

A student may participate in the Mathematics Cooperative Education Program in either the parallel or alternate track. The parallel track combines academic study and cooperative experience during the same semester, while the alternate track alternates semesters totally

devoted to work with semesters totally devoted to academic study. Students in the Mathematics Cooperative Education Program must participate in a minimum of two semesters in the program. Students interested in participating in the program should contact the

Coordinator of Undergraduate Programs in the Department of Mathematics for information [or the University Career Center](#).

COOPERATIVE EDUCATION PROGRAM (p 85)

Students majoring in Physics have an opportunity to combine work experience with their academic experience. The Cooperative

Education Program is a plan whereby a student completes his/her lower-division coursework and, after being formally accepted as a

co-op student, alternates periods of academic coursework with periods of paid employment in an area mutually agreed upon by the

student, an employer, and the University. This program enables the student to integrate classroom instruction with practical on-the-job experience with business, industry, government agencies, or other employers. A student electing this option should expect to graduate

in five years, instead of the four years normally required. Further information regarding Cooperative Education can be found elsewhere

in this *Catalog*. Information regarding the application procedure for admission into this program can be obtained from the Physics and

Optical Science Department [or the University Career Center](#).

College of Business Administration

Experiential Learning Opportunities. (p 93)

Students are encouraged to participate in professional work experiences that support academic and career development. The College

is working with the University Career Center to expand experiential learning offerings to enable more students to graduate with career-

related experience. The [program consists of 49ership opportunities and Cooperative Education](#).

Cooperative Education involves professionally related, paid work experiences in multiple semesters. It does not offer academic credit,

but it is noted on the student's transcript. To participate in this program, students must have a GPA of at least 2.5, meet specific

departmental requirements, and pay a participation fee. Approval for enrollment must be arranged before the student begins the work experience. Most students begin this program during their junior year; transfer students must complete one semester at UNC Charlotte

before making application for the program. Students maintain full-time student status during their co-op work semesters. For further information, and to explore other credit and non-credit experiential earning opportunities including internships, contact the major

Department Chairperson or the University Career Center.

49erships involve paid or unpaid work in a career-related position for professional experience. A minimum of 80 work hours for one

semester is required to complete the program. Fall and Spring 49erships are part-time. Summer 49erships may be full or part-time. Full-time students who are in good University standing, have completed their freshman year, and have a 2.0 minimum cumulative GPA are eligible.

It does not offer academic credit, but it is noted on the student's transcript; students pay a participation fee. Approval for enrollment

must be arranged before the student begins the work experience. Students may begin this program during their sophomore year; transfer students must complete one semester at UNC Charlotte before making application for the program. For more information, contact the

University Career Center.

Service Learning Opportunities through the University Career Center

Service Learning opportunities include 49erships in non-profit and government agencies and organizations, enabling students to gain career related and community service experience while learning about related social, civic, human service, and political issues. Students work a minimum of 80 hours per semester to complete the program. Fall and spring 49erships are part-time, and summer 49erships

may be full or part-time. Students must qualify academically, and pay a registration fee for transcript notation. Employers (as well as

career advisors) assist students in working toward learning objectives and will complete an evaluation on each student at the end of each term. Students receive transcript notation, but not academic credit.

Cooperative Education Program. (p 95)

Students in the Department of Accounting may obtain practical work experience related to their major by participating in the Cooperative Education Program. The work experience arranged in coordination with the University Career Center must be closely related to the study

of accounting and must be approved by the Co-op Advisor in the Accounting Department. To be eligible for cooperative education,

students must be juniors who have an overall GPA of at least 2.5 and have completed the progression courses required by The Belk

College of Business Administration. Transfer students must complete at least 12 hours at UNC Charlotte to be eligible for cooperative education. Completion of courses related to the co-op position may be required prior to the co-op work experience. These courses will be established by the Co-op Advisor. Students must complete either two full-time alternating semesters of work or three consecutive part-time work semesters while taking a reduced academic load of no more than nine credit hours. Students selected to work in a public accounting

firm or for an internal audit position may complete program requirements by working one semester and either writing a paper or making a

formal presentation before faculty and students.

Cooperative Education Program. (p 96)

Management Information Systems and Industrial/Operations Management majors may obtain practical work experience related to their

major by participating in the cooperative education program. To be eligible for cooperative education, students must be juniors who have

an overall GPA of at least 2.5 and have completed the progression courses required by The Belk College of Business Administration.

Transfer students must complete at least 12 hours at UNC Charlotte to be eligible for cooperative education. Completion of courses related

to the co-op position may be required prior to the co-op work experience. These courses will be established by the Co-op Advisor. Students must complete either two full-time alternating semesters of work or three consecutive part-time work semesters while taking a reduced

academic load of no more than nine credit hours. Participation must be approved in advance. Contact the University Career Center for

more information.

Cooperative Education Program. Management Students majoring in Management Information Systems are strongly encouraged to

participate in the University cooperative education program, which provides substantial educational and employment opportunities. Furthermore, many companies hire only students who have participated in the cooperative education program. To be eligible for

cooperative education, students must be juniors who have an overall GPA of at least 2.5 and have completed the progression courses

required by The Belk College of Business Administration. Transfer students must complete at least 12 hours at UNC Charlotte to be eligible

for cooperative education. Completion of courses related to the co-op position may be required prior to the co-op work experience. These courses will be established by the Co-op Advisor. Students must complete either two full-time alternating semesters of work or three consecutive part-time work semesters while taking a reduced academic load of no more than nine credit hours. Participation must be

approved in advance. Contact the University Career Center for more information.

Cooperative Education Program. (p 99)

Economics majors may obtain practical work experience related to their major by participating in the cooperative education program. To

be eligible for cooperative education, students must be juniors who have an overall GPA of at least 2.5 and have completed the eight progression courses required by the Department of Economics. Transfer students must complete at least 12 hours at UNC Charlotte to be eligible for cooperative education. Completion of courses related to the co-op position may be required prior to the co-op work experience. These courses will be established by the Co-op Advisor and must be approved in advance. Contact the University Career Center for more information.

Cooperative Education Program. (p 102)

Management majors may obtain practical work experience related to their major by participating in the cooperative education program. To

be eligible for cooperative education, students must be juniors who have an overall GPA of at least 2.5 and have completed the progression courses required by The Belk College of Business Administration. Transfer students must complete at least 12 hours at UNC Charlotte to be eligible for cooperative education. Completion of courses related to the co-op position may be required prior to the co-op work experience. These courses will be established by the Co-op Advisor in the University Career Center. Students must complete either two full-time

alternating semesters of work or three consecutive part-time work semesters while taking a reduced academic load of no more than nine

credit hours. Experiences are arranged in coordination with the University Career Center.

Cooperative Education Program. (p 104)

Marketing majors may obtain practical work experience related to their major by participating in the cooperative education program. To be eligible for cooperative education, students must be juniors who

have an overall GPA of at least 2.5 and have completed the progression courses required by The Belk College of Business Administration. Transfer students must complete at least 12 hours at UNC Charlotte to

be eligible for cooperative education. Completion of courses related to the co-op position may be required prior to the co-op work

experience. These courses will be established by the Co-op Advisor. Students must complete either two full-time alternating semesters

of work or three consecutive part-time work semesters while taking a reduced academic load of no more than nine credit hours. The

Department of Marketing coordinates the co-op experience with the University Career Center.

College of Engineering

Cooperative Education (Co-op) Program. (p 118)

Students in The William States Lee College of Engineering may obtain practical work experience while pursuing their degree by participating

in cooperative education whereby a student alternates semesters of full-time academic study with semesters of full-time work experience in industry. The work experience is under the direction of the student's major department and is closely related to his or her field of study. Civil engineering, computer engineering, electrical engineering, and mechanical engineering students who fulfill all requirements of the co-op program can earn up to three credit hours for a technical elective and will receive partial credit toward the professional practice requirement

for registration as a Professional Engineer. To be eligible for the Co-op program, an engineering student must have completed at least 24

credit hours at UNC Charlotte including a number of specified courses with a minimum GPA of 2.5. A transfer student is expected to have completed at least 12 hours at UNC Charlotte. An engineering technology student must have earned an Associate of Applied Science degree with a GPA of 2.5 or better (out of 4.0) and completed at least 12 hours at UNC Charlotte. For an undergraduate to be officially designated as

a Co-op student, he or she must participate in at least three semesters of work experience (three work sessions and three seminar courses). Consequently, participation in Co-op Education usually means that the student will take five years to complete the engineering program or three years (at UNC Charlotte) to complete the engineering technology program. Students interested in learning more about the advantages and opportunities of participating in this program should contact the College's Faculty Associate for Student Professional Development or

the University Career Center.

Domestic Internships. A number of opportunities for non-credit internships, called 49erships, exist for students in the College. Engineering internships are almost always paid positions. A minimum of 80 work hours for one semester is required to complete the program. Fall and Spring 49erships are part-time. Summer 49erships may be full or part-time. Full-time students who are in good University standing, have completed their freshman year, and have a 2.0 minimum cumulative GPA are eligible. It does not offer academic credit, but it is noted on the student's transcript; students pay a participation fee. Approval for enrollment must be arranged before the student begins the work

experience. Students may begin this program during their sophomore year; transfer students must complete one semester at UNC Charlotte before making application for the program. Students interested in learning more about these opportunities should consult with their advisor, the College's Faculty Associate for Student Professional Development or the University Career Center. Information, contact the Office of Continuing Education, Extension, and Summer Programs.

Experiential Learning Requirements. (p 126)

All students graduating after August 1999 must complete at least one experiential course. Experiential courses are practice oriented courses such as cooperative education, internships, senior design projects, or undergraduate research.

College of Information Technology (p 140)

Cooperative Education Program. Students in the College of Information Technology may obtain practical work experience while pursuing

their degree by participating in cooperative education, whereby a student alternates semesters of academic study with semesters of work experience in industry. The work experience is under the direction of the student's department and is closely related to his or her field of

study. To be eligible for the Co-op program, students in the College of Information Technology must have completed at least 24 credit hours

at UNC Charlotte, including a number of specified courses, with a minimum GPA of 2.50. A transfer student is expected to have completed 12 hours at UNC Charlotte, with those same specified courses. For an undergraduate to be officially designated as a Co-op student, he or she must participate in at least two semesters of work experience. Consequently, participation in Co-op Education may mean that the student

will take five years to complete the programs at UNC Charlotte. Students interested in learning more about the advantages and opportunities

of participating in this program should contact the University Career Center.

Internships. A number of opportunities for internships exist for students in the College. These internships may be with or without pay

and with or without academic credit. Students interested in learning more about these opportunities should consult with their advisor and

with the College of Information Technology program coordinator in the University Career Center.

Cooperative Education in Computer Science. By participating in the Cooperative Education program, students in computer science may

pursue their education along with alternating work experiences so that they may be better prepared to enter their chosen professional career. Interested students should contact the *University Career Center* for more information.

Cooperative Education in Software and Information Systems. (p 142)

By participating in the Cooperative Education program, students in the department may pursue their education along with alternating work experiences so that they may be better prepared to enter their chosen professional career. Interested students should contact the University Career Center for more information.

Special Program (p 146)

Experiential Learning Programs

The majority of UNC Charlotte students are expected to and do participate in University-sanctioned experiential learning programs

(over 60%). Opportunities are available for both undergraduate and graduate students to receive course credit, transcript notation, or other recognition for supervised experiences in public and private agencies within the community, nationally, and internationally. These opportunities are offered through experiential learning programs including over 330 courses involving clinicals, cooperative education, internships, 49erships, and practical. The University Career Center coordinates most experiential learning opportunities for the campus

and can provide information about the following options:

Cooperative Education: This career related professional program is available to students in the Colleges of Arts and Sciences, Business Administration, Information Technology, and Engineering. Participants must have a GPA of at least 2.5 and complete course requirements specified by their department. Transfer students must complete 12 hours at UNC Charlotte before applying to the program. Co-op students work two to three semesters either part-time or fulltime (depending on college requirements) with an employer in a paid work experience. Although the experience does not offer academic credit, participants are classified as full-time students and receive transcript notation.

Internships: Internship programs provide an introduction to career options in a professionally related work experience **which enables the student to apply classroom learning**. This experience is usually unpaid and may offer academic credit if there is appropriate faculty

supervision. Students work 8 to 12 hours a week while also taking classes.

The 49ership Program: The University Career Center sponsors a non-credit internship called a 49ership. Program participation is especially valuable for students who want career experience and do not have an internship option through their academic major. Students may

participate in the program after their freshman year provided they have a GPA of 2.0 or better; graduate students must complete 9 credit

hours in their graduate program before making application. (Transfer students must successfully complete 12 credit hours at UNC Charlotte before making application.) **A minimum of 80 work hours for one semester is required to complete the program. Fall and Spring 49erships**

are part-time. Summer 49erships may be full or part-time. Full-time students who are in good University standing, have completed their

freshman year, and have a 2.0 minimum cumulative GPA are eligible. It does not offer academic credit, but it is noted on the student's transcript; students pay a registration fee. Approval for enrollment must be arranged before the student begins the work experience. Participating employers have included Carolinas Medical Center, the District Attorney's Office, General Electric, Walt Disney World,

Duke Energy, Vanguard, Transamerica, and US Airways. Seventy percent (70%) of the positions in this program are compensated.

Service Learning Opportunities through the University Career Center

Service Learning opportunities include 49erships in non-profit and government agencies and organizations, enabling students to gain career related and community service experience while learning about related social, civic, human service, and political issues. Students work a minimum of 80 hours per semester to complete the program. Fall and spring 49erships are part-time, and summer 49erships

may be full or part-time. Students must qualify academically, and pay a registration fee for transcript notation. Employers (as well as

career advisors) assist students in working toward learning objectives and will complete an evaluation on each student at the end of each term. Students receive transcript notation, but not academic credit.

The Career Prospector Program: This program involves “shadowing” professionals in various career fields. Students are able to explore career options and academic interests by conducting informational interviews and observing professionals in the career fields of their

choice. The shadowing experiences can last for one day or longer, depending on the schedules of the students and sponsors. Over 300 sponsors in various career fields participate in this program coordinated through the University Career Center.

cc: Dr. Rick Lejk, Chair, Undergraduate Course & Curriculum Comm.
Ms. Denise Dwight Smith, Director, University Career Center

Dr. Bill Hill, Assoc. Dean, College of Arts & Sciences

Dr. Hughlene Burton, Accounting Dept.

Dr. Mark Clemens, Biology Dept.

Dr. Bernadette Donovan-Merkert, Chemistry Dept.

Dr. John Gandar, Economics Dept.

Dr. Ronald Smelser, Assoc. Dean, College of Engineering

Dr. Gerald Ingalls, Geography & Earth Sciences Dept.

Dr. Calvin W. Sealey, Jr., Finance Dept.

Dr. Moutaz Khouja, Bus. Info. Systems & Operations Management

Dr. Alan Dow, Math Dept.

Dr. Ben Tepper, Management Dept.

Dr. Linda Swayne, Marketing Dept.

Dr. Faramarz Farahi, Physics Dept.

Ms. Stephanie Hodgins, President, Student Government Association

Mr. Richard Yount, Registrar

Mr. Craig Fulton, Director, Admissions

Ms. Peggy Gordon, Undergraduate Catalog

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 2, 2004

RE: Request to Renumber ITCS 3120 to ITCS 4120 and ITCS 6120 to ITCS 5120

The request to Renumber ITCS 3120 to ITCS 4120 and ITCS 6120 to ITCS 5120 was approved by the chair of the Undergraduate Course and Curriculum Committee on May 28, 2004 for immediate implementation.

New catalog copy

ITCS 4120. Introduction to Computer Graphics. (3)

Prerequisites: ITCS 2214 and MATH 2164 or consent of Department. Graphics hardware; raster algorithms;

geometric transformations; 2D/3D interactive graphics; 3D viewing and perspective projections; color and lighting models; hidden surface removal; modeling hierarchies; fractals; curved surfaces.

(Spring; Fall on demand)(Evenings)

ITCS 5120. Introduction to Computer Graphics. (3)

Prerequisites: ITCS 2214 and MATH 2164 or consent of Department. Graphics hardware; raster algorithms;

geometric transformations; 2D/3D interactive graphics; 3D viewing and perspective projections; color and lighting models; hidden surface removal; modeling hierarchies; fractals; curved surfaces.

(Spring; Fall on demand)(Evenings)

cc: Dr. Rick Lejk
Dr. Mike Allen

Dr. Larry Hodges

Ms. Stephanie Hodgkin

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 2, 2004

RE: Request to establish ITCS 1200/ITIS 1200: Freshman Seminar

The request to establish ITCS 1200/ITIS 1200: Freshman Seminar was approved by the chair of the Undergraduate Course and Curriculum Committee on May 28, 2004 for immediate implementation.

New catalog copy

ITCS 1200. Freshman Seminar (3)

Prerequisite: permission of department. An introductory Information Technology course designed to assist

students with the transition to college by acquainting them with the University's resources and support, exploring opportunities in the IT field, and developing a strong sense of community within the College of IT

and the University as a whole. The development of learning skills, time management skills, and other life skills

necessary for college success will be emphasized. (*Fall, days*)

ITIS 1200. Freshman Seminar (3)

Prerequisite: permission of department. An introductory Information Technology course designed to assist

students with the transition to college by acquainting them with the University's resources and support, exploring opportunities in the IT field, and developing a strong sense of community within the College of IT

and the University as a whole. The development of learning skills, time management skills, and other life skills

necessary for college success will be emphasized. (*Fall, days*)

cc: Dr. Rick Lejk
Dr. Bill Chu

Dr. Larry Hodges

Ms. Stephanie Hodgkin

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: April 9, 2004

RE: Request to establish ITIS 4250/5250 - Computer Forensics

The request to establish ITIS 4250/5250 - Computer Forensics was approved by the Graduate Council on March 2, 2004 and the Faculty Council on the March 15, 2004 Consent Calendar for immediate implementation.

New catalog copy

ITIS 4250. Computer Forensics. (3) Prerequisite: ITIS 2300 or consent of the Department. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment. *(On Demand)*

ITIS 5250. Computer Forensics. (3) Prerequisite: Enrollment in the MS IT or MS CS program or consent of the Department. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment. *(On Demand)*

cc: Dr. Rick Lejk
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: February 25, 2004

RE: Request to establish ITCS 3590, ITCS 3695, ITIS 3590, and ITIS 3695

The request to establish ITCS 3590, ITCS 3695, ITIS 3590, and ITIS 3695 was approved by the chair of the Undergraduate Course and Curriculum Committee on February 23, 2004 for immediate implementation.

New catalog copy

ITCS 3590. Computer Science Cooperative Education and 49ership Experience. (0) This course is required of Co-op and 49ership students during the semester they are working. Participating students pay a registration fee for transcript notation. Assignments must be arranged and approved in advance. Course may be repeated. Evaluation is

satisfactory/unsatisfactory. For more information, contact the University Career Center. *(Fall, Spring, Summer)*

ITCS 3695. Computer Science Cooperative Education Seminar. (1)

Required of Co-op students immediately following each work assignment for presentation of reports on work done the prior semester. *(Fall, Spring, Summer)*

ITIS 3590. Software and Information Systems Cooperative Education and 49ership Experience. (0)

This course is required of Co-op and 49ership students during the semester they are working. Participating students pay a registration fee for transcript notation. Assignments must be arranged and approved in advance. Course may be repeated. Evaluation is satisfactory/unsatisfactory. For more information, contact the University Career Center. *(Fall, Spring, Summer)*

ITIS 3695. Software and Information Systems Cooperative Education Seminar. (1)

Required of Co-op students immediately following each work assignment for presentation of reports on work done the prior semester. *(Fall, Spring, Summer)*

cc: Dr. Rick Lejk
Dr. Mike Allen

Dr. Larry Hodges

Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: January 13, 2004

RE: ITIS 4250 – Computer Forensics

The request to add a new course – ITIS 4250 – Computer Forensics, was approved by the Chair of the Undergraduate Course and Curriculum Committee on January 12, 2003 for immediate implementation.

New catalog copy

ITIS 4250. Computer Forensics. (3)

Prerequisites: ITIS 2300 or consent of the Department. The identification, extraction,

documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment. (*On demand*).

cc: Dr. Bill Chu
Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: January 5, 2004

RE: ITCS 6226 & ITCS 8226 (Bioinformatics)

The request to add two new courses – ITCS 6226 & ITCS 8226 (Bioinformatics) was approved by the Graduate Council on December 2, 2003 and by the Faculty Council on the December 16, 2003 Consent Calendar for immediate implementation.

New catalog copy

ITCS 6226: Bioinformatics. (3)

Prerequisites: Graduate standing. Topics include: Brief Review of molecular biology, proteins

and their classifications, DNA, RNA, and using microarrays and gene chips for sequencing;

review of computational techniques for bioinformatics, expectation maximization, Bayesian

classifiers, dynamic programming, information theory and entropy analysis, Markov chain

models, and neural networks; computational techniques for local and multiple sequence

alignment; application of Markov chains in finding genes; using information theory to estimate

binding sites, start Codon prediction; RNA secondary structure prediction; computational

techniques for protein function prediction; Advanced signal processing techniques in feature

extraction from protein sequences.

(On demand) (Evenings)

ITCS 8226: Bioinformatics. (3)

Prerequisites: Graduate standing. Topics include: Brief Review of molecular biology, proteins and their classifications, DNA, RNA, and using microarrays and gene chips for sequencing; review of computational techniques for bioinformatics, expectation maximization, Bayesian classifiers, dynamic programming, information theory and entropy analysis, Markov chain models, and neural networks; computational techniques for local and multiple sequence alignment; application of Markov chains in finding genes; using information theory to estimate binding sites, start Codon prediction; RNA secondary structure prediction; computational techniques for protein function prediction; Advanced signal processing techniques in feature extraction from protein sequences.

(On demand) (Evenings)

cc: Dr. Larry Hodges
Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Peggy Gordon

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: November 1, 2003

RE: Request to establish ITIS 6130, ITIS8130, ITIS 6140, and ITIS 8140

The request to establish ITIS 6130, ITIS8130, ITIS 6140, and ITIS 8140

was approved by the Graduate Council on September 16, 2003 and by Faculty Council on the October 20, 2003 Consent Calendar for immediate implementation.

New catalog copy

ITIS 6130 Software Requirements Engineering for Information Systems (3).

Pre-requisite: Full graduate standing, or consent of the Department. Introduction to requirement engineering methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development models; risk management models; software engineering maturity model. (On demand)

ITIS 8130 Software Requirements Engineering for Information Systems (3).

Pre-requisite: Full graduate standing, or consent of the Department. Introduction to requirement engineering methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development models; risk management models; software engineering maturity model. (On demand)

ITIS 6140 Software Testing and Quality Assurance (3).

Prerequisite: ITIS 6112 or consent of the Department. Methods for evaluating software for correctness, and reliability including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. Software engineering maturity model. (On demand)

ITIS 8140 Software Testing and Quality Assurance (3).

Prerequisite: ITIS 6112 or consent of the Department. Methods for evaluating software for correctness, and reliability including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. Software engineering maturity model. (On demand)

cc: Dr. Gerald Ingalls
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 23, 2003

RE: Request to add an Undergraduate Minor in Software and Information Systems

The request to add an Undergraduate Minor in Software and Information Systems was approved by the Chair of the Undergraduate Course and Curriculum Committee on June 16, 2003 for immediate implementation.

New catalog copy

Software and Information Systems Minor

This program is designed to provide students with the Information Technology knowledge necessary for today's information-based society. Students will not only gain hands-on knowledge of how to use the Internet to develop effective and easy-to-use applications but also will understand critical issues in designing information systems such as requirements development, integration, security and privacy, legal and policy considerations, and project management.

Program requirements:

The minor requires 18 credit hours. The following courses (9 credit hours) are required:

§ ITIC 1214. Introduction to Computer Science I

§ ITIS 2300. Introduction to Web-Based Application Development

§ ITIS 3132. Information Systems

Students should select three of the following courses (9 credit hours):

§ ITCS 1215. Introduction to Computer Science II.

§ ITIS 3130. Human and Computer Interfaces

- § ITIS 3131. Human and Computer Information Processing.
- § ITIS 3200. Introduction to Information Security and Privacy
- § ITCS 3160. Data Base Design and Implementation **
- § ITCS 3688. Computers and their Impact on Society***

** If this course is to be selected, the student must also select ITCS 1215.

*** This course meets the General Education Requirements for written and oral communications.

cc: Dr. Rick Lejk
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic

College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 23, 2003

RE: Request to change prerequisite for ITIS 3132

The request to change prerequisite for ITIS 3132 was approved by the Chair of the Undergraduate Course and Curriculum Committee on June 16, 2003 for immediate implementation.

New catalog copy

ITIS 3132. Information Systems. (3)

Prerequisite: ITIS 2300, or consent of the department. Analysis, design, implementation, and evaluation of information systems. Topics include: techniques of manipulating data; behavioral component of dealing with the user and integration of technology, procedures, and people. (*On demand*)

cc: Dr. Rick Lejk
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 23, 2003

RE: Request to change prerequisite for ITIS 3130

The request to change prerequisite for ITIS 3130 was approved by the Chair of the Undergraduate Course and Curriculum Committee on June 16, 2003 for immediate implementation.

New catalog copy

ITIS 3130. Human and Computer Interfaces. (3)

Prerequisite: ITIS 2300, or consent of the department. Concepts of the design of the human-machine environment, with special emphasis on human computer interaction and how people acquire, store, and use data from the environment and from computers. Topics include: analysis, creation and improvement of equipment and environment to make them compatible with human capabilities and expectation;

analysis of existing equipment with respect to user usability and interfacing capabilities. *(Fall, Alternate years) (Evenings)*

cc: Dr. Rick Lejk
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Sanders
Director of Assessment and Faculty Governance

DATE: June 23, 2003

RE: Request to change prerequisite for ITIS 3131

The request to change prerequisite for ITIS 3131 was approved by the Chair of the Undergraduate Course and Curriculum Committee on June 16, 2003 for immediate implementation.

New catalog copy

ITIS 3131. Human and Computer Info Processing. (3) Prerequisite: ITIS 2300, or consent of the department. Overview of methods people use to acquire, store, and use the data they receive from the environment and their implementation of computers. Topics include: perception, pattern recognition, attention, memory, knowledge representation, language, and problem solving. *(On demand)*

cc: Dr. Rick Lejk
Dr. Bill Chu

Mr. Stefanos Arethas

Mr. Richard Yount

Mr. Craig Fulton

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland

Director of Assessment and Faculty Governance

DATE: February 28, 2003

RE: Revise requirements for M.S. degree in Computer Science

The request to revise requirements for M.S. degree in Computer Science was approved by the Graduate Council on February 5, 2003 and by the Faculty Council on the February 13, 2003 Consent Calendar. It is approved for immediate implementation.

Catalog Copy:

M.S. in Computer Science

Degree Requirements

The Master of Science program in Computer Science requires 30 graduate credit hours, which may optionally include 6 hours of thesis. At least 15 hours must be ITCS or ITIS courses at 6000 level or above. A maximum of 6 hours of graduate credit may be transferred from other institutions.

I. Core subjects and breadth

Each student must demonstrate knowledge in the following listed core subjects. A student can satisfy the requirements of a core subject by having a prior undergraduate course on the subject, or completing the ITCS undergraduate course (which carries no graduate credit hours), or completing a related graduate course.

All of the following three core subjects must be completed before the end of the first year:

- a. Programming Languages (ITCS 3102 or equivalent) Related graduate course: ITCS 5102

b. Algorithm Analysis (ITCS 2215 or equivalent) Related graduate course: ITCS 6114

c. Computer Architecture (ITCS 3182 or equivalent) Related graduate course: ITCS 5141

In addition, to ensure breadth, each student must demonstrate knowledge in at least two of the following four subjects listed below before graduation. A student can satisfy the breadth requirement on a subject by having a prior undergraduate course on the subject, or completing the ITCS undergraduate course (which carries no graduate credit hours), or completing a related graduate course

d. Operating Systems (ITCS 3143 or equivalent) Related graduate course: ITCS 6144

e. Software Engineering (ITCS 3155 or equivalent) Related graduate course: ITCS 6112

f. Data Bases (ITCS 3160 or equivalent) Related graduate course: ITCS 6160

g. Communications and Networks (ITCS 3166 or equivalent) Related graduate course: ITCS 6166

II. Systems Course

Each student must complete at least one systems course:

ITCS 5141 Computer Organization and Architecture

ITCS 6112 Software System Design and Implementation

ITCS 6144 Operating system Design

ITCS 6148 Advanced Object Oriented Systems

ITCS 6160 Database Systems

ITCS 6166 Computer Communication and Networks

ITCS 6182 Advanced Computer Architecture

III. Theory course

Each student must complete at least one theory course:

ITCS 5110 Programming Languages and Compilers

ITCS 5165 Coding and Information Theory

ITCS 5170 Formal Languages and Automata

ITCS 6114 Algorithms and Data Structures

ITCS 6115 Advanced Topics in Algorithms and Data Structures

ITCS 6170 Logic for Artificial Intelligence

ITCS 6175 Computability and Complexity

IV. Area of Concentration

Each student must take at least three related courses (9 hours) to form an area of concentration. The three courses forming the student's area of concentration must have the written approval of the student's academic advisor. Some suggested areas of concentrations and their courses can be found on the Computer Science MS Program website.

cc: Dr. Larry Hodges

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: February24, 2003

RE:

Course description updates for ITCS 1214, 1215, 2214, and 2215

The request for course description updates for ITCS 1214, 1215, 2214, and 2215, was approved by the Chair of the Undergraduate Course and Curriculum Committee on February 19, 2003. It is approved for immediate implementation.

Catalog Copy: (Changes in **bold blue**)

ITCS 1214. Introduction to Computer Science. (3)

Prerequisite or co-requisite: MATH 1100, 1103, 1120, 1241, or consent of the Department. Basic concepts and terminology of computers; basic data structures, and data and procedural abstraction. Introduction to algorithmic problem solving strategies and algorithm development; event driven programming; and the use of computers to **implement** numerical and symbolic algorithms. An object oriented language **such as Java** is taught. (*Fall, Spring, Summer*) (*Evenings*)

ITCS 1215. Introduction to Computer Science II. (3)

Prerequisite: ITCS 1214 with a grade of C or better, or permission of the Department. A continuation of material from ITCS 1214, including elementary software design tools and programming constructs, such as state diagrams, decision tables, recursion, stacks, queues, and trees; dynamic storage allocation; **continued implementation using** an object-oriented language **such as Java**. (*Fall, Spring, Summer*) (*Evenings*)

ITCS 2214. Data Structures. (3)

Prerequisite: ITCS 1215 with a grade of C or better, or permission of the Department. A continuation of material from ITCS 1215, including general trees and graphs, special purpose trees and graphs; searching/traversing; programming emphasis is on the use of **C++** to implement algorithms related to various data structures. (*Fall, Spring, Summer*) (*Evenings*)

ITCS 2215. Design and Analysis of Algorithms. (3)

Prerequisites: ITCS 2214, MATH 1165, and **either** MATH 1120 or 1241. **Introduction to the design and analysis of algorithms. Design techniques: divide-and-conquer, greedy approach, dynamic programming. Algorithm analysis: asymptotic notation, recurrence relation, time-space complexity and tradeoffs. Study of sorting, searching, hashing, and graph algorithms.** (*Fall, Spring, Summer*) (*Evenings*)

cc: Dr. Larry Hodges

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: February 18, 2003

RE: Request to establish ITCS 4140, Data Visualization

The request to establish ITCS 4140, Data Visualization, was approved by the Chair of the Undergraduate Course and Curriculum Committee on February 10, 2003. It is approved for immediate implementation.

Catalog Copy:

ITCS 4140. Data Visualization. (3)

Prerequisites: ITCS 2214, MATH 2164, and consent of the instructor. Methodology and application of data visualization to scientific, engineering and abstract data; data types, models and representation; visualization algorithms; volume visualization; scalar, vector, and tensor fields; multi-variate visualization; visualization systems and models; visualization applications; visualization software and hardware; research issues and future trends. *(On demand) (Evenings)*

cc: Dr. Larry Hodges

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: February 18, 2003

RE: Course description update for ITCS 4131, Communication Network Design

The request for a course description update for ITCS 4131, Communication Network Design, was approved by the Chair of the Undergraduate Course and Curriculum Committee on February 11, 2003. It is approved for immediate implementation.

Catalog Copy:

ITCS 4131. Communication Network Design. (3)

Prerequisites: ITCS 3166 or consent of the department. Emphasis on the design and analysis of communication networks. Application, host, and network requirements analysis; Data flow analysis, models and specifications; Technology choices; Interconnection mechanisms; Network management and security; Physical network design; Addressing and routing. (*On demand*)

cc: Dr. Larry Hodges

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: February 17, 2003

RE: Change in requirements to M.S. degree in Information Technology

The request for a change in requirements to M.S. degree in Information Technology was approved by the Chair of the Graduate Council on January 31, 2003. It is approved for immediate implementation.

Catalog Copy:

M.S. in Information Technology

The total number of hours required is 30 hours. The required courses include:

- MBAD 6121: Business Information Systems

- One of ITIS 5166: Network-based Application Development or MBAD 6125: Business Data Communications

- One of ITIS 6112: Software System Design and Implementation or MBAD 6124: Business Information Systems Development

- ITIS 5160: Applied Databases (please note that ITIS 6160 can be a substitute for ITIS 5160)

- ITIS 6342: Project Management

- ITIS 6177: Systems Integration

- Three hours of ITIS, ITCS, or other approved 6000 level elective. Students may elect to take a 3 credit hour internship course, ITIS 6198, to gain valuable IT work experience.

Each student must complete a three-course (nine credit hours) sequence in an approved concentration area. Other concentration areas are possible with the approval of the MSIT Program Coordinator. In addition, the MSIT Program Coordinator can approve substitution of courses within approved concentrations. Details on concentration requirements are available on the department website and at the department office. Students may also take the thesis option and complete six credit hours of master's thesis.

cc: Dr. Bill Chu

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: February 17, 2003

RE: Change in requirements to Graduate Certificate in Information Security and Privacy

The request for a change in requirements to the Graduate Certificate in Information Security and Privacy was approved by the Chair of the Graduate Council on January 31, 2003. It is approved for immediate implementation.

Catalog Copy:

Graduate Certificate in Information Security and Privacy

1. Take the following core course:
 - ITIS 6200: Information Security and Privacy

2. Take three courses from the following elective courses:
 - ITIS 6210: Access Control and Security Architecture

 - ITIS 6220: Information and system Assurance

 - ITIS 6230: Information Infrastructure Protection

- ITIS 6240: Applied Cryptography

- ITIS 6362: Information Technology: Ethics, Policy and Security

- One of ITIS 5166: Network-based Application Development, or ITCS 6166: Computer Communication Networks

- ITIS 6167: Information and Network Security

- ITIS 6198: IT Project

- Other course options may be available, please contact the program coordinator.

cc: Dr. Bill Chu

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: January 3, 2003

RE: Request for changes to the SIS BA curriculum

The request for changes to the SIS BA curriculum was approved by the chair of the Undergraduate Course and Curriculum Committee on December 18, 2002. It is approved for immediate implementation.

Catalog Copy:

New courses:

Ø **ITIS 2300. Web Based Applications Development. (3)**

Prerequisite: ITCS 1214 or consent of the Department. Basic concepts for developing interactive web based applications; HTML, client side scripting, server side scripting, user interface design considerations. Students will be required to develop working prototypes of web-based applications. (*On Demand*)

Ø **ITIS 3300 Software Requirements and Project Management. (3)**

Prerequisite: ITCS 2214, or consent of the Department. Introduction to requirements engineering and project management methodologies. Topics include: requirements elicitation, specification, and validation; structural, informational, behavioral, security, privacy, and computer user interface requirements; scenario analysis; application of object-oriented methodologies in requirements gathering; spiral development model; risk management models; software engineering maturity model; project planning and milestones; cost estimation; team organizations and behavior. Case studies will be used. *(On Demand)*

-

Ø **ITIS 3310. Software Architecture and Design. (3)**

Prerequisite: ITCS 2214 or consent of the Department. Introduction to software design with emphasis on architectural design and design patterns. Models of software architecture. Architecture styles and patterns, including explicit, event-driven, client-server, and middleware architectures. Decomposition and composition of architectural components and interactions. Use of non-functional requirements for tradeoff analysis. Component based software development, deployment, and management. A system design language, such as UML, will be introduced and used throughout the course. *(On Demand)*

Ø **ITIS 3320. Introduction to Software Testing and Assurance. (3)**

Prerequisite: ITCS 2214 or consent of the Department. Methods for evaluating software for correctness and reliability, including code inspections, program proofs, and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. *(On Demand)*

New catalog copy for revisions in curriculum:

BACHELOR OF ARTS: SOFTWARE AND INFORMATION SYSTEMS

This program consists of 51 hours of software and information systems, and computer science as well as 15 hours in mathematics. Courses included are: ITCS 1214, 1215, 2214, 2215, 3160, 3166, 3143, and 3688; ITIS 2300, 3300, 3310, 3320, 3200, 3650, and 3651; and six semesters of approved ITIS or ITCS courses numbered 3000 or above; MATH 1120, 1165, 2164, STAT 1220, 1223*.

*A mathematics option consisting of MATH 1241, 1242, 1165, 2164, and STAT 2122 may be selected as an alternate to the math courses listed.

CURRICULUM OUTLINE: B.A. DEGREE
SOFTWARE AND INFORMATION SYSTEMS

Freshman Year

| | | | Fall |
|-----------|---------------------|----------|------|
| Spring | | | |
| 1215 | ITCS 1214 3 | 3 | ITCS |
| 1102 | MATH 1120 3 | 3 | ENGL |
| 1165 | Gen. Education 3 | 4 | MATH |
| 1220 | Gen. Education 3 | <u>3</u> | STAT |
| Education | <u>4</u> | | Gen. |
| | | 13 | 16 |

Sophomore Year

| | | | Fall |
|-----------|----------------|---|------|
| Spring | | | |
| Education | ITIS 2300 3 | 3 | Gen. |
| Education | ITCS 2214 3 | 3 | Gen. |

| | | | |
|------|-----------------------|----------|---------|
| 2215 | STAT 1223 3 | 3 | ITCS |
| work | ENGL 2116 3 | 3 | Related |
| 2105 | MATH 2164 <u>3</u> | <u>4</u> | COMM |
| | 15 | 16 | |

Junior Year

| | | | |
|--------|----------------------------|--------------------|---------|
| | | Fall | |
| Spring | | | |
| 3160 | ITIS 3300 3 | 3 | ITCS |
| work | ITCS 3166 3 | 3 | Related |
| work | ITCS 3688 3 | 3 | Related |
| work | Related 3 | ITIS/ITCS Elective | 3 |
| 3310 | Gen. Education <u>3</u> | <u>3</u> | ITCS |
| | 15 | 15 | |

Senior Year

| | |
|--------|------|
| Spring | Fall |
|--------|------|

| | | | |
|-----------|----------------------|--------------------|----------|
| 3143 | ITIS 3320 3 | 3 | ITCS |
| 3651 | ITIS 3650 3 | 3 | ITIS |
| Education | ITIS 3200 3 | 3 | Gen. |
| work | Related 3 | ITIS/ITCS Elective | 3 |
| | Elective <u>3</u> | <u>3</u> | Elective |
| | 15 | 15 | |

Total Hours 120

cc: Dr. Rick Lejk

Dr. Bill Chu

Dr. William Tolone

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

MEMORANDUM

TO: Dean Mirsad Hadzikadic
College of Information Technology

FROM: Cathy Outland
Director of Assessment and Faculty Governance

DATE: January 2, 2003

RE: Request to delete ITCS 4150, 4165, 4171, and 4183 from the undergraduate catalog.

The request to delete ITCS 4150, 4165, 4171, and 4183 from the undergraduate catalog was approved by the chair of the Undergraduate Course and Curriculum Committee on December 11, 2002. It is approved for immediate implementation.

Catalog Copy:

Delete the following:

ITCS 4150 – Intelligent Systems

ITCS 4165 – Coding and Information Theory

ITCS 4171 – Topic Programming

ITCS 4183 – Computer Arithmetic

cc: Dr. Rick Lejk

Dr. Larry Hodges

Mr. Brian Bradley

Mr. Richard Yount

Mr. Craig Fulton

Ms. Betty Johnson

Ms. Carolyn Thigpen

Advising Team
