Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete the Coordinator Form on page 2, if changes in this course will affect other units.

Please indicate:  ____X__ NEW  ____ MODIFY  ____ DELETE

Local Unit: ECE/TCOM  
Graduate Council Approval Date:

Course Abbreviation: TCOM  
Course Number: 606

Full Course Title: Advanced Mobile Communications Systems

Abbreviated Course Title (24 characters max.): Advanced Mobile Systems

Credit hours: 3.0  
Program of Record: MS in Telecommunications

Repeatable for Credit?  
_D=Yes, not within same term  
_T=Yes, within the same term  
_N=N=Cannot be repeated for credit

Activity Code (please indicate):  ____X__ Lecture (LEC)  ____ Lab (LAB)  ____ Recitation (RCT)  
____ Studio (STU)  ____ Internship (INT)  ____ Independent Study (IND)  
____ Seminar (SEM)

Catalog Credit Format: 3.0: 3.0: 0  
Course Level: GF(500-600) ____X__ GA(700+)

Maximum Enrollment: 30  
For NEW courses, first term to be offered: Spring 2005

Prerequisites or co-requisites: prerequisite course TCOM 552

Catalog Description (35 words or less) Please use catalog format and attach a copy of the syllabus for new courses: Advanced global navigation satellite systems, such as the US GPS, the European Galileo, and the Russian GLONASS. System description; design of wide area augmentation system (WAAS in US, EGNOS in Europe, and MSAS in Japan).

For MODIFIED or DELETED courses as appropriate:

Last term offered:  
Previous Course Abbreviation:  
Previous number:

Description of modification:

APPROVAL SIGNATURES:

Submitted by:  ____Jeremy Allnutt____________ email: _jallnutt@gmu.edu_

Department/Program:  ____ECE/MS in Telecommunications __ Date: _Oct. 18 th, 2004_

College Committee:  
Date: __Oct. 21 st, 2004_

Graduate Council Representative:  
Date: __________________
GEORGE MASON UNIVERSITY
Course Coordination Form

Approval from other units:

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

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Graduate Council approval: ______________________________________________ Date: ____________
Graduate Council representative: __________________________________________ Date: ____________
Provost Office representative: ____________________________________________ Date: ____________
SCHOOL PROPOSAL TO THE GRADUATE COUNCIL
BY
SCHOOL OF INFORMATION TECHNOLOGY AND ENGINEERING

1. CATALOG DESCRIPTION
   (a) TCOM 606 Advanced Mobile Communications Systems (3:3:0)
   (b) Prerequisites: TCOM 552
   (c) Catalog Description:
       *Introduction to post-second generation cellular systems; benefits and features of third
        generation (3G) systems and personal communications services (PCS); review of air interface
        standards and transmission technologies for mobile and quasi-stationary wireless systems,
        including cellular networks, satellite networks, indoor systems (Wi-Fi, Personal Local Area
        Networks, Orthogonal Frequency Multiplexing, Ultra Wide Band technologies); review of
        network control strategies; investigation of user authentication, privacy, and data and voice
        encryption aspects. Evolving technology, analysis of competing multiple access methods,
        transition plans, and backward compatibility between 2G, 2½G, 3G, and future systems, with
        possible fallback plans.*

2. JUSTIFICATION
   (a) Course Objectives
       This course is intended to provide both a broad background to the future terrestrial and satellite
       mobile radio alternatives and an in-depth study of the major technological proposals for post-2G
       cellular systems, indoor wireless LANs, and broadband initiatives. Students will obtain an
       appreciation for the difficulties in gaining approval for a universal standard by which competing
       systems may interoperate with each other over a standard air interface in both a broadband
       cellular based terrestrial system and competing indoor proposals for personal local area
       networks. It will briefly cover the early development of post 2G cellular concepts and then
       provide students with a detailed knowledge of the major air interface standards and the
       competing multiple access methods being proposed for a variety of mobile and quasi-mobile
       systems. A major element of the course will be a term project to allow the students to investigate
       one aspect of advanced mobile communications in more depth than the course will cover.
   (b) Course Necessity
       The proposed course is one of a group of elective courses that would be made available in
       Module 3 (Wireless Communications) of the MS in Telecommunications for those students who
       wish to study wireless communications in depth. The course builds on the fundamental course in
       digital communications (TCOM 551) and the introductory course in mobile communications
       (TCOM 552). The current trend to move from a wired environment to a wireless environment
       throughout all aspects of communications (commercial, educational, and in-home) has led to
       rapid advances in technology development and a variety of competing proposals to satisfy the
       wireless system demand. This course is required to equip students with the knowledge to
       understand and develop such systems.
   (c) Relationship to Existing Courses
       The course is a natural progression for students to take following the introduction to mobile
       communications (TCOM 552). To enable this logical progression, TCOM 552 will be offered in
       the fall semesters and this course will be offered in the spring semesters. Timing and related
       telecommunications background required for this course would be obtained through TCOM 500,
       501, and 502. TCOM 551 Digital Communications and TCOM 552 Mobile Communications
       systems provide the technology and link calculation background that would be used in this
       course. No single course matches the proposed course in its detailed content, although there are
       introductory elements in TCOM 552. ECE courses ECE 630 and ECE 732 provide a much more
in depth, theoretical understanding of the digital techniques and mobile communications design approaches than do TCOM 551 and TCOM 552, respectively, and also capture elements of this course. It is also likely that ECE 742 will address a number of the emerging technologies, such as Ultra Wide Band and Orthogonal Frequency multiplexing, as part of the topic of high-speed networks.

3. APPROVAL HISTORY
ECE Department Date: October 18th, 2004
IT&E Graduate Committee Date: October 21st, 2004
IT&E Dean Date:

4. SCHEDULING
Every spring semester, starting spring 2005.
Proposed Instructors: Dr. Peter Paris, Dr. Brian Mark, Dr. Zoran Kostic, and Dr. Jeremy Allnutt and other qualified faculty, and by qualified adjunct professors.

5. COURSE OUTLINE

Week 1
Introduction
• Overview of wireless communication systems
• Paging and 1st generation cellular services
• Transition from analog cellular to digital cellular (US vs. European experience)
• Features and services of 2G, 2.5G, 2.75G, and 3G systems (i.e. advanced calling services, mobile data, mobile internet, and etc.).
• Present project outlines.

Week 2
Wireless Communication Concepts
• Propagation models; Multiple access methods; Wireless layer protocols; Antennas

Week 3
Cellular System Concepts
• Market and technology overview; Cell splitting; Cellular system economics, cellular design concepts; intersystem operation and roaming

Week 4
Personal Communications Services
• Overview; PCS philosophy; Advanced calling services and features; Worldwide spectrum allocations and implementations

Week 5
2nd Generation FDMA/TDMA Cellular Systems
• GSM Part 1 – over-the-air design concepts

Week 6
2nd Generation FDMA/TDMA Cellular Systems
• GSM Part 2 – Handoff; Roaming; Security
Week 7
Course Review
MID-TERM EXAM

Week 8
CDMA Cellular Systems
- CDMA concepts
- IS-95 (CDMAone) Part 1 – over-the-air design concepts

Week 9
CDMA Cellular Systems
- IS-95 (CDMAone) Part 2 – Handoff; Power Control; Security
- CDMA2000

Week 10
Transition to Third Generation GSM
- GSM data service evolution from circuit-switched to packet-switched, packet switching center, Mobile IP
- SMS, MMS, E-SMS
- GPRS
- EDGE (EGPRS)

Week 11
WCDMA – The move to 3rd Generation GSM
- Over-the-air concepts; Handoff; Power Control; Security

Week 12
Technology Survey of Land Mobile Satellite Systems
- LEO, MEO, and GEO
- Inmarsat; Globalstar; Iridium; Thuraya; ACES

Week 13
Wireless LANs: IEEE 802.11b and g
- Introduction; over-the-air concepts; security

Week 14
Project presentations

Week 15
Final exam

(a) Required text

Supplementary texts

(b) Student Evaluation Criteria

Homework 15%
Mid-term exam 25%
Project 25%
Final 35%