# LONG SIGNATURE SHEET

**UNC CHARLOTTE**

**Proposal Number:** ECGR 10-1-10

**Proposal Title** A New Graduate Course in Fundamentals of Wireless Systems and Protocols

**Originating Department** Electrical and Computer Engineering

TYPE OF PROPOSAL: UNDERGRADUATE_____ GRADUATE___X___ UNDERGRADUATE & GRADUATE____
(Separate proposals sent to UCCC and Grad. Council)

| DATE RECEIVED | DATE CONSIDERED | DATE FORWARDED | ACTION | SIGNATURES |
|---|---|---|---|---|
| | | | Approved | **DEPARTMENT CHAIR** |
| | | | Approved | **COLLEGE CURRICULUM COMMITTEE CHAIR** Engineering Graduate |
| 12/6/10 | 12/21/10 | 12/21/10 | Approved | **COLLEGE FACULTY CHAIR** |
| 12/21/10 | 1/3/11 | 1/3/11 | Approved | **COLLEGE DEAN** |
| | | | Approved | **UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR** (for undergraduate courses) |
| 1-26-11 | 2-1-11 | 2-2-11 | Approved | **GRADUATE COUNCIL CHAIR** (for graduate courses) Rob Roy McGregor |
| | | | Approved | **FACULTY GOVERNANCE SECRETARY** (noting Faculty Council approval on Consent Calendar) |
| | | | | **FACULTY EXECUTIVE COMMITTEE** (if decision is appealed) |

Revised 12/10/09
OAA/jdp

University of North Carolina at Charlotte

Proposal for New Graduate Course

Course and Curriculum Proposal from: Department of Electrical and Computer Engineering

### A New Graduate Course in Fundamentals of Wireless Systems and Protocols

## A. PROPOSAL SUMMARY AND CATALOG COPY

1. SUMMARY: The Department of Electrical and Computer Engineering proposes to add a new elective course to the graduate curriculum: ECGR 6188/8188, Fundamentals of Wireless Systems and Protocols.

2. PROPOSED CATALOG COPY: **ECGR 6188. Fundamentals of Wireless Systems and Protocols (3).** Prerequisite: Graduate standing and a prior course in data communications or computer networks. The course provides an overview of different wireless and mobile network standards and systems. It covers the distinct characteristics of these wireless systems that require a fundamental redesign of protocols at layer 2 to layer 4 of the network protocol stack. Protocols for medium access control, routing, and reliable transport, in addition to middleware and applications custom-made for wireless networks will be dealt with. Credit will not be given for ECGR 6188 where credit has been given for ECGR 8188. *(Fall) (Evening)* PROPOSED CATALOG COPY: **ECGR 8188. Fundamentals of Wireless Systems and Protocols (3).** See ECGR 6188 for Course Description. Credit will not be given for ECGR 8188 where credit has been given for ECGR 6188.

## B. JUSTIFICATION.

1. Identify the need addressed by the proposal and explain how the proposed action meets the need: Wireless and mobile systems have experienced tremendous growth in the past decade. A wide variety of new wireless networks and applications beyond conventional telephony services have emerged in recent years, including wireless local area networks, wireless personal area networks, ad hoc networks, wireless sensor networks, wireless mesh networks, vehicular networks, and mobile Internet. Each type of wireless networks brings greater technological challenges and requires a redesign of networking protocols. Therefore, there is a great need for Electrical and Computer Engineers to understand the distinct characteristics and design principles of

different types of wireless networks. This course addresses this need and presents the principles and network design issues in a systematic way in order to cover the fundamentals, evolution, major standards, and recent advances of wireless systems. In addition, the course will effectively prepare graduate students for research in the field of wireless communications and networking.

2. <u>Discuss prerequisites/corequisites for course(s) including class-standing:</u> Prerequisites: Graduate standing and a prior course in data communications or computer networks. Prerequisites are to ensure that the student has a background in data and computer networks, in particular, the architecture and protocols used within the Internet.

3. <u>Demonstrate that course numbering is consistent with the level of academic advancement of students for whom it is intended:</u> The course numbering ECGR 6188/8188 is consistent with the level of academic advancement of students for whom it is intended. Wireless system and protocol design requires the integration of diverse areas of knowledge (analog and digital communications, data and computer communications, and computer networks, which are usually covered in the senior year of undergraduate studies), and the translation of that knowledge into system design with constraints imposed by technological challenges. This course can effectively motivate students' interest in further studies of advanced graduate courses in telecommunications and prepare graduate students for research in the field of wireless communications and networking.

4. <u>In general, how will this proposal improve the scope, quality and/or efficiency of programs and/or instruction:</u> Presently, several advanced graduate courses in telecommunications exist (ECGR 6120 Wireless Communication and Networking, ECGR 6121 Advanced Theory of Communications I, ECGR 6122 Advanced Theory of Communications II, and ECGR6187 Modeling and Analysis of Communication Networks) covering specific topics in wireless communications. However, no existing graduate course systematically covers the fundamentals and protocol design of all different types of emerging wireless systems. The proposed course complements the existing courses on wireless communications with an emphasis on the design at a system-level as well as the tradeoffs among various objectives and system requirements in diverse wireless and mobile networking environments. The proposed course will be an important component of the graduate curriculum on telecommunications in ECE Department.

## C. IMPACT.

1. <u>What group(s) of students will be served by this proposal?</u> Graduate Electrical and Computer Engineers with interest in wireless systems in general. Because of the prerequisite of data communications or computer networks background, it is not likely that students outside electrical and computer engineering will be served.

2. What effect will this proposal have on existing courses and curricula?
The proposed course will complement the existing courses on wireless communications in Electrical and Computer Engineering and effectively prepare graduate students for further studies in advanced graduate courses in telecommunications.

  a. When and how often will added course(s) be taught? Every year in Fall semesters.

  b. How will the content and/or frequency of offering of other courses be affected? No effect expected.

  c. What is the anticipated enrollment in course(s) added (for credit and auditors)? Typical enrollment expected to be 20-30 students.

  d. How will enrollment in other courses be affected? None expected. How did you determine this? It is the only introductory graduate course on wireless protocol design of various wireless systems.

  e. If course(s) has been offered previously under special topics numbers, give details of experience including number of times taught and enrollment figures. The proposed course is a modified form of a special topic course that was taught annually in the Fall semester of 2004 ~ 2010. The enrollment is:
  Fall 2004, Enrollment: 9 (7 M.S., 2 Ph.D.)
  Fall 2005, Enrollment: 37 (34 M.S., 3 Ph.D.)
  Fall 2006, Enrollment: 32 (28 M.S., 4 Ph.D.)
  Fall 2007, Enrollment: 36 (30 M.S., 6 Ph.D.)
  Fall 2008, Enrollment: 27 (22 M.S., 5 Ph.D.)
  Fall 2009, Enrollment: 19 (17 M.S., 2 Ph.D.)
  Fall 2010, Enrollment: 17 (17 M.S.)

  f. Identify other areas of catalog copy that would be affected, e.g., curriculum outlines, requirements for the degree, etc. Crosslisting ECGR 6188 and ECGR 8188 in catalog.

## D. RESOURCES REQUIRED TO SUPPORT PROPOSAL.

When added resources are not required, indicate "none". For items which require "none" explain how this determination was made.

1. Personnel
   a. Specify requirements for new faculty, part-time teaching, student assistant and/or increased load on present faculty: None.
   b. List by name qualified faculty members interested in teaching the course(s): Jiang (Linda) Xie

2. Physical Facility: None

3. Equipment and Supplies: None

4. Computer: None

5. Audio-Visual: None

6. Other Resources: None

7. Indicate source(s) of funding for new/additional resources required to support this proposal: None required

### E. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

1. Library Consultation
   Indicate written consultation with the Library Reference Staff at the departmental level to insure that library holdings are adequate to support the proposal prior to its leaving the department. (Attach copy of *Consultation on Library Holdings*).

2. Consultation with other departments or units
   N/A

### F. INITIATION AND CONSIDERATION OF THE PROPOSAL

1. Originating Unit
   Briefly summarize action on the proposal in the originating unit including information on voting and dissenting options.
   Approved per attached signatures

2. Other Considering Units
   Briefly summarize action on the proposal by each considering unit including information on voting and dissenting options.
   N/A

## G. ATTACHMENTS

## Course Syllabus

1. Course Number and Title:
    **ECGR 6188/8188. Fundamentals of Wireless Systems and Protocols**

2. Course Description (Catalog Description):
    **ECGR 6188. Fundamentals of Wireless Systems and Protocols (3).** Prerequisite: Graduate standing and a prior course in data communications or computer networks. The course provides an overview of different wireless and mobile network standards and systems. It covers the distinct characteristics of these wireless systems that require a fundamental redesign of protocols at layer 2 to layer 4 of the network protocol stack. Protocols for medium access control, routing, and reliable transport, in addition to middleware and applications custom-made for wireless networks will be dealt with. Credit will not be given for ECGR 6188 where credit has been given for ECGR 8188. *(Fall) (Evening)*
    **ECGR 8188. Fundamentals of Wireless Systems and Protocols (3).** See ECGR 6188 for Course Description. Credit will not be given for ECGR 8188 where credit has been given for ECGR 6188.

3. Prerequisites:
    Graduate standing and a prior course in data communications or computer networks.

4. Course Objectives:
    The objective of this course is to provide students with the working knowledge required to understand, design, and analyze emerging wireless systems with distinct characteristics. Detailed objectives include:

    - Understand principles of cellular networking;

    - Understand the impact of wireless network characteristics on existing network protocols;

    - Apply network design principles to new protocols that are suited to the characteristics of emerging wireless systems;

    - Demonstrate skills in literature search, reading, and summarizing.

5. Instructional Method:
    The course is a lecture format.

## 6. Evaluation:

The grade for the course will be determined using the following weightings:

| | |
|---|---|
| Homework Assignments: | 10% |
| Quizzes: | 15% |
| Exam I: | 25% |
| Exam II: | 25% |
| Final Project: | 25% |
| TOTAL: | 100% |

## 7. Policies that apply to this course:

a. University integrity

b. Attendance is required

c. Grading policy (A, B, C, Unsatisfactory with 90-100%=A, 80-90%=B, 70-80%=C, other=U)

## 8. Probable Textbooks:
The course relies principally on handout materials.

Secondary references:
- D. P. Agrawal and Q.-A. Zeng, *Introduction to Wireless and Mobile Systems*, 2nd Edition, Thomson, 2005
- Y. B. Lin and I. Chlamtac, *Wireless and Mobile Network Architecture*, John Wiley & Sons, 2001

## 9. Topical Outline:
a. Overview of Wireless Networks
b. Fundamentals of Cellular Networks (frequency reuse, interference, mobility management)
c. Cellular Networking (First Generation AMPS, Second Generation GSM/IS-41/IS-95)
d. Next Generation Cellular Networks (GPRS, EDGE, UMTS, Third Generation and Beyond)
e. Wireless Local Area Networks
f. Wireless Personal Area Networks
g. Mobile IP
h. Ad Hoc Networks
i. Wireless Sensor Networks
j. Wireless Mesh Networks

## CONSULTATION ON LIBRARY HOLDINGS

**To:** Alison Bradley, Engineering Librarian (adbradle@uncc.edu)
**From:** Jiang (Linda) Xie (linda.xie@uncc.edu)
**Date:** September 28, 2010
**SUBJECT:** ECGR 6188/8188 CONSULTATION ON LIBRARY HOLDINGS

**PROPOSED CATALOG COPY:** ECGR 6188. **Fundamentals of Wireless Systems and Protocols**
**(3).** Prerequisite: Graduate standing and a prior course in data communications or computer networks. The course provides an overview of different wireless and mobile network standards and systems. It covers the distinct characteristics of these wireless systems that require a fundamental redesign of protocols at layer 2 to layer 4 of the network protocol stack. Protocols for medium access control, routing, and reliable transport, in addition to middleware and applications custom-made for wireless networks will be dealt with. Credit will not be given for ECGR 6188 where credit has been given for ECGR 8188. *(Fall) (Evening)*

**Summary of Librarian's Evaluation of Holdings:**

**Evaluator:** Alison Bradley          **Date: 9/28/10**

**Please Check One:**

| | |
|---|---|
| Holdings are superior | |
| Holdings are adequate | __x__ |
| Holdings are adequate only if Dept. purchases additional items. | |
| Holdings are inadequate | |

**Comments:**
Library holdings are adequate to support student research in this area. The catalog lists 443 items with the LC subject heading Wireless Communication Systems, 144 with Computer Network Protocol, and 248 with Mobile Communication Systems. We also provide access to relevant databases and online journals such as IEEE Xplore, ACM Digital Library, Electronics & Communications Abstracts, and Computer and Information Systems Abstracts. For students whose research interests require access to additional material, we are able to borrow materials from other libraries through various consortial agreements.

*Alison Bradley*

_____
**Evaluator's Signature**

9/28/10

_____
**Date**