1.0 INTRODUCTION

Two new TCOM certificate programs are proposed: Telecommunications Forensics and Security (TFAS) and Advanced Network Protocols for Telecommunications (ANPT) within the MS in Telecommunications degree program. These certificate programs incorporate new, advanced level courses that have been designed for modules 1, 2, and 3 of the regular MS in Telecommunications degree, and they lend themselves for further development into concentrations within either an MS or Ph.D. program.

2.0 BACKGROUND

There are currently three, 15-credit hour certificates offered within the MS in Telecommunications program. These are (a) Networking Technologies and Applications; (b) Wireless Communications; and (c) Telecommunications and Systems Modeling. These certificates have been popular, and approximately 33% of the graduating students have also included a certificate program within their degree program. By far the most popular has been the Network Technologies and Applications certificate, reflecting the trend of most MS in Telecommunications students to opt for most of their courses in specialty modules 1 (Network Technologies) and 2 (Network Applications). In view of the popularity of the courses in modules 1 and 2, and the students’ requests for additional, more advanced, courses in these areas, a suite of new networking and protocol courses has been developed. These proposed new courses, TCOM 609 IGP (Interior Gateway Protocols), TCOM 610 BGP (Border Gateway Protocols), and TCOM 611 MPLS (Multi-Protocol Label Switching) are the subject of separate course proposals that accompany this proposal for two new certificates.

In addition to the strong interest of students in advanced networking protocols, we have seen strong registrations whenever we have offered courses that dealt with security aspects. The first two, 1.5 credit hour, courses developed in this area were TCOM 548 Security Issues in Telecommunications and TCOM 556 Cryptography and Network Security. This pair of courses was first offered in spring 2001 and they have been very popular. These courses were followed by a complementary 3 credit hour course TCOM 562 Network Security Fundamentals in 2003. TCOM 548/556 and TCOM 562 form a logical spring/fall offering sequence. All three courses have drawn strong registrations, as did an advanced secure networking course offered in spring 2004. In all these courses, the emphasis has been on the telecommunications and networking aspects rather than on coding and processing hardware cryptography elements that are the strengths of the INFS and ECE programs.

Security issues have now moved well beyond just protecting the links and networks and into the area of forensics: the search for clues following a successful cyber intrusion. To help address this area, two new courses have been developed for the TCOM program,
TCOM 660 Network Forensics and TCOM 661 Digital Media Forensics, to deal with the forensics issues in telecommunications. A third course, TCOM 662 Advanced Secure Networking, complements the 500 level security courses and links to the two forensics courses. With this set of security and forensics courses, some in place and others in the proposal stage, it seems appropriate to offer a Telecommunications Forensics and Security certificate within the MS in Telecommunications program. The proposed new courses TCOM 660, TCOM 661, and TCOM 662 accompany this proposal for two new certificates in the TCOM program.

This document sets out the proposals for two, 15-Credit hour certificates in the MS in Telecommunications Program: Advanced Networking Protocols for Telecommunications (ANPT) and Telecommunications Forensics and Security (TFAS). The proposed ANPT and TFAS certificates build on a set of new courses that have been developed over the last year, or are in the proposal stage, to allow students in the MS in Telecommunications program to be able to select a concentration in advanced networking protocol or forensics and security. Most of these new courses have been taught at least once as advanced topics courses. Students will be allowed to take the ANPT or TFAS certificates as stand-alone items or as part of their degree program. For the former, they will be required to enroll in a certificate program; for the latter, since they are already enrolled in a degree program, they need only apply for the appropriate certificate after they have satisfied its requirements. Students enrolled in the ANPT or TFAS certificates may transfer into the MS in Telecommunications degree program at any point, and will be able to transfer up to 12 credit hours of certificate courses currently completed in the ANPT or TFAS certificate programs, subject to the usual rules of a B minimum course grade on transfer.

3.0 JUSTIFICATION

The M.S. in Telecommunications program has been evolving rapidly over the last four years since its inception in 2000. Students have, by and large, been concentrating on the networking and wireless modules. Students have also been drawn in increasing numbers to courses that provide insight into telecommunications security issues. Special Topics and Advanced Topics courses have been offered over the last two years on IGP, MPLS, and Advanced Secure Networking, with excellent results. These advanced topics courses have therefore been developed into new course proposals so that these courses can be offered on a regular basis within a structured program. The new course proposals, TCOM 609 Interior Gateway Protocols, TCOM 610 Border Gateway Protocols, TCOM 611 Multi-Protocol Label Switching, TCOM 660 Network Forensics, TCOM 661 Digital Media Forensics, and TCOM 662 Advanced Secure Networking form a companion set to this proposal for two new certificates that embrace these topics. The intent of these new certificates is to permit students to concentrate their elective element in the MS in Telecommunications program in the area of advanced networking protocols for telecommunications (ANPT) or telecommunications forensics and security (TFAS) so that they have substantial knowledge of the chosen certificate area. For degree-seeking students, the ANPT or TFAS certificates would form the specialty module, elective element of their program.
3.0 PROPOSED TWO CERTIFICATES

3.1 Advanced Networking Protocols for Telecommunications (ANPT)

*Mandatory Core Courses (9 credits from 12 credits)*

- TCOM 609 (*) Interior Gateway Protocols (IGP)
- TCOM 610 (*) Border Gateway Protocols (BGP)
- And either TCOM 509/519 (#) Internet Protocols/Voice over IP
  or TCOM 515 Internet Protocol Routing

*Elective Courses (6 credits from 12 credits)*

- TCOM 509/519 (**) Internet Protocols/Voice over IP
- TCOM 515 (**) Internet Protocol Routing
- TCOM 611 (*) Multi-Protocol Label Switching
- TCOM 662 (*) Advanced Secure Networking

(#) TCOM 504 Asynchronous Transfer Mode may be substituted for TCOM 519
(*) These courses are in the process of being approved in parallel with the certificates
(**) TCOM 509/519 or 515 cannot be taken twice for credit. Whichever course(s) are taken in the core element cannot be taken again in the elective element.

3.2 Telecommunications Forensics and Security Certificate (TFAS)

*Mandatory Core Courses (9 credits from 15 credits)*

  or TCOM 515 Internet Protocol Routing
- TCOM 562 Network Security Fundamentals
- And either TCOM 660 (*) Network Forensics
  or TCOM 661 (*) Digital Media Forensics

*Elective Courses (6 credits from 12 credits)*

- TCOM 660 (**) Network Forensics
- TCOM 661 (**) Digital Media Forensics
- TCOM 662 (*) Advanced Secure Networking
- ISA 662 Informations Systems Security (formerly INFS 762)

(*) These courses are in the process of being approved in parallel with the certificates
(**) TCOM 660 and TCOM 661 cannot be taken twice for credit. If either course is taken in the core element, it cannot be taken again in the elective element.
NOTES:
(a) Students must earn a B grade, or above, in each course to allow those courses to transfer from a certificate program to a degree program, if the student first enrolls in the certificate program.
(b) Students are permitted to carry one C grade in the certificate program, as per the George Mason University academic rules.
(c) Students, with prior permission, may take substitute courses, should their required course not be available in that particular semester to allow their certificate program to be completed on schedule.
(d) Only 3 credit hours may be transferred into a GMU graduate certificate program from another university.

4.0 ADMISSION REQUIREMENTS
The certificate programs *Advanced Networking Protocols for Telecommunications* (ANPT) and *Telecommunications Forensics and Security* (TFAS) are open to all students who hold a bachelor’s degree from an accredited university and meet the admissions requirements for the MS in Telecommunications.

5.0 REGISTRATION PROCEDURES
5.1 New Students
New students who are interested in the certificate programs should apply for admission in either degree or non-degree status. A box on the admission forms permits the certificate option to be selected.

5.2 Students already enrolled in the MS in Telecommunications Programs
Students who are currently enrolled in the MS in Telecommunications program and who wish to take advantage of the ANPT or TFAS certificates within their own program while pursuing their master’s degree may complete an application for a certificate once the appropriate fifteen credit hours have been satisfied. Students who have taken advantage of any of the accelerated MS in TCOM/BS programs may count graduate level courses taken towards their master’s degree while in undergraduate status towards their certificate, provided those courses meet with the grades noted earlier (i.e. no more than one C grade for a course in the certificate program).

5.3 Transfer Students
5.3.1 Students may transfer one course earned at another university into this certificate program. The usual rules of transfer apply in that the course being transferred must have been passed with a B grade, or higher.

5.3.2 Students who have been admitted as certificate-seeking students may apply to transfer to a regular masters degree in the MS in Telecommunications program at any time. If they are admitted into the regular masters program, a maximum of 12 credits may be carried into that regular masters program from their certificate program. Such students, like all students in the regular MS in Telecommunications programs, may apply for the appropriate certificate at any time they have satisfied the fifteen-credit requirement of that certificate.