George Mason University
Graduate Course Approval/Inventory Form

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: 603

Full Course Title: Standards for Advanced Optical Networks

Abbreviated Course Title (24 characters max.): Standards for Adv Op Net

Credit hours: 3  Program of Record: MS in Telecommunications

Repeatable for Credit?  ___ D=Yes, not within same term  Up to hours ___ T=Yes, within the same term  Up to hours  ____ N=Cannot be repeated for credit

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

Catalog Credit Format  3 : 0 : 0  Course Level: GF(500-600)  ____ GA(700+)  ____

Maximum Enrollment: 25  For NEW courses, first term to be offered: Fall 2004
Prerequisites or corequisites: TCOM 503 and TCOM 513

Catalog Description (35 words or less) Please use catalog format and attach a copy of the syllabus for new courses.: Current and upcoming global optical networking standards; SONET and evolution to next standard; Automatic Switched Optical Network standard of ITU and Generalized MPLS of IETF; G. Etna standards at ITU and 802.XX standard of IEEE.

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: _June 2003_______
College Committee:  __________________________________ Date: __________________
Graduate Council Representative:  __________________________________ Date: ______________
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.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Head of Unit’s Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 603 Advanced Optical Networks (3:0)
(b) Prerequisites: TCOM 503 and 513
(a) Catalog Description:
Introduction of Current and Upcoming Global Optical Networking standards and technologies. Course will introduce the currently deployed Optical Networking technologies, primarily SONET, and proceed with the evolution of the next generation Optical Networks as envisioned by the various standards bodies, as implemented by major vendors, and as projected in advanced laboratory work. Standards work on Automatic Switched Optical Networks (being worked at ITU) will be covered along with Generalized Multi-Protocol Label Switching (being worked at IETF), and its generalization Multi-Protocol Lambda Switching. The course will also cover the evolution of Ethernet from Local Area Networking to Wide Area Networking, including 1 and 10 Gigabit Ethernet as implemented in optical networks, and standards including G.Etna that is being developed at ITU and T1.X1 committee and 802.xxx developed by IEEE. It will also look at future IP implementations in all-optical networks, and all-optical switching technologies.

2. JUSTIFICATION
(a) Course Objectives:
This course is intended to provide an overview of advanced optical network technologies and standards. It will cover how the present telecommunications and data networks are evolving to cater to future requirement and services. It will give the students a good insight into the way the Optical Networks are designed and implemented.
(b) Course Necessity:
The proposed course is one of a group of elective courses that would be made available in Module 1 (Network Technologies) and Module 2 (Network Applications) of the MS in Telecommunications for those students who wish to study network technologies and applications in depth. Optical communications networks are a growing element of the networking infrastructure of both traditional core communications and Internet traffic.
(c) Relationship to Existing Courses:
The course is a natural progression for students to take following TCOM 503/513 that introduces the concepts of Optical Communication Networks. Some advanced topics courses in ECE cover some areas of this course.

3. APPROVAL HISTORY
ECE Department Date: June 2003
IT&E Graduate Committee Date: September 2003
IT&E Dean Date: September 2003

4. SCHEDULING
Every fall semester, starting fall 2003 and every Fall thereafter.
Proposed Instructors: Dr. Thomas Fowler and other faculty and adjunct faculty who are qualified in this area
5. COURSE OUTLINE

(a) Syllabus
The course will cover the following elements:
   (a) Overview of optical networking
       i. Transport, switching
       ii. Layer 2 & layer 3
       iii. Switching, routing
       iv. Impact of optical transport
       v. OEO vs All-optical
   (b) Principal technologies
   (c) OEO: SONET
   (d) Optical transport networks
   (e) MPLS, MP2.S
   (f) Ethernet over optical networks
   (g) IP over optical networks
   (h) All optical networks

The week-by-week outline is given below.

Week 1
Introduction and overview of optical networking: Review of principles of optical networks, network types, OSI layers, OEO and all-optical networks

Week 2:
How SONET works, the evolution of SONET, SONET architecture and Protocols, SONET payloads, SONET synchronization and Timing

Week 3
SONET Network Equipment, SONET OAM&P (Operations administration, maintenance and provisioning),

Week 4
SONET Rings, SONET services

Week 5
Overview of Optical Transport Networks, Detailed understanding of G.709, digital wrapper

Week 6
Mapping of diverse services over G.709

Week 7
Automatic Switched Optical Networks, architectural details

Week 8
Overview of Generalized Multi-Protocol Label Switching

Week 9
Global Optical Ethernet; 1 Gig and 10 Gig Ethernet

Week 10
Ethernet LAN, MAN, WAN
Week 11
IP and optical networks

Week 12
All optical switches and networks

Week 13
Deployment trends; business case for optical networks; last mile challenge

Week 14
Future directions of Optical Networking Standards

(b) Reading and reference material

Contributions available on www.ietf.org and www.t1.org

Others to be posted.

(c) Student Evaluation Criteria

Homework: 20%
Project: 40%
Final: 40%