LONG SIGNATURE SHEET

UNC CHARLOTTE

Proposal Number: ITIS 10-06-10

Proposal Title: Network Science (ITIS 6570/8570)

Originating Department: Software and Information Systems

TYPE OF PROPOSAL: UNDERGRADUATE GRADUATE X UNDERGRADUATE & GRADUATE
(Separate proposals sent to UCCC and Grad Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION
			Approved
			Approved
10/17/12	10/17/12	10/17/12	*Approved*
10/17/12	10/17/12	10/17/12	*Approved*
			Approved
			Approved
10-24-12	11-6-12	5-22-13	*Approved*
			Approved

SIGNATURES

DEPARTMENT CHAIR

Dr. Mary Lou Maher

COLLEGE CURRICULUM COMMITTEE CHAIR

Dr. Anthony Fodor

COLLEGE FACULTY CHAIR (if applicable)

Dr. Dennis Livesay

COLLEGE DEAN

Dr. Teresa Dahlberg

GENERAL EDUCATION
(for General Education courses)

UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR (for undergraduate courses)

GRADUATE COUNCIL CHAIR
(for graduate courses)

Rob Roy McGregor

FACULTY GOVERNANCE ASSISTANT
(Faculty Council approval on Consent Calendar)

FACULTY EXECUTIVE COMMITTEE
(if decision is appealed)

University of North Carolina at Charlotte **ITIS 10-06-10**

New Graduate Course and Curriculum Proposal from the Department of Software and Information Systems

Title: Network Science

A. Proposal Summary and Catalog Copy

1. Summary

The Department of Software and Information Systems proposes to add a new course, ITIS 6520/8520 Network Science, designed to provide graduate students with a comprehensive look at the emerging science of networks. This course is intended for SIS majors at the MS and PhD level.

2. Proposed Catalog Copy

ITIS 6520/8520 Network Science (3) Prerequisite: Full graduate standing or department approval. Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. The course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing. The course includes 3 credit lectures. (On demand)

B. Justification

1. Identify the need addressed by the proposal and explain how the proposed action meets the need.

The scientific study of networks, including computer networks, social networks, and biological networks, has received an enormous amount of interest in the last few years. The rise of the Internet and the wide availability of inexpensive computers have made it possible to gather and analyze network data on a large scale, and the development of a variety of new theoretical tools has allowed us to extract new knowledge from many different kinds of networks.

The study of networks is broadly interdisciplinary and important developments have occurred in many fields, including mathematics, physics, computer and information sciences, biology, and the social sciences. This course brings together the most important breakthroughs in each of these fields and presents them in a coherent fashion, highlighting the strong interconnections between advances in different areas.

Subjects covered include the measurement and structure of networks in many branches of science, methods for analyzing network data (including methods developed in physics, statistics, and sociology), the fundamentals of graph theory, computer algorithms, spectral methods, mathematical models of networks (including random graph models and generative models), and theories of dynamical processes taking place on networks.

2. Discuss prerequisites/co-requisites for course(s) including class-standing.

There are no prerequisites for this course. The students only need to have graduate standing.

3. Demonstrate that course numbering is consistent with the level of academic advancement of students for whom it is intended.

The course is intended for graduate students interested in the analysis of dynamical systems. It is usually taken in conjunction with the course on Complex Adaptive Systems. These courses can be taken in any sequence.

4. In general, how will this proposal improve the scope, quality and/or efficiency of programs and/or instruction?

The advances in computing, communication, and Internet technologies have brought to our attention the importance of understanding both network fundamental properties and the analysis of network-enabled behavior. No educational degree related to computational and information technologies is complete today without the proper treatment of the concept of networks, as they are found in both natural and man-made systems.

C. Impact

1. What group(s) of students will be served by this proposal? (Undergraduate and/or graduate; majors and/or non-majors, others?

The course is designed to serve the needs of the SIS MS and PhD students.

2. What effect will this proposal have on existing courses and curricula?

a. When and how often will added course(s) be taught?

ITIS 6520/8520 will be taught every other semester (Fall or Spring).

b. How will the content and/or frequency of offering of other courses be affected?

There should be no impact on the content or frequency of offering of other courses.

c. What is the anticipated enrollment in course(s) added (for credit and auditors)?

The anticipated enrollment of ITIS 6520/8520 is approximately 15 students per class.

d. How will enrollment in other courses be affected?

This course may increase the demand for the Complex Adaptive Systems course, and vice versa.

e. If course(s) has been offered previously under special topics numbers, give details of experience including number of times taught and enrollment figures.

Not applicable.

f. Identify other areas of catalog copy that would be affected, e.g., curriculum outlines, requirements for the degree, etc.

There are no other anticipated changes in the catalog.

D. Resources Required to Support Proposal

1. Personnel

a. Specify requirements for new faculty, part-time teaching, student assistant and/or increased load on present faculty.

No new or part-time faculty is required in order to offer these courses; nor will these courses introduce an increased teaching load on present faculty.

b. List by name qualified faculty members interested in teaching the course(s).

Faculty qualified to teach this course include Dr. Mirsad Hadzikadic, Dr. Bill Tolone, Dr. Bill Chu, Dr. Anita Raja, and Yongge Wang.

2. Physical Facility

The College of Computing and Informatics (CCI) has the basic hardware and software infrastructure needed to cover this course.

3. Equipment and Supplies

No additional equipment or supplies are needed for the proposed course.

4. Computer

Any computer laboratory on campus or personal computer will suffice as a computational platform for this course.

5. Audio-Visual

Current facilities are adequate to support this course.

6. Other Resources

None needed.

7. Indicate source(s) of funding for new/additional resources required to support this proposal.

None needed.

E. Consultation with the Library and Other Departments or Units

1. Library Consultation

Consultation was initiated on 12-08-2010 and completed on 12-09-2010.

2. Consultation with Other Departments or Units

Consultation with the Department of Computer Science was initiated on 12-08-2010 and completed on 1-07-2011.
Consultation with the Department of Bioinformatics and Genomics was initiated on 12-08-2010 and completed on 12-11-2010.

F. Initiation and Consideration of the Proposal

1. Originating Unit

Approved by the Department of Software and Information Systems on 11-23-2010.
Approved by the College of Computing and Informatics faculty on 03-15-2011.

2. Other Considering Units

Department of Computer Science (see E.2. above)
Department of Bioinformatics and Genomics (see E.2. above)

G. Attachments

Attachment 1. ITIS 6520/8520 Course Outline and Suggested Textbooks

Note: the original proposal was incorrectly numbered as 6510/8510 which was already in use so the library consultation refers to those courses numbers. 6520 and 8520 are the correct course numbers.

Attachment 2. Library Consultation

Attachment 3. Consultations

Attachment 1. ITIS 6520/8520 Course Outline and Suggested Textbooks

ITIS 6520/8520: Network Science

Fall 2013

Mirsad Hadzikadic

Contact Information:

Web page: http://www.sis.uncc.edu/~mirsad
Email: mirsad at uncc.edu
Office: Woodward Hall 343A
Office phone: 704-687-8643
Office Hours: Tuesdays 4:00-6:30pm

Course Description:

Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. The course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

Prerequisites: Consent of the Instructor

Objectives of the Course:

Networks are all around us, including natural and man-made systems. Examples include rivers, trees, arteries, highways, brain, economy, social connections, military, energy distribution, cyber attacks, terrorist networks, epidemics, Internet, and Facebook. Students will learn (a) the basic principles, concepts, and principles of networks; (b) how and why network structures and properties determine the performance and sustainability of any system; (c) how to measure and evaluate network-based systems; (d) how to utilize networks for the benefit of their organizations and society; and (e) how to utilize and design tools for understanding, visualizing, and applying the principles of networks.

Instructional Method:

Materials presented in this course will be covered through lectures and projects. Every topic will be covered both in class and through the project-based hands-on experience. In the end, students will have both the theoretical understanding of network concepts and concrete experience of putting such concepts and principles into practice.

Means of Student Evaluation:

Project:	40%
Midterm Exam:	20%
Final Exam:	40%

Policies:
Students will be allowed to miss no more than 3 classes without affecting their final grade. For every additional 3 absences the final grade will be lowered by one letter grade.

Students are not allowed to use any electronic devices during the class, unless otherwise instructed by the instructor.

Academic Integrity:
All students are expected to adhere to the UNC Charlotte Code of Student Academic Integrity (http://legal.uncc.edu/policies/ps-105.html) as specified in the current Catalog (http://catalog.uncc.edu/) . Among other things, this code forbids cheating, fabrication or falsification of information, multiple submission of academic work, plagiarism, abuse of academic materials, and complicity in academic dishonesty.

Textbook:
"Networks: An Introduction," by Mark Newman, 2010, Oxford

Topical Outline of Course Content

1. The empirical study of networks
    a. Technological networks
    b. Social networks
    c. Networks of information
    d. Biological networks
2. Fundamentals of network theory
    a. Mathematics of networks
    b. Measures and metrics
    c. The large-scale structure of networks
3. Computer algorithms
    a. Basic concepts of algorithms
    b. Fundamental network algorithms
    c. Matrix algorithm and graph partitioning
4. Network models
    a. Random graphs
    b. Random graphs with general degree distributions
    c. Models of network formation
    d. Other network models
5. Processes on networks
    a. Percolation and network resilience
    b. Epidemics on networks
    c. Dynamical systems on networks
    d. Network search
    e. Emergence
    f. Epidemics

g. Synchrony
h. Vulnerability
i. Risk

Attachment 2. Library Consultation

UNCCHARLOTTE
J. Murrey Atkins Library

Consultation on Library Holdings

To: Bruce Long
Assistant Chair & Director of Undergraduate Programs
Software and Information Systems Department
College of Computing and Informatics

From: Reese Manceaux

Date: December 9, 2010

Subject: **ITIS 6510/8510 --- Network Science**

Summary of Librarian's Evaluation of Holdings:

Evaluator: Reese A. Manceaux

Check One:

Holdings are superior
☑ **Holdings are adequate (Please see comments) YES**
Holdings are adequate only if Dept. purchases additional items.
Holdings are inadequate

Comments:

This is a proposal for an new graduate course. This course covers measurement and structure of networks in many branches of science, methods for analyzing network data, mathematical models of networks, etc. It is intended for graduate students interested in the analysis of dynamical systems, taken in conjunction with "Complex Adaptive Systems".

A small sampling of subject searching in the Atkins Library online catalog reveals the following holdings in support of these courses. (See the table that follows). A search of the related subjects retrieved over 2,000 pertinent items.

The Library has electronic access to periodicals and other electronic resources (e-books from Skillport/Books 24x7) that support these courses. Skillport, in particular, has an enormous catalog of computer related literature; especially up-to-date programming language books. In addition, the library has many electronic databases such as EBSCO databases (Cinahl), Springer Link, ACM Digital Library, IEEE Explore, ScienceDirect and Compendex (many with links to full text articles) supporting the overall Computing and Informatics program. The collection, especially if supported by ongoing purchases, is quite adequate to support this program.

Atkins Library Holdings in Areas Related to

Usable Security and Privacy

Library of Congress Subject Headings	Books	After Year 2001	Journals	Skillport /Books 24x7
Information Networks	208	49	4	1001
Social Networks	318	130	1	
Biology Mathematical Models	34	10	3	
Nonlinear Theories	239	38	18	
System Theory	176	37	12	
Electric Networks	169	9	15	
System Design	267	66	9	
TOTAL	**1411**	**339**	**62**	**1001**

Reese A. Manceaux

Evaluator's Signature

December 9, 2010

Attachment 3. Consultations

Long, Bruce

From: Wu, Wensheng
Sent: Friday, January 07, 2011 12:31 PM
To: Wu, Wensheng; Long, Bruce
Cc: Ribarsky, William
Subject: RE: Consultation

Bruce:

Graduate committee has discussed the proposals from SIS and consulted with CS Chair and relevant faculty.

In general, the chair has asked that we be mindful of efficiency and avoid duplicating course offerings within our department or across the departments. When there is significant overlap between courses, as in 4500/5500 and 4180/5180, we will ask for cross-listing or some other mechanism to enable joint teaching. The chair says that CS will need to go through a review of its curriculum and prioritization of its course offerings. He predicts that SIS will need to do a similar thing. This will be the only way we will be able to teach what we want to across the departments while maximizing efficient use of limited resources.

Here is feedback on specific courses:

For ITIS 6201/8201 (Computer Security and Privacy):

If SIS determines there is no substantial overlap with other courses in SIS (e.g., 6200, 6210), we support the addition of this new course.

ITIS 6510/8510 (Network Science):
CS supports the addition of this new course to the SIS curriculum.

ITIS 4500/5500 (Web Mining)

This course is very similar to ITCS 6265 (Advanced Topics in KDD): Information Retrieval and Web Mining, a graduate-only course offered by CS in Fall 2009 (http://www.cs.uncc.edu/~wwu18/itcs6265/). CS faculty (esp. Zbyszek and Wensheng) are interested in offering similar course to undergraduate students.

The graduate committee consulted with KDD faculty including Dr. Ras and also with CS chair Dr. Ribarsky. Based on the consulation, we recommend SIS to cross-list the course as ITIS/ITCS 4500/5500. This also improves the efficiency of course offerings by both CS and SIS.

Given that CS is already offering a similar course at the graduate level (KDD faculty also plans to offer a new graduate course on Text Data Mining), we suggest that 4500/5500 focuses on the application aspects of Web mining, while ITCS 6265 (& the planned new course) focuses on principles, analysis, and advanced techniques. Again, this would improve the efficiency & avoid duplicate offerings.

ITIS 4180/5180 (Mobile Application Development)

Several CS faculty members (e.g., Robert Kosara) are interested in the subject & plan to offer similar courses. So the graduate committee consults with CS chair Dr. Ribarsky on this. Based on the consultation, we recommend the course to be cross-listed as ITIS/ITCS 4180/5180, given the conflict of interest & efficiency in offering.

Regards,

Wensheng

Assistant Professor, Ph.D.
Computer Science Department, UNC Charlotte
9201 University City Blvd, Charlotte, NC 28223
Office: Woodward Hall 430E
Phone: (704)687-7022
Email: w.wu@uncc.edu
Web: http://www.cs.uncc.edu/~wwu18/

From: Wu, Wensheng
Sent: Fri 12/10/2010 11:05 AM
To: Long, Bruce
Cc: Ribarsky, William
Subject: RE: Consultation

Bruce: We will review this too & get back to you.

Regards,

Wensheng

Assistant Professor, Ph.D.
Computer Science Department, UNC Charlotte
9201 University City Blvd, Charlotte, NC 28223
Office: Woodward Hall 430E
Phone: (704)687-7022
Email: w.wu@uncc.edu
Web: http://www.cs.uncc.edu/~wwu18/

From: Long, Bruce
Sent: Fri 12/10/2010 9:22 AM
To: Wu, Wensheng
Cc: Ribarsky, William
Subject: Consultation

Wensheng,

The ITIS 6201 proposal has now been approved and SIS would appreciate your consultation.

Thanks,
Brice

Bruce Long

Assistant Chair & Director of Undergraduate Programs
Software and Information Systems Department
College of Computing and Informatics
University of North Carolina at Charlotte
9201 University City Blvd
Charlotte, NC 28223
704-687-8441

Long, Bruce

From: Long, Bruce
Sent: Wednesday, December 08, 2010 2:26 PM
To: Mays, Larry; Marshall, Elise
Subject: Course proposal consultation
Attachments: ITIS 4180 5180 Mobile Application Development.docx; ITIS 4500-5500 Webmining-Nov-23.docx; itis6201-ComputerSecurityAndPrivacy-proposal-2010-09-15 (1).doc; ITIS 6510 8510 Network Science_ver2.docx

Larry,

SIS has a number of course proposals pending. I am forwarding them for your consultation. If you have any questions please let me know.

Thanks,
Bruce

Bruce Long
Assistant Chair & Director of Undergraduate Programs
Software and Information Systems Department
College of Computing and Informatics
University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223
704-687-8441

Long, Bruce

From: Mays, Larry
Sent: Saturday, December 11, 2010 9:29 PM
To: Long, Bruce; Marshall, Elise
Subject: Re: Course proposal consultation

I support the adoption of all of these.

On 12/8/10 2:25 PM, "Long, Bruce" <nblong@uncc.edu> wrote:

> Larry,
>
> SIS has a number of course proposals pending. I am forwarding them for your consultation. If you have any questions please let me know.
>
> Thanks,
> Bruce
>
> Bruce Long
> Assistant Chair & Director of Undergraduate Programs
> Software and Information Systems Department
> College of Computing and Informatics
> University of North Carolina at Charlotte
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