Graduate Council Curriculum Subcommittee
October 17, 2007
1:30 p.m., 327 MH

Agenda

1. Welcome and call to order
2. Approval of minutes from October 2, 2007
3. Addition of an M.S. in Digital Forensics, College of Engineering and Computer Science
4. Announcements and adjournment
5. Next meeting: October 30, 2007, 12:30 p.m., MH 243

Florida Board of Governors

Request to Offer a New Degree Program

University of Central Florida
University Submitting Proposal

Spring 2008
Proposed Implementation Date

Engineering & Computer Science
Name of College or School

Electrical Engineering and Computer Science, Engineering Technology
Name of Department(s)

Digital Forensics
Academic Specialty or Field

Master of Science Digital Forensics, CIP Code 11.0199
Complete Name of Degree
(Include Proposed CIP Code)

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial resources and the criteria for establishing new programs have been met prior to the initiation of the program.

Date Approved by the University Board of Trustees	President	Date
Signature of Chair, Board of Trustees — Date	Vice President for Academic Affairs	Date

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE).

Implementation Timeframe	Projected Student Enrollment (From Table 1)		Projected Program Costs (From Table 2)		
	HC	FTE	Total E&G Funding	Contract & Grants Funding	E&G Cost per FTE
Year 1	15	4.22	$71,294	$18,000	$16,894
Year 2	48	14.88			
Year 3	80	24.89			
Year 4	90	29.05			
Year 5	100	33.36	$208,684	$18,000	$6,256

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Note: This outline and the questions pertaining to each section must be reproduced within the body of the proposal to ensure that all sections have been satisfactorily addressed.

Introduction

I. Program Description and Relationship to System-Level Goals

A. Briefly describe within a few paragraphs the degree program under consideration, including (a) level; (b) emphases, including concentrations, tracks, or specializations; (c) total number of credit hours; and (d) overall purpose, including examples of employment or education opportunities that may be available to program graduates.

This proposal requests approval of a Master of Science in Digital Forensics degree that will prepare students to analyze computers and other digital media to determine if they have been used for illegal or unauthorized activities or are the media and victims of a malicious attack.. This proposal describes an interdisciplinary effort that brings together computer technology with criminal justice to prepare students for work in the emerging field of digital forensics. The curriculum will be delivered mostly online to working professionals and will be built on industry-driven competencies as defined by the Technical Working Group for Education and Training in Digital Forensics, sponsored by the National Institute of Justice. The program will have an industry advisory board. In addition, students will prepare a portfolio and participate in an internship if they have not had previous work experience. New laws, including the Sarbanes-Oxley and Gramm-Leach-Bliley Acts, mandate that businesses keeping electronic records must be capable of recovering lost information and accounting for electronic transactions, so the need for individuals with training in digital forensics will continue to increase.

The proposed 30-credit hour, Master of Science in Digital Forensics degree is composed of two tracks: Professional and Science/Computing. These tracks use common core courses and tailored electives to achieve common educational goals with different focus areas. The Professional Track is directed toward current professionals in the field, who will pursue the degree as part-time students, and those who would like to gain the knowledge and skills required to work as an examiner in the field. The Science/Computing Track is directed toward those with an interest in the scientific applications and research in the field. These students will be full-time, conducting research with faculty resulting in a thesis, and may be interested in pursuing a doctoral degree in a related field or a law degree afterward. The MS degree in Digital Forensics addresses a local, state and national need for state-of-the-art education in the area of digital forensics.

The proposed degree is a collaborative effort between various UCF academic departments – Engineering Technology, Electrical Engineering and Computer Science, Forensic Science of Chemistry, Criminal Justice and Legal Studies – and the National

Center for Forensic Science. The National Center for Forensic Science is a State of Florida Type II Center and a member of the National Institute of Justice Forensic Resource Network of the Department of Justice, serving the needs of state and local law enforcement and forensic scientists.

UCF has offered a Graduate Certificate in Computer Forensics since the fall of 2001. There have been 70 graduates of the program as of the end of spring 2007. The Graduate Certificate in Computer Forensics is composed of five courses (15 hours) in computer science, forensic science of chemistry, and digital media. This proposal requests an additional 15 credit hours of coursework based on existing and new courses to create a curriculum for an MS degree in Digital Forensics. The purpose of the Master of Science in Digital Forensics degree is to provide a comprehensive, professional, high-quality program for students wishing to become professionals and researchers in the new field of digital forensics.

There is currently only one other master's degree in digital forensics in the United States, and a handful of digital forensics undergraduate programs, none exist in the state of Florida. Establishing a master's degree in digital forensics at UCF would place UCF in a unique position to become a leader in the field of digital forensics.

What is "Digital Forensics"?

Forensics, or forensic science, is the application of science to questions that are of interest to the legal system. Digital forensics is the analysis of computers and other types of digital media to determine if they have been used for illegal or unauthorized activities, or if they are the "victims" of illegal attacks. Business and industry use digital forensics to gather internal information regarding intellectual property theft, fraud, network and computer intrusions, and unauthorized use of computers and other digital media including fax machines, answering machines, personal data assistants, cell phones, etc., to assist in employee termination, and both civil and criminal litigation. Law enforcement agencies use digital forensics to gather digital evidence for a variety of crimes including child pornography, fraud, terrorism, extortion, cyberstalking, money laundering, forgery, and identity theft. The military and government intelligence agencies use digital forensics to gather intelligence information from computers captured during military actions.

Positions for Graduating Students

One may ask: "What are the kinds of jobs that could be available for someone with this master's degree, and in what types of activities would a graduate of this program be involved?" A typical position for someone with a degree in digital forensics would be a *digital forensics examiner*. Such positions are available in law enforcement, business/industry, government, the military, and the intelligence community. Examiners are responsible for the identification, collection, and examination of digital media, written reports of their findings and presentation of these findings in court. For instance, an examiner working in law enforcement may be responsible for identifying and recovering from a computer or other digital media such items as fake driver's license graphics, pornographic images of children, or documents used for credit card fraud or identity theft. An examiner in industry may be responsible for identifying and recovering stolen

intellectual property (e.g., patents) from a company's computer. An examiner in the military or intelligence services may be responsible for identifying and recovering documents and emails that contain plans for poisoning a major water system from computers seized from a terrorist organization.

In each of the scenarios described above, the examiner would begin by identifying all digital media at the suspect's home or place of work that has the potential to store evidence, including computer hard drives, cell phones, USB/thumb drives, CDs, floppies, digital cameras, game consoles, etc. Once identified, the examiner performs a forensically sound collection of the media, making sure not to change any facet of the evidence (such as time and date stamps or the actual contents). Evidence collection may occur at the scene by forensically copying the digital data, or at the examiner's laboratory if the media is seized.

Back at the digital forensic laboratory, the examiner would use special digital forensics hardware and software to examine the evidence. Common tasks for examiners include recovering deleted files and slack space; using digital fingerprints to identify files; searching for specific text on hard drives; searching for specific file names; identifying times and dates associated with files; recovering and interpreting computer log files; identifying mislabeled files; and correlating information from multiple sources (such as servers, routers, and wireless access points) to determine the source of a network intrusion.

An examiner often must improvise to solve a problem because a commercial software tool may not be available for the task at hand. In this case the examiner may need to develop a software tool using a computer scripting language in order to solve the problem. Alternatively, the examiner may download from the Internet a freeware or open source tool, which may then be used to solve the problem. It is crucial that the tools downloaded from the Internet be scientifically validated. (Validation is a systematic procedure to determine whether software does what its makers claim it does, and does not do anything that may adversely affect the integrity of the evidence.) Thus it is important that the examiner understand the correct scientific procedures for the verification and validation of software tools, whether those tools are commercial, freeware or open source, or tools the examiner created of his or her own volition.

In this example, the examiner might first recover any deleted files in case the suspect attempted to hide the fruits or tools of the crime; search the media for specific keywords contained in the file to determine if the classified file exists on the media; identify and recover any encrypted files, which the suspect may have used to hide crime-related data; decrypt any encrypted files found using special software; and create a digital fingerprint of any recovered files that are of probative value to the case. Finally, the examiner would write a technical report based on his or her findings that describe the technical procedures used, as well as a description of any potential evidence located.

Examiners often testify in court regarding the results of an examination. It is common for prosecutors and attorneys to ask the court to admit the examiner as an expert witness to the case. An examiner's status as an expert witness is determined by whether the examiner's education, training, and experience are commensurate with those of an expert

in the field, and this status is at the discretion of the judge in the case. Expert testimony allows the expert to offer their opinions and this requires very specific skills to be performed correctly. Specifically, the ability to communicate very technical details to a non-technical jury is considered a prized skill, as is being able to use visual aids to explain technical details to a lay jury. These are skills not taught in any typical university course; thus there is a need for courses that cover these practical skills so that students are prepared once they graduate.

As the examples above illustrate, a professional digital forensics examiner must exhibit a myriad of skills, ranging from understanding computers and networks at a very technical level, to understanding the legal system and current laws pertaining to computers, communications, networks, and search and seizure. Moreover, a professional examiner must have excellent communication skills, in both oral and written forms. We believe that there is no other profession that requires skills so varied as those required by a digital forensics examiner.

Digital (computer) forensics is a scientific discipline. It has its roots in the law, as well as in computer and network security, which has been an important field since the very beginning of computer science. The security subsystem is a critical component of any computer operating system, such as Windows, Linux, or MAC OS. The Internet that connects most computers and workstations in use today only made security even more critical in an interconnected society. Network vulnerability analysis, incident response, malicious code prevention and detection, network firewalls and efficient processing of large volumes of digital data are all challenging issues faced by professionals as well as researchers in the field of digital forensics. The proposed Master of Science in Digital Forensics degree provides a unique opportunity for students to be engaged with these issues by developing tools, validating them and applying them in the field. The degree would also allow the students to further their graduate education in a related field such as computer science, cyberlaw, or information security. The increased maturity of the digital forensics field is evident in the publication of a new journal, *IEEE Transactions on Information Forensics and Security*, which published its first issue in January 2006. Existing journals related to digital forensics include the *Journal of Digital Forensics Practice* (first issue in 2006), *Digital Investigations* (first issue in 2004),, and the *International Journal of Digital Evidence* (first issue in 2002, an online publication).

Graduates of the Master of Science in Digital Forensics program will possess the necessary skills to work in government or private forensics laboratories or as industry experts in digital evidence, such as in corporate IT departments. In the private sector, typical jobs include digital forensics examiner, investigator, or analyst; private consultant; network security administrator; trainer; software engineer developing forensic applications; and instructor/professor in a forensic science program or computer/information security program.

The proposed master's degree in Digital Forensics is built upon the existing Graduate Certificate Program in Computer Forensics, which UCF started in the fall of 2001. Students of the certificate program are typically IT professionals in the private sector, law enforcement officers, or recent college graduates from related disciplines. There are many success stories reported by the alumni of the certificate program. One of the first

students that completed the Graduate Certificate in Computer Forensics is now a computer forensic investigator with the Orange County Sheriff's Office. Upon completion of the Certificate program, he formed a digital evidence laboratory for his department. A 1999 graduate from the University of Central Florida who received the Graduate Certificate in Computer Forensics worked at the National Center for Forensic Science for three years, and was recently hired in a computer forensic position in Washington, DC with a salary of $90,000. A 2005 graduate of the certificate program was hired by the Ohio State Attorney's office as a forensic examiner after competing against 30 other applicants. At an October 2005 meeting in Washington, the Director of the Drug Enforcement Agency mentioned that three of his recent hires were graduates of the UCF Graduate Certificate program in Computer Forensics. A number of Federal forensic managers have expressed an interest in a graduate digital forensics program, including a 2004 graduate of the certificate program who now works in the FBI CART (Computer Analysis and Response Team) unit near Washington, DC. There has been a broad interest in UCF's graduate computer forensics courses. For example, one of the first courses in the certificate program, CGS 5131 (Computer Forensics I), drew over 30 students in the fall semester of 2006; many of them expressed interest in pursuing a master's degree if it becomes available. Over 15 students from an undergraduate course computer forensics course, CET 4885, Digital Investigative Technologies, have expressed an interest in applying for the master's degree as well.

Forensic Sciences at UCF

UCF has a long and distinguished tradition in its forensic science program housed within the Department of Chemistry, with areas of emphasis mainly in physical trace evidence and DNA biochemistry. Since the fall of 2001, the forensic science program, along with Computer Science and the Digital Media Program, established a Graduate Certificate in Computer Forensics, sponsored by the National Center for Forensic Science of UCF. The Graduate Certificate in Computer Forensics program provides a unique opportunity for graduate training to professionals and paraprofessionals who deal directly or indirectly with digital evidence, including law enforcement investigators, forensic laboratory analysts, lawyers and judges, and corporate computer security specialists. The annual enrollment to the Graduate Certificate in Computer Forensics program is about 30 students. A total of 70 students completed the certificate program during the period from 2002, when the first students graduated, through spring of 2007. Students of the Graduate Certificate in Computer Forensics program come from a variety of educational backgrounds including computer science and engineering, information systems, and criminal justice. Many of the students expressed an interest in pursuing graduate degrees to further their knowledge and further explore challenging scientific or legal issues arising in digital forensics.

Based on UCF's strong academic programs and its close ties to the National Center for Forensic Science and to the law enforcement and forensic science communities, UCF is in a unique position to initiate a credible, interdisciplinary graduate program that offers a master's degree in digital forensics.

Digital Forensics Faculty at UCF

UCF is singularly qualified to offer a master's degree in Digital Forensics given the current depth and breadth of expertise of its faculty. Dr. Philip Craiger has a dual appointment at UCF: He is the Assistant Director for Digital Evidence at the National Center for Forensic Science, and an Assistant Professor in the Department of Engineering Technology. He is also an Associate Member of the Academy of Forensic Sciences. FBI Special Agent (Retired) Mark Pollitt, M.S., is the former Director of the FBI's Computer Analysis and Response Team, former Director of the FBI's Regional Computer Forensic Laboratories (RCFL), and a Member of the Academy of Forensic Sciences. Mr. Pollitt has a dual appointment with NCFS and the Department of Engineering Technology. Carrie Whitcomb, M.S.F.S, is the Director of the National Center for Forensic Science, a Fellow in the Academy of Forensic Sciences, and a leader in the field of digital forensics. Ms. Whitcomb is the former Director of the U.S. Postal Inspection Service Forensics Laboratory, in Washington, DC. The US Secret Service has a working Digital Evidence laboratory within NCFS to assist UCF police, and state and local law enforcement.

Dr. Sheau-Dong Lang has been serving as the program coordinator for UCF's Graduate Certificate in Computer Forensics since its inception in the fall of 2001. Dr. Lang regularly teaches two UCF graduate courses in computer forensics, and does volunteer work with the computer crime squad at the Orange County Sheriff's Office. Dr. Ratan Guha, Dr. Damla Turgut and Dr. Cliff Zou, members of the faculty of Electrical Engineering and Computer Science who regularly teach and conduct research on topics related to computer and network security, will contribute to developing new elective courses for the proposed master's degree in Digital Forensics. Dr. Guha is the Principal Investigator for several research projects sponsored by federal agencies for research and training work related to parallel and distributed processing, security, and simulation systems. Dr. Zou is the Principal Investigator of an NSF Cyber Trust Grant (2006 – 2009) on Botnet research. Dr. Damla Turgut is a Co-PI of an NSF grant (2007 – 2008) for research on agent-based team learning algorithms.

Online Delivery

All required courses for the Professional Track will be offered online in order to reach a broader and more diverse student population. Online students need to show evidence of adequate access to computing and networking facilities, and must have sufficient computer background through education and/or work experience. These students may complete the entire degree online by choosing proper elective courses from the proposed curriculum. Web-based online courses allow students from any location to participate, regardless of geographic proximity to UCF. A second advantage is that online courses offer flexibility for those individuals who are unable to attend traditional classroom lectures. The flexibility offered by online courses will facilitate completion of the degrees, and also allow us to reach a broader and more diverse population of students. We expect the degree to be fully on-line within two years. Starting in the fall semester of 2006, the courses of the graduate certificate program in computer forensics have been available via online delivery to qualified students.

Assuring Program Quality

The Master of Science in Digital Forensics courses map to federal requirements for information security protection. The National Centers of Academic Excellence in Information Assurance Education Program has the goal of reducing vulnerabilities in the national information infrastructure by promoting higher education in information assurance and producing professionals with information assurance expertise in various disciplines. Universities designated as Centers of Excellence are eligible to apply for scholarships and grants through the Federal Department of Defense Information Assurance Scholarship Programs, as well as the Scholarship for Service scholarships from the National Science Foundation. Dr. Craiger was successful at his previous university in obtaining Center of Excellence status from the National Security Agency, as well as winning awards of 2.2 million dollars through Scholarships for Service from the National Science Foundation and $294,000 from the Department of Defense (NSA) for Information Assurance Scholarship Program scholarships.

National Center for Forensic Science Background

The National Center of Forensic Science (NCFS) was founded at UCF in 1998 by Dr. Bill McGee to serve forensic science practitioners working in fire and explosives. NCFS is both a national center, as part of the National Institute of Justice (NIJ) Forensic Research Network (FRN) of the Department of Justice (DOJ), and a state Type II Center. NCFS is based in the UCF College of Sciences as a forensic science research center and is housed in Orlando's Research Park, adjacent to UCF.

Carrie Whitcomb, the director of NCFS, served as President of the American Society of Crime Laboratory Directors in 1995-96. She developed the concept of digital evidence, as opposed to electronic crimes, in 1997 while observing that computer evidence was information in a digital format and that audio, video, and images in an analog format were being digitized for enhancement. It occurred to her that all these forms of digitized information, while having very different formats, were all digital and needed to be handled under uniform forensic science principles. Otherwise, admissibility of these types of digital evidence in court would be in jeopardy.

The FBI and the Federal Crime Laboratory Directors in Washington, DC formed the Scientific Working Group on Digital Evidence (SWGDE) in 1998. SWGDE defined digital evidence as any information of probative value that is stored or transmitted in a binary form. FBI Special Agent Mark Pollitt was the first Chair of SWGDE and Carrie Whitcomb, US Postal Inspection Service, Forensic & Technical Services Division, was the first Vice Chair of SWGDE. The FBI sponsors both SWGDE and the Scientific Working Group on Imaging Technology (SWGIT) through the NCFS. NCFS hosts meetings and provides travel for these groups to meet and develop protocols, definitions, quality assurance guides and best practices for the community.

Credit Hours and Courses

The MS in Digital Forensics requires a total of 30 credit hours of graduate-level course work (5000-level or above). Students admitted to the program will be selected on a competitive basis and must meet the following minimum requirements: a bachelor’s degree in a related discipline from an accredited institution, 3.0 GPA on the last 60 hours

of attempted undergraduate coursework or a competitive GRE score, a personal statement (essay), and three letters of recommendation. (Typical GRE scores for UCF graduate admissions are approximately 1000.) Students are admitted to either the Professional Track or the Science/Computing Track. The two tracks share common core courses that lay the foundation of the discipline, and provide restricted electives and a thesis option to distinguish the intended audience and expected program outcomes. The structure of the curriculum is briefly described below:

Required Core Courses:
Students in both tracks will be required to complete a set of core courses. These core courses provide an in-depth study of the foundational knowledge and skills required of the discipline, including coursework in forensic science, law, computers and networking, and practice of digital forensics, emphasizing the multidisciplinary nature of the field.

Restricted Elective Courses:
Students in both tracks will choose electives from prescribed groups of courses in each track. These courses are used to provide roadmaps specific to each track, by offering advanced topics in concentration areas leading to better problem solving skills.

Graduate Internship/Practicum:
Students of both tracks are eligible for participating in an internship or practicum with faculty mentoring and supervision. A graduate internship is required of students in the Professional Track. The sites that offer internships/practica will include computer crime labs at the local, state and federal level, along with IT security/forensics departments in the private sector.

Thesis Option:
The Science/Computing Track offers a thesis option for those students who plan to pursue an R&D career after completion of the MS degree. The thesis will be worth 6 credit hours, and students choosing the thesis option will work with a faculty advisor typically for two semesters. The research results are expected to advance the state-of-the-art of digital forensics, leading to publication in peer-reviewed journals or conference proceedings.

Summary of MS Requirements:

Requirements	***Hours***
Professional Track:	
Required Core Courses including internship	24
Elective courses (approved by the program track's oversight committee)	6
Total Credit Hours	**30**
Science/Computing Track – Thesis Option:	
Required Core Courses	12
Restricted Elective Courses (selected from 3 groups)	12

Thesis	6
Total Credit Hours	**30**

Science/Computing Track – Non-Thesis Option:	
Required Core Courses	12
Restricted Elective Courses (selected from 3 groups)	15
Internship/Practicum	3
Total Credit Hours	**30**

B. Describe how the proposed program is consistent with the current State University System (SUS) Strategic Planning Goals. Identify which goals the program will directly support and which goals the program will indirectly support. (See the SUS Strategic Plan at http://www.flbog.org/StrategicResources/)

State University System of Florida Strategic Plan

The State University System of Florida's Strategic Plan for 2005-2013, adopted by the Board of Governors on June 9, 2005, identifies targeted degree programs to meet statewide professional and workforce needs as one of the Strategic Plan's main goals (http://www.flbog.org/StrategicPlan/pdf/StrategicPlan_05-13.pdf). Digital forensics is a new field, and included as part of Computer Science and Information Technology, which the State University Strategic plan lists as a targeted discipline.

The Board established system goals for 2012-2013 in the following areas:

- Goal 1: Access to and production of degrees
- Goal 2: Meeting statewide professional and workforce needs
- Goal 3: Building world-class academic programs and research capacity
- Goal 4: Meeting community needs and fulfilling unique institutional responsibilities

The proposed MSDF degree will directly support all four goals, as described in more detail in this proposal: in Section II, Need and Demand (Goals 2 and 4); in Section IV, Project Benefit (Goals 1 and 2); in Section VI, Related Institutional Mission and Strength (Goal 4); and in Section VII, Program Quality Indicators (Goal 3).

In addition, the proposed MSDF will support the shared mission of the SUS identified in the Strategic Plan, which states: "The State University System of Florida consists of ten public universities and one Shared Mission public liberal arts college, each with its distinctive mission, collectively dedicated to serving the needs of a diverse state through excellence in teaching, research and public service."

Institutional and State Level Accountability

II. Need and Demand

A. Need: Describe national, state, and/or local data that support the need for more people to be prepared in this program at this level. Reference national, state, and/or local plans or reports that support the need for this program and requests for the proposed program which have emanated from a perceived need by agencies or industries in your service area. Cite any specific need for research and service that the program would fulfill.

The need for **educated** forensics examiners is increasing at the local, state, and national levels, in law enforcement and industry. Highly-placed law enforcement agents have suggested that the growth in the need for digital forensics examiners may be **exponential**. FBI Special Agent Tim Kosiba, Laboratory Manager for the Computer Analysis and Response Team Laboratory, foresees a tremendously growing need for educated forensic examiners:

"... As for future needs, that requirement will continue to increase exponentially in the coming years with every case involving digital media... As for the Master's Degree, it certainly establishes the credibility with the Courts to be able to testify as an Expert Witness. Also, this field is getting very competitive, so it would undoubtedly make someone more marketable in the job market. If the specific field of [law enforcement] is where someone wants to be, the Master's Degree on increases their possibilities in running Labs, managing people, etc which is also a huge benefit. The need for well rounded, well spoken managers is greatly desired in this arena." (Personal communication, September, 2007)

This need is not limited to a single Federal agency, nor law enforcement only. U.S. Secret Service Special Agent Keith Hoover, served for four years as the Criminal Squad Supervisor Criminal Investigative Division as Assistant to the Special Agent in Charge – Electronic Crimes Special Agent Program Manager. Special Agent Hoover predicts an exponentially increasing need for educated forensic examiners in both law enforcement **and** industry:

"With the exponential growth of emerging technology throughout the world today, it only follows that the criminal element will attempt to capitalize on its use to further their quest for anonymity and profitability. In order for law enforcement to remain ahead of the power curve, it must adapt to the changes presented by both technology and criminals in a timely manner... From law enforcement prospective a degree program which focuses on Computer Forensics will give the credentials needed for a career in a field that experiences continual growth. Computer technology will only continue to advance and criminals will only continue to get smarter in the ways they use computers to carry out crimes and hide information. By having the academic industry train computer forensic professionals in both law enforcement and private

industry will prove to be extremely valuable in the years to come fighting cyber crime." (Personal communication, September, 2007)

The dearth of educational programs in digital forensics means that current examiners must seek 'tool specific' training programs in order to increase their knowledge and skills. This training, however, does not provide the equivalent knowledge and skills that are required to develop a proficient examiner. John Barbara, Crime Laboratory Analyst Supervisor with the Florida Department of Law Enforcement (FDLE) in Tampa, FL, argues that the currently proposed master's degree is

"Currently, examiners possess a variety of degrees ranging from criminalistics to computer engineering. Virtually none of the degrees included undergraduate course work in digital forensics. Specific vendor provided training in the use of examination tools is currently the only standard of comparison available. However, this training is generally specific to the product and does not necessarily include the scientific principles and practices necessary for the analysis of physical evidence. For those examiners possessing a bachelor's degree, the eventual attainment of a Master's Degree in digital forensics will significantly enhance their overall knowledge level and expand their skills associated with performing analysis. The formalized process of obtaining a Masters Degree in digital forensics will set a standard of achievement that is currently lacking in the community." (Personal communication, September, 2007).

The need for digital forensic examiners at the local (Florida) level is quite obvious. Of the 563 agencies in the Florida, only a handful have dedicated digital forensics examiners. Further, crime cases involving computers or digital devices have increased in recent years. For example, both Orange and Seminole County Sheriff's offices are projecting an increase of 30 – 40% in their computer crime lab's workload in 2007.

A recent article published at http://education-portal.com/, a portal to education programs and career information, states that (accessed September 10, 2007):

"*Forensic analysis and investigative techniques are useful in many instances - law enforcement, the federal government, the military, and computer network companies are some the best examples. The technical and analytical skills gained through this course of study will prove invaluable to modern crime investigation*."

"*This is one of the few bachelor's degrees that guarantee recipients a minimum salary of $60,000, no matter organization location or size. This minimum salary is expected to continue to climb at a greater than average rate*."

"*The economic outlook for computer and digital forensic degree holders is extremely favorable. Experts in crime analysis and investigation will be in high demand as society becomes more and more complex*."

The USAJOBs site http://www.usajobs.gov/, an official job site of the United States federal government, produces 12 positions with the following job titles using the search keywords "computer forensics" (accessed September 12, 2007):

- INFORMATION TECHNOLOGY SPECIALIST, salary 55,706.00 to 103,220.00 USD
- IT SPECIALIST (INFOSEC), salary 55,706.00 to 72,421.00 USD

- INTELLIGENCE OPERATIONS SPECIALIST (COUNTERMEASURES), salary 46,041.00 to 103,220.00 USD
- Special Agent, salary 49,347.00 - 67,220.00 USD

Computerization of our society, and an associated overabundance of data, is occurring at a rapidly increasing rate. This has ramifications for law enforcement as criminals begin to use computers more and more in their illegal activities. Because of the increasing number of computerized devices that hold data (such as cell phones, PDAs, embedded auto computers, GPS, iPods and other miniaturized music players), there will be a tremendous increase in the data that law enforcement must identify, recover, examine, and investigate. This is already an overwhelming occurrence for even the best-financed law enforcement organizations. The two figures below are official figures from the FBI (2005) for Fiscal Years 99 through 2004 that demonstrate the increase in the amount of data that law enforcement is already seeing.

Figure 1 below shows that the number of cases increased from 2,084 in 1999 to nearly 10,000 in 2004, which amounts to a five-fold increase in five years. Also consider the numbers in Figure 2, which shows the amount of data (in terabytes) that the FBI collected during the same period. A terabyte is one thousand gigabytes, or one trillion bytes. In 1999 the FBI collected 17 TB of data, and in 2004 265 TB. This amounts to a 46-fold increase in the amount of data collection over that same five-year period.

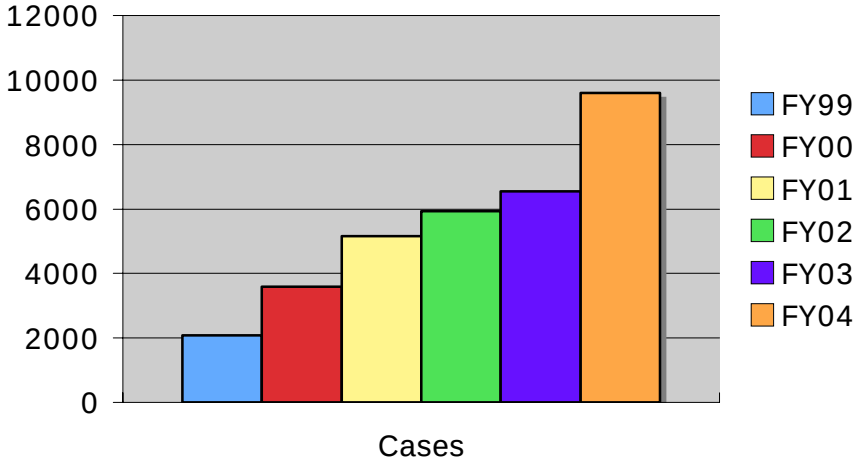

Figure 1. Number of Federal Computer-Crime Related Cases (Source: FBI)

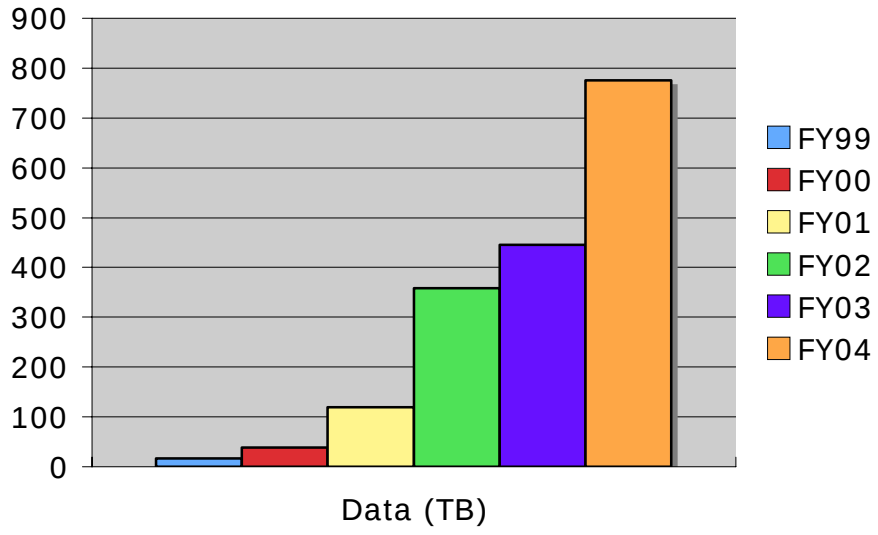

Figure 2. Growth in Digital Evidence (Federal Crimes Source: FBI)

The Computer Analysis Response Team (CART) is the FBI's computer forensic unit and is primarily responsible for conducting forensic examinations of all types of digital hardware and media. The data above represents two metrics of the unit's activity. The data burden represents the total capacity of digital media examined by CART. While the FBI is somewhat unique as a law enforcement agency, its broad jurisdiction makes it useful as an indicator of investigative activity.

The most important factor in coping with the increasing amount of data is to have more employees educated in the field.

B. Demand: Describe data that support the assumption that students will enroll in the proposed program. Include descriptions of surveys or other communications with prospective students.

In addition to the expected demand from working professionals in criminal justice field the proposed degree will initially recruit undergraduate students in computer science, information technology, management information systems, criminal justice, and related disciplines who are currently enrolled at UCF. Recent graduates and those who are currently enrolled in the graduate certificate program in computer forensics will also be recruited for their interest in the proposed master's degree. There have been more than a dozen inquiries from these pools of prospective students, expressing interest in applying to the MSDF degree. Many students have started taking courses in the certificate program in anticipation of the approval of the MSDF degree. Some sample email inquiries about the MSDF program are included in the Appendix F.

In addition to the received email inquiries we have conducted surveys via emails and class presentations to students that are currently enrolled at UCF. In two undergraduate classes that are related to digital forensics, CET 4885 (Digital Investigative Technologies) and CIS 3360 (Security in Computing), we found 15 and 7 students, respectively, who are interested in applying to the MSDF degree program. When the current students of the Graduate Certificate program in Computer Forensics were contacted via email in the fall semester of 2007, 14 out of 30 students (46%) expressed an interest in applying to the MSDF degree. Therefore, the survey results indicated significant demand for the proposed MSDF degree from our own students.

C. If similar programs (either private or public) exist in the state, identify the institution(s) and geographic location(s). Summarize the outcome(s) of any communication with such programs with regard to the potential impact on their enrollment and opportunities for possible collaboration (instruction and research). Provide data that support the need for an additional program.

There are two community colleges in the state of Florida that offer courses related to digital forensics: (1) St. Petersburg College, located in St. Petersburg, Florida, offers a certificate called "Computer Related Crime Investigations" (CRCI-CT), which requires eight courses at the undergraduate level geared more towards crime scene investigation than digital forensics; (2) Florida Community College at Jacksonville (FCCJ) offers a certificate called "Computer Forensics Specialist", which consists of 8 courses at the undergraduate level. In addition, Southwest Florida College, a private nonprofit institution located in Ft Myers and Tampa, offers career training programs in network security and computer forensics.

A reputable website, the e-evidence info center at http://www.e-evidence.info/index.html, maintains a list of over 80 digital forensics education programs throughout the world. This list includes only two programs from the state of Florida: the CRCI certificate of St. Petersburg College, referenced in the preceding paragraph, and the graduate certificate program in computer forensics (http://www.cs.ucf.edu/gccf) offered at UCF. A recent article published in USA Today (June 06, 2006) with the title "Cybercrime spurs college courses in digital forensics" specifically mentioned UCF along with Purdue, Johns Hopkins, and Carnegie Mellon as schools offering undergraduate and graduate courses in digital forensics.

Faculty members of the Computer Information Sciences (CIS) and Criminal Justice Departments of Florida A&M University (FAMU) in Tallahassee have expressed interest in working with UCF in developing undergraduate and graduate-level courses related to digital forensics. A workshop for a small group of FAMU's CIS faculty and staff members was conducted in June of 2007 at UCF. The purpose of the workshop was to discuss collaboration between FAMU and UCF in teaching and research work related to digital forensics. As a result of this collaborative effort the CIS Department of FAMU started offering a graduate-level course in digital forensics, CIS 5930, in fall 2007. Further collaboration between UCF and FAMU is possible by offering UCF's digital

forensics courses to FAMU via online instruction, and for FAMU to share their courses with UCF.

D. Use Table 1 (A for undergraduate and B for graduate) to categorize projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Generally undergraduate FTE will be calculated as 40 credit hours per year and graduate FTE will be calculated as 32 credit hours per year. Describe the rationale underlying enrollment projections. If, initially, students within the institution are expected to change majors to enroll in the proposed program, describe the shifts from disciplines that will likely occur.

Table 1-B reflects the two sources of students expected to have an interest in the program; working professionals who would benefit from the education offered by the MS degree in digital forensics and recent graduates from related disciplines (Engineering, Computing, Information Technology). Since the MSDF degree will be fully available online, it will also draw significant interest from non-Florida residents, as evidenced in the sample emails included in Appendix F. We expect the largest and steadiest group of students will come from working professionals, who may be sent from government agencies or business sectors. Another group of students come from recent graduates in a related field (e.g. computer science, information technology), who may be from UCF, other in-state or out-of-state institutions. Additional in-state or out-of-state individuals who are interested in digital forensics represent a third group of students. We do not expect many UCF graduate students to change majors to digital forensics. Instead, undergraduate students who have an interest in digital forensics but previously have no suitable graduate degree programs to apply, e.g., students of the Information Technology major, will now have an opportunity to attend graduate school in digital forensics at UCF.

TABLE 1-B

PROJECTED HEADCOUNT FROM POTENTIAL SOURCES

(Digital Forensics Master of Science Degree Program)

SOURCE OF STUDENTS (Non-duplicated headcount in any given year)*	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Individuals drawn from agencies/ industries in your service area (e.g., older returning students)	15	4.22	25	7.50	35	10.16	40	11.53	40	11.53
Students who transfer from other graduate programs within the university**	0	0	5	1.41	10	2.97	5	1.41	0	0
Individuals who have recently graduated from preceding degree programs at this university	0	0.00	5	2.32	10	4.64	10	4.64	10	4.64
Individuals who graduated from preceding degree programs at other Florida public institutions	0	0.00	3	0.84	8	2.34	13	5.22	18	8.03
Individuals who graduated from preceding degree programs at non-public Florida institutions	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Additional in-state residents***	0	0.00	0	0.00	2	0.56	7	2.03	17	4.94
Additional out-of-state residents***	0	0.00	10	2.81	15	4.22	15	4.22	15	4.22
Additional foreign residents***	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other (Explain)***	0	0.00	0	0.00	0	0.00	0	0.00	0	0.000
Totals	**15**	**4.22**	**48**	**14.88**	**80**	**24.89**	**90**	**29.05**	**100**	**33.36**

*List projected yearly cumulative ENROLLMENTS instead of admissions.
**If numbers appear in this category, they should go DOWN in later years
***Do not include individuals counted in any PRIOR category in a given COLUMN

E. Indicate what steps will be taken to achieve a diverse student body in this program, and identify any minority groups that will be favorably or unfavorably impacted. <u>The university's Equal Opportunity Officer should read this section and then sign and date in the area below.</u>

The College of Engineering and Computer Science proposes to actively recruit minority students and under-represented populations for the M.S. in Digital Forensics in the following ways:

- A marketing strategy to increase diversity will be developed to include broad advertising on campus. UCF's Office of Student Involvement (http://www.osa.ucf.edu/home.html) maintains a list of minority student organizations. which include the African American Student Union, the Asian Student Association, the Hispanic American Student Association, and society for women engineers. These groups will be the focus of a special effort to increase diversity in our program.
- The program will selectively advertise in national journals and newsletters aimed at Digital Forensics. These may include professional organization journals and newsletters such as *The American Academy of Forensic Sciences Newsletter*.
- Regional and local minority-targeted media sources such as *FLAVOR: Black Life and Style*, and *El Sentinel* are also important outlets to attract minority students.
- The program will maintain an active, carefully constructed website of the proposed program, faculty, research opportunities, internship sites, and career opportunities, as well as providing information about admission, curriculum, and graduation requirements.
- Information announcing the program will be sent to all colleges and universities that offer undergraduate degrees and graduate certificates in Digital Forensics, including those universities that have high minority student enrollment.
- UCF is collaborating with FAMU in developing courses and collaborating in research projects related to digital forensics. This collaboration will also provide a great opportunity to recruit minority students from FAMU, a member of the Historically Black Colleges and Universities (HBCUs), to apply to UCF's MSDF degree once it is in place.
- Currently (fall of 2007) out of the 30 active students enrolled in the Graduate Certificate in Computer Forensics, 7 students are of Hispanic/Latino ethnic origin, 1 African American, and 1 Native American. The gender distribution is male 23 and female 7. Thus it seems the field of computer (digital) forensics attracts an adequate number of students from under-represented groups.

_____ _____

Equal Opportunity Officer **Date**

III. Budget

A. Use Table 2 to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)

Table 2 details the projected costs for Year 1 and Year 5 and their sources. In Year 1, there are three sources for the program costs: (1) E&G money for faculty salaries to teach existing courses that can be used toward the MSDF degree, and to teach two new courses, for $51,419; (2) E&G money for library books and a half-time program assistant, for $19,875; and (3) contracts and grants (C&G) to pay for graduate assistants and travel expenses for advisory board meetings, for $18,000.

Similar to Year 1, Year 5's program costs consist of the following: (1) E&G money for faculty salaries to teach existing courses that can be used toward the MSDF degree but with additional sections to accommodate increased enrollment, and to teach four new courses, for $166,529; (2) E&G money for library books, a newly hired faculty member (continued from Year 4), and a half-time program assistant, for $42,154; and (3) contracts and grants (C&G) to pay for graduate assistants and travel expenses for advisory board meetings, for $18,000.

TABLE 2

PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 1						Year 5				
	Funding Source					Subtotal E&G and C&G	Funding Source				Subtotal E&G and C&G
	Reallocated Base * (E&G)	Enrollment Growth (E&G)	Other New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	
Faculty Salaries and Benefits	$33,419	$0	$0	$0	$0	$33,419	$148,529	$22,279	$0	$0	$170,809
A&P Salaries and Benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
USPS Salaries and Benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Personnel Services	$18,000	$0	$0	$0	$0	$18,000	$18,000	$0	$0	$0	$18,000
Assistantships and Fellowships	$0	$0	$0	$0	$15,000	$15,000	$0	$0	$0	$15,000	$15,000
Library	$0	$500	$0	$0	$0	$500	$0	$500	$0	$0	$500
Expenses	$0	$19,375	$0	$0	$3,000	$22,375	$0	$19,375	$0	$3,000	$22,375
Operating Capital Outlay	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Special Categories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs	$51,419	$19,875	$0	$0	$18,000	$89,294	$166,529	$42,154	$0	$18,000	$226,684

*Identify reallocation sources in Table 3.

**Includes recurring E&G funded costs ("reallocated base", "enrollment growth", and "other new recurring") from Years 1-4 that continue into Year 5.

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions (person-years)	Year 1	Year 5
Faculty	0.25	1.27
A&P	0	0
USPS	0	0

Calculated Cost per Student FTE

		Year 1	Year 5
Total E&G Funding		$71,294	$208,684
Annual Student FTE		4.22	33.36
E&G Cost per FTE		$16,894	$6,256

Worksheet Table 2 Budget

New E&G $19,875

New E&G $42,154

Table 3 shows how E&G funds are reallocated to support the proposed degree in Year 1. One faculty member (Dr. Craiger) from Engineering Technology will spend 11% of his time to teach a new course, which amounts to $12,674. Two faculty members of the School of EECS (Drs. Lang and Turgut) will each spend 11% of their time in program administration and teaching a new course, respectively, which amounts to $22,890. As Table 3 shows the total amount of salaries reallocated to supporting the MSDF degree program ($35,564) represents a very small portion (0.49%) of the base budgets ($7,201,163) for the two contributing departments combined.

TABLE 3
ANTICIPATED REALLOCATION OF EDUCATION AND GENERAL FUNDS

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
16 27 0074 Engineering Technology	$791,949	$12,674	$779,275
16 40 2074 Computer Science	$6,409,214	$22,890	$6,386,324
Totals	$7,201,163	$35,564	$7,165,599

B. If other programs will be impacted by a reallocation of resources for the proposed program, identify the program and provide a justification for reallocating resources. Specifically address the potential negative impacts that implementation of the proposed program will have on related undergraduate programs (i.e., shift in faculty effort, reallocation of instructional resources, reduced enrollment rates, greater use of adjunct faculty and teaching assistants). Explain what steps will be taken to mitigate any such impacts. Also, discuss the potential positive impacts that the proposed program might have on related undergraduate programs (i.e., increased undergraduate research opportunities, improved quality of instruction associated with cutting-edge research, improved labs and library resources).

The proposed MSDF degree will not have a negative impact on participating departments and programs due to reallocation of resources. The curriculum of the degree (described in more detail in Section VIII) is mainly based on existing, regularly offered graduate-level courses from Computer Science, Chemistry/Forensic Science, Criminal Justice, and Digital Media. The only exceptions are two new courses which are required by the professional track of the MSDF degree and proposed by Engineering Technology, and three new courses which are elective courses for the science/computing track and proposed by Electrical Engineering and Computer Science (EECS). However, Engineering Technology has hired additional faculty in 2006 in anticipation of the MSDF degree. The faculty members of Engineering Technology (Craiger and Pollitt) will have opportunities to offer graduate-level courses and access to graduate students to assist in their research work once the MSDF program is in place. Similarly, the elective courses from EECS will be taught by existing faculty members given their research interests and expertise; these new courses are expected to be taken by graduate students enrolled in EECS and other graduate degree programs.

As the enrollment of the MSDF degree grows, the need will arise for offering additional sections of both required and elective courses. Therefore, additional faculty and supporting staff will be needed (see details described in Table 2).

C. Describe other potential impacts on related programs or departments (e.g., increased need for general education or common prerequisite courses, or increased need for required or elective courses outside of the proposed major).

The most significant impact on participating programs and departments is the concern of accommodating additional students from the MSDF degree program into existing courses (e.g., those from Criminal Justice and Legal Studies). Basically, four Criminal Justice courses are identified as electives for the MSDF degree. Since these courses are offered fairly regularly (three times annually for one course, once annually for two courses, and once bi-annually for the last course), there is an adequate number of classes to accommodate the additional enrollments. A Memo Of Understanding from the Department of Criminal Justice and Legal Studies endorsing the proposed MSDF degree is included in Appendix G.

D. Describe what steps have been taken to obtain information regarding resources (financial and in-kind) available outside the institution (businesses, industrial organizations, governmental entities, etc.). Describe the external resources that appear to be available to support the proposed program.

Businesses dealing with IT security work have an interest in employing students trained in digital forensics. For example, UCF's Career Services & Experiential Learning Center has placed several students in the graduate certificate program in computer forensics at local businesses for co-op or internship jobs. Dr. Lang has met with representatives from Earthlink's headquarters in Atlanta for potential internship positions in their Atlanta or Orlando offices. Thus, it appears quite feasible to establish long-term arrangements for internship or co-op jobs with local businesses, especially for those students who already have a good background in information technology. As another example the Director of Forensic Investigations at Microsoft. recently contacted us expressing an interest in establishing an internship program at the Microsoft headquarters in Redmond, Washington. We are actively pursuing this possibility. The Microsoft email is included in Appendix G.

The local sheriff's offices have internship programs to accept qualified students in their computer crime labs. These positions require strict background checks and are typically for non-paying work. However, the opportunities provide excellent training and, as a result, several students have benefited greatly in finding employment after their internship experience at the sheriff's office. The forensic lab of the United States Secret Service Task Force located at the National Center for Forensic Science conducts forensic exam work at the site. We will be coordinating with the Secret Service agents to provide internship opportunities in the lab.

IV. Projected Benefit of the Program to the University, Local Community, and State

Use information from Table 1, Table 2, and the supporting narrative for "Need and Demand" to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

The need for educated forensics examiners is increasing at the local, state, and national levels, in law enforcement and industry. Highly-placed law enforcement agents have suggested that the growth in the need for digital forensics examiners may be exponential. Industry sources indicate that the economic outlook for computer and digital forensic degree holders is extremely favorable, and experts in crime analysis and investigation will be in high demand as society becomes more and more complex. The FBI data shows that the number of cybercrime cases increased from 2,084 in 1999 to nearly 10,000 in 2004, which amounts to a five-fold increase in five years. Over that same five-year

period, the amount of data that needs to be processed increased 46-fold, from 17 TB (Tera-byte) in 1999 to 265 TB in 2004. There is also a real shortage of trained digital forensics examiners at the local and state levels. Of the 563 agencies in Florida, only a handful have dedicated digital forensics examiners. Further, crime cases involving computers or digital devices have increased in recent years. For example, both Orange and Seminole County Sheriff's offices are projecting an increase of 30 – 40% in their computer crime lab's workloads in 2007.

The proposed MSDF degree is a collaborative effort between various programs and departments of UCF, offering a great opportunity for both faculty and especially students to work on challenges presented in digital forensics. The MSDF degree is built on the strength of the existing computer forensics certificate program, the interest from undergraduate students and working professionals wishing to pursue a graduate degree, and the research expertise and professional experiences of participating faculty.

The MSDF degree also provides concentrated coursework and a pool of graduate students for UCF to apply for federal funding. The US Department of Homeland Security (DHS) and the National Security Agency (NSA) jointly sponsor a program awarding the Center of Academic Excellence in Information Assurance Education (CAE/IAE). This designation is attained through a competitive process that evaluates the institution's ability to meet rigorous standards for information assurance education. Institutions that have met these standards and have been designated as a CAE/IAE are eligible for DoD's Information Assurance Scholarship Program. The grant competition also allows CAE/IAEs to request support for capacity-building activities. Capacity building activities may include research, faculty development, curriculum development and improvements to laboratory facilities underpinning the IA Scholarship program.

Table 1-B reflects the two sources of students expected to have an interest in the program; working professionals who would benefit from the education offered by the MS degree in digital forensics and recent graduates from related disciplines (Engineering, Computing, Information Technology). Since the MSDF degree will be fully available online, it will also draw significant interest from non-Florida residents, as evidenced in the sample emails included in Appendix F.

Table 2 shows the details of the program cost from E&G funds (faculty salaries, program assistant, library books) and C&G funds. Table 3 shows how E&G funds are reallocated to support the proposed degree in Year 1. As Table 3 shows the total amount of E&G funds reallocated to supporting the MSDF degree program represents a very small portion (0.49%) of the base budgets for the two contributing departments combined.

There are currently no other graduate-level degree programs in digital forensics in the state of Florida. The proposed MSDF degree will require creation of two new courses for the professional track of the degree. Three new elective courses will also be created for the science/computing track which can be taken by students enrolled in other existing graduate programs. The bulk of required or elective courses of the MSDF program are based on existing faculty members and their courses offered by participating departments. The MSDF degree will be made available for online delivery, increasing its reach to students beyond local regions. Our projected student headcounts versus the program

costs as seen in Tables 1 and 2, the needs analysis and demand from our initial surveys, and the potential to apply for CAE/IAE designation and competing for federal funding, strongly suggest significant economic benefits of the MSDF degree to the university, local community, and the state.

V. Access and Articulation – Bachelor's Degrees Only

N/A.

Institutional Readiness

VI. Related Institutional Mission and Strength

A. Describe how the goals of the proposed program relate to the institutional mission statement as contained in the SUS Strategic Plan and the University Strategic Plan.

University of Central Florida Strategic Plan

The proposed degree is related to UCF's Mission, Vision, Goals, and Strategic Initiatives. The curriculum is timely and important for the growth of a metropolitan research university. One UCF goal is increasing the quantity and quality of education in information technology. Not only will the curriculum provide an excellent educational experience for UCF students, but the collaborative research will also continue to enhance the national and international prominence and visibility of UCF.

UCF's Mission

The University of Central Florida is a public, multi-campus, metropolitan research university, dedicated to serving its surrounding communities with their diverse and expanding populations, technological corridors, and international partners. The mission of the university is to offer high-quality undergraduate and graduate education, student development, and continuing education; to conduct research and creative activities; to provide services that enhance the intellectual, cultural, environmental, and economic development of the metropolitan region, address national and international issues in key areas, establish UCF as a major presence, and contribute to the global community.

UCF's Vision

The University of Central Florida will be the nation's leading metropolitan research university recognized for its intellectual, cultural, technological, and professional contributions and renowned for its outstanding programs and partnerships.

Supports UCF Mission and Vision

The proposed program will support UCF's mission and vision by being one of the first programs of its kind in the United States, with high quality teaching, research, and service, including developing partnerships with industry and government agencies. Technology is our future, and this program will prepare students for employment in government and industry, contributing to the economic well-being of the state and nation.

Supports UCF Strategic Plan Goals

Goal 2: Achieve national prominence in key programs of graduate study and research

Currently there is a single university in the U.S. that offers a master's degree in computer or digital forensics. There are two reasons for the dearth of these programs. First, digital forensics is a very new field and does not yet have a standardized curriculum. This lack of standardized curriculum is being rectified by the Technical Working Group on Training and Education in Digital Forensics, a group funded by the NIJ, to develop guidelines for digital forensics curriculum at the associate's, bachelor's, and master's levels. Our goal is to be the first university to implement a curriculum that is consistent with these standards.

A second reason there are no master's degrees in computer forensics is that it is a relatively new area of science. Historically, most digital forensics examiners have been self taught, or at most have had limited access to week-long "vendor" training courses. Thus, there are two primary drivers for the new program. First, new laws such as Sarbanes-Oxley and Gramm-Leach-Blily mandate that businesses that keep electronic records must provide the capability to recover lost information and to account for any transactions occurring on electronic records. Second, digital technology has increased in complexity and has become ubiquitous. As these trends continue, there will be a need for individuals with the forensic knowledge and skills to adjust to the complexities and growth of these technologies. Thus it is expected that an increase in the demand for individuals with computer forensics skills will be required in business and industry.

Because of the demand for such skills, our program should attract the top students in the nation who are interested in this new field. Moreover, the diversity of the program (which includes computer forensics, audio, video, and image forensic analysis) will draw students from diverse educational backgrounds and skills.

Goal 5: Be America's Leading Partnership University

The National Center for Forensic Science has partnerships via "Understandings" with the U.S. Secret Service, FBI, the US Postal Inspection Service, state and local law enforcement, as well as business and industry. Once the degree is in place, we expect these partnerships to grow to include a more diverse audience (more industry participation for instance), and we also expect to expand our partnerships at the national and international level. Letters in support of partnership and collaboration from law enforcement and private industry are attached in the appendix.

Supports UCF's Strategic Initiatives

In pursuing and enacting its mission, the UCF Strategic Plan identifies three pathways and 12 strategic initiatives**. Those that are directly supported by the proposed MSDF degree are described as follows:**

Pathway One: Enhance UCF's Academic Mission

Strategic Initiative 2: Increase Prominence in Graduate Studies

The degree would increase our prominence as one of the first universities to have a program that addresses the forensic aspects of digital media, as opposed to the security aspect; note that the two are NOT equivalent.

Strategic Initiative 3: Foster Excellence in Research and Creative Activities

Digital forensics is a new science. Therefore the research activities will, by their very nature, be creative. Each faculty member has a strong background in digital forensics, forensic science, or computer/engineering technology. The diverse skill sets of the faculty members provide a foundation for excellence in research. For instance, Dr. Craiger has over a dozen digital forensics-related peer-reviewed publications and professional conference presentations. Mr. Mark Pollitt, retired FBI special agent, and former head of the FBI's Computer Analysis and Response Team (CART) and Regional Computer Forensics Labs, has several peer-reviewed digital forensics publications and dozens of professional conference presentations on the subject. Mr. Pollitt recently received the American Academy of Forensic Science's General Section Achievement Award at the 2006 meeting. Dr. Sheau Lang has extensive research experience and dozens of peer-reviewed publications. These faculty members will serve as the core of the program and will foster research and creative activities consistent with their previous duties. Their publications are listed at the end of this document in each person's vita.

Pathway Two: Serve the Central Florida Metropolitan Region

We have agreements and Memoranda of Understanding with the Orange County Sheriff's Office, Seminole County Sheriff's Office, and the UCF Police Department. NCFS hosts a U.S. Secret Service Digital Evidence Laboratory. This operational lab serves law enforcement digital evidence investigators in surrounding counties in Central Florida. These investigators come to the laboratory to use software and hardware, obtain technical assistance by UCF Police Examiners, and benefit from NCFS expertise.

Currently the majority of our students come from the Central Florida metro area. Many are working, part-time students who take our courses online. We expect that, initially, most of our students will be from Central Florida, and they will take the knowledge and skills that they acquire from our degree back to their local jobs.

Strategic Initiative 7: Enhance Collaboration

This program brings together collaborators from various colleges and departments at UCF to work with federal laboratories, state agencies and professional organizations to enhance the capabilities of law enforcement and forensic scientists working in digital evidence. Efficient collaboration is required of our interdisciplinary team of departments including Engineering Technology, Computer Science, Legal Studies, and Chemistry.

Pathway Three: Strengthen UCF's Services and Processes

Strategic Initiative 11: Increase Visibility

Offering one of the first master of science degree in digital forensics in the U.S. will clearly increase UCF's visibility. It is also important that the program is of the highest quality. Being one of the first is not necessarily significant if the program is not of high quality. We are building this program from the ground up to provide students with a quality education in digital forensics. We want to be the best digital forensics program in the country.

B. Describe how the proposed program specifically relates to existing institutional strengths, such as programs of emphasis, other academic programs, and/or institutes and centers.

This program proposal is directly linked to the National Center for Forensic Science (NCFS), which is developing the scientific basis for digital evidence. NCFS Director Carrie Whitcomb developed the concept of digital evidence in 1997 and has an international reputation in this area. NCFS works closely with the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB) to facilitate the accreditation of digital evidence in crime laboratories. Two faculty members from the Department of Engineering Technology have dual appointments at NCFS (Craiger, Pollitt), and have brought in approximately $450,000 in digital forensics-related research programs in the last two years alone.

The program faculty members are primarily from the Departments of Computer Science and Engineering Technology in the College of Engineering and Computer Science. The faculty members have taught computer forensics and computer security related topics for years at the university level (Craiger, Lang, Pollitt, Guha, Zou). Faculty members from both departments have an extensive track record in information/computing related topics, including several dozen publications and conference presentations in the field of digital forensics. (See Appendix E that includes faculty member vitas.)

UCF started a Graduate Certificate in Computer Forensics in the fall of 2001. As of the end of spring 2007, 70 students have completed the certificate. The certificate draws on courses and faculty from Computer Science, Forensic Science of Chemistry, and Engineering Technology, and has been one of the largest graduate certificate programs at UCF. The proposed MSDF degree will build upon the existing certificate program and provide a unique and timely opportunity for students interested in digital forensics to pursue an advanced graduate degree.

Strengths of Research Labs and Research Faculty

UCF digital forensics faculty has a strong presence in digital forensic research at the national and international levels. The following is a brief explanation of ongoing research in this area.

Research Labs

Faculty from Engineering Technology and NCFS have access to state-of-the-art facilities for their digital forensics research projects. The Digital Evidence Research Lab, located at NCFS headquarters in Partnership I, has approximately twenty workstations, running a combination of Windows, Linux and Mac OS X. These workstations are used for an assortment of purposes, including the creation and analysis of research material. We have recently acquired several Intel-based Mac computers for additional research. Within our lab we run several networks; our primary internal network is isolated from the Internet and provides basic communication and storage for the analysis workstations. Other networks are used for testing and research. For research storage we currently employ a Linux-based 1.5 terabyte NAS (Network Attached Storage) connected to our isolated internal network. Additional research is performed using an Apple Xserve 7 terabyte SAN (Storage Area Network) connected to workstations via Fibre Channel. For presentations to visiting researchers and students, we have a widescreen 37" LCD television.

Faculty members of EECS have access to several teaching and research labs that can be used for the MSDF program. The networking lab has state-of-the-art equipment including network switches, routers, and firewalls; these facilities may be used in teaching and research network vulnerability assessment, intrusion detection, and network forensic issues. The School of EECS has a cluster machine with 32 nodes to support research and teaching courses on parallel and distributed processing.

Research Projects and Faculty

1. Virtual Digital Evidence Lab (Research by NCFS/Dept of Engineering Technology. Funded by National Institute of Justice. Funding totaling $204,000)

We are developing a virtual ‘digital evidence lab’ that includes the tools and resources required for digital forensic examinations, but these resources may be located in various geographic locations and administered and maintained by different entities. These geographic locations are connected via a high-speed network. Examiners access the virtual lab through a single portal on the Internet. Examiners can upload evidence for secure storage to one location and analyze the evidence using tools from a second location. Reports can be located at a third location. Prosecutors and attorneys would access the results through the same portal. PI: Craiger.

2. Digital Forensics Tool and Process Validation (Research by NCFS/Dept of Engineering Technology. Funded by State of Florida, $20,000)

Digital forensic professionals commonly employ cryptographic one-way hash algorithms for multiple purposes, including identifying notable and known files, and verifying media

integrity. While conducting a validation study of proficiency test media, we found that applying the same hash algorithm against a single CD using different applications resulted in different hashes. This was unexpected because the only plausible explanation of the different hashes would be if the CD media changed in between hashing procedures. We formulated a series of experiments using several variables to determine the cause of the anomalous results. The results suggested that certain burn options might cause hash applications to report various and unpredictable hashes. We conclude with a discussion of possible consequences of these anomalies in a court of law, and recommendations on how to handle this situation. PI: Craiger.

3. Collaborative Research: CT-ISG: Modeling and Measuring Botnets. Funded by NSF (NSF Cyber Trust #0627318), 09/01/2006 – 08/31/2009 ($175,000)

A botnet is a network of compromised computers, or bots, commandeered by an adversarial botmaster. Botnets are responsible for many attacks, including spam, phishing, key logging, and denial of service. This project aims to develop techniques to model and measure botnet propagation and on-line population dynamics. Knowing the trend, size, and locations of the population of a botnet can help estimate the potential threat of a botnet, and select and prioritize the appropriate response actions.

Although Internet worms are often used to create botnets, there is a fundamental difference between worms and botnets. Worms are typically designed to infect as many machines as possible, and are in general "noisy" and easily detected (and thus removed), whereas botnets are designed to evade detection, and control and make use of the compromised machines for as long as possible. The existing worm models focus on the initial and short propagation phase of a worm. However, a good botnet model needs to track the dynamics of a botnet online population in the long run.

This project has three main tasks. The first is to develop diurnal models to track the grow-and-decline trend of botnet online populations using factors such as time zones and distribution of vulnerable systems. The second is to develop sampling and measurement approaches including capture-and-recapture and DNS cache snooping to estimate the total population of a botnet. The third is to develop measures for threat assessment, e.g., its aggregated bandwidth and resilience to response, based on the system, location and topology information of the bots. PI: Dr. Cliff Zou.

4 Automated Vulnerability Analysis: Leveraging Control Flow for Evolutionary Input Crafting. Funded by Intel Corp, 08/01/2007 - 07/31/2010 ($53,465)

In this project we are targeting the testing and vulnerability identification issues in both software and hardware applications. First, software security is one of the most critical problems for computer systems. At the core of the problem of securing software, there are several tasks involving binary analysis we believe can be automated through the novel application of machine learning concepts. By automating them as we outline in this proposal, security analysts will be freed from tedious manual software evaluation, resulting in decreased development costs, increased productivity, and a more efficient allocation of resources towards securing software. There are three main challenges facing

security analysts that we will address in this project: (1) driving programs down specific execution paths; (2) maximizing localized code coverage for software testing; and (3) automating protocol reverse engineering. PI: Dr. Cliff Zou.

5. Learning teamwork from observation. Funded by NSF, 08/01/2007 – 07/31/2008 ($127,024)

This proposal's broad goal is to develop algorithms and methods that allow agents to identify and analyze teamwork through the observation of other embodied agents. The goal is to learn from these observations (a) which agents are acting as a team, (b) what collaborative action are they currently executing, and (c) what is the structure of the team, what roles do each of the team members play?

The research described in this proposal has immediate practical applications. Recognizing teamwork can help robotic teammates integrate with human teams, with immediate applicability in fields such as disaster response. The analysis of the behavior of the team, as well as that of other successful teams, can provide important feedback in training. In homeland security and surveillance applications, recognizing team action in a crowd can help identify terrorist threats. Co-PI: Dr. Damla Turgut.

6. Assessing trace evidence of secure deletion tools (Research by NCFS/Dept of Engineering Technology. Funded by State of Florida. Funding totaling $12,000)

Secure delete programs often erase the actual contents of the file, but most leave behind digital artifact, or "trace evidence" on the file system. Trace evidence can be used by forensic examiners to determine whether a secure delete program was employed, in addition to providing additional information about the original file (metadata). This research examines different programs currently on the market to discern what trace evidence remains after a secure delete operation is performed. PI: Craiger

7. Digital Evidence Markup Language (Research by NCFS/Dept of Engineering Technology. Funded by National Institute of Justice. Funding totaling $141,000)

DEML is a schema based on XML that supports the standardization of digital evidence-related artifacts. Below we provide an overview of DEML. DEML must be built with extensibility and flexibility in mind, as technology changes will require continual changes in the language to appropriately model changes in the technologies used in computer-related crime. PI: Craiger

8. Certification of Digital Evidence Professionals ("Digital Forensics Certification Board"). Funded by National Institute of Justice. $79,997 (FY 2004), $28,000 (FY 2005), $50,159 (FY 2006).

The purpose of the DFCB is to promote trust and confidence in the digital forensics profession by offering professional certification to qualified individuals. The Corporation shall be operated exclusively for the benefit of the practitioners in areas of digital forensics. PI: Carrie Whitcomb

9. Scientific Working Group on Imaging Technologies (SWGIT). Funded by National Institute of Justice. $125,000 (FY 2005)

NCFS hosted a Scientific Working Group on Imaging Technologies (SWGIT) workshops. PI: Carrie Whitcomb

10. NCFS hosted a Scientific Working Group on Digital Evidence (SWGDE). Funded by National Institute of Justice. $595,000 (FY 2004), $257,936 (FY2007)

NCFS hosted a Scientific Working Group on Digital Evidence (SWGDE) workshops. PI: Carrie Whitcomb

11. Modeling and Simulation Environment for Critical Infrastructure Protection. Funded by the University of Wisconsin-Madison, 05/01/01 - 04/30/06, $783,127
.
A project, the purpose of which is to integrate diverse disciplines
to provide multidisciplinary analysis, understanding, and remediation of problem
s in the protection of critical national infrastructures. PI: Ratan Guha.

12. Introducing Fundamental Concepts and Evaluation Methods for Distributed Systems and Applications. Funded by National Science Foundation. 09/15/00 - 08/31/05. $550,000.

A project, the purpose of which is to develop innovative curricular
elements for teaching the fundamental concepts of distributed computer systems,
modern computer networks and distributed applications to the undergraduate students at
the University of Central Florida. PI: Ratan Guha.

13. High Performance Cluster Computing for Collaborative Large Scale Simulation. Funded by the Office of Naval Research. 05/01/04 - 01/31/06. $270,000

A project, the purpose of which is to: High Performance Cluster Computing for Collaborative Large Scale Simulation. PI: Ratan Guha.

C. Provide a narrative of the planning process leading up to submission of this proposal. Include a chronology (table) of activities, listing both university personnel directly involved and external individuals who participated in planning. Provide a timetable of events necessary for the implementation of the proposed program.

Below is a timeline overview of the genesis of the degree, beginning with the development of the Graduate Certificate in Computer Forensics.

- **Summer 1998**
  - Digital evidence was defined by the Scientific Working Group on Digital Evidence (SWGDE) as "information of probative value that is stored or transmitted in a binary form." Digital evidence can be text, numerals,

audio, video, or images. Mark Pollitt was Chair of SWGDE and Carrie Whitcomb was Vice-Chair.

- **Summer 1999**
  - Computer Science offered a special topics class in Computer Forensics for the first time.
  - Carrie Whitcomb joined UCF in June at the National Center for Forensic Science.
  - Whitcomb discussed expanding the forensics offerings to a full program with Dr. Erol Gelenbe, then Director of the School of Electrical Engineering & Computer Science.
  - Several discussions were held between the Department of Chemistry, Computer Science, and NCFS regarding expanding forensic-related offerings.
- **2000**
  - With funding from NCFS, faculty attended computer forensic training courses and conferences, including the National White Collar Crimes Center course, the George Mason Digital Evidence Conference, and the Digital Forensics Research Workshop.
  - Carrie Whitcomb suggested an international, peer-reviewed journal to meet Daubert Criteria, which later became the International Journal of Digital Evidence (online journal).
  - Carrie Whitcomb developed a class through the Chemistry Department, CHS 5503 Topics in Forensic Science, for the Graduate Certificate in Computer Forensics Program (GCCF).
  - NCFS funded Computer Science faculty to develop/deliver the courses Computer Forensics I and II. (CGS 5131 and 5132).
  - Tom Sadaka, the Florida Statewide Prosecutor for Computer Crimes, developed a course regarding the legal aspects of digital forensics and delivered it at NCFS.
- **Fall 2001**

  The Graduate Certificate in Computer Forensics was offered at UCF and classes were held at NCFS. The GCCF is housed in the Dean's Office at the (former) College of Arts and Sciences. Courses offered were the following:
  - CGS 5131 Computer Forensics I (3 hours, taught by Computer Science)
  - CHS 5503 Topics in Forensic Science (3 hours, taught by Carrie Whitcomb)
  - CGS 5132 Computer Forensics II (3 hours, taught by Computer Science)
  - CHS 5518 Evidence Collection & Examination (3 hours, taught by Chemistry)
  - CHS 5596 The Forensic Expert in the Courtroom (3 hour elective, taught by Chemistry)
- **Spring 2002**

  The inaugural issue of The International Journal of Digital Evidence was published electronically at www.ijde.org.
- **Summer 2004**
  - The MS in Digital Forensics was proposed as a new program.
  - The Vice-Provost worked with faculty members to develop the MSDF and complete a draft proposal by November 1, 2005.

        - New course added: IDS937 The Practice of Digital Forensics, taught by Mark Pollitt (adjunct at that time).
    - **2005**
        - Draft proposal was placed on hold, pending discussion of the location of the program after splitting the College of Arts and Sciences.
    - **2006**
        - Carrie Whitcomb discussed the location of the program with the new Dean of the College of Science. This was followed by a discussion between the Dean of the College of Science and the Dean of Engineering regarding location. It was agreed that the program best fit in the College of Engineering and Computer Science.
        - The Vice-Provost suggested that the MSDF be composed of two tracks, Professional and Science/Computing, and be housed at CECS.
        - Additional Engineering Technology faculty hired.
        - Further meetings between faculty were held regarding curricular tracks.
        - Professional and Science/Computing Tracks were drafted and incorporated into the proposal.
    - 2007
        - Proposal meetings including budget discussions for the proposed degree were held on the following dates with Dr. Bishop, attended mainly by Cariger, Eaglin, Whitcomb, Lang, and Hughes (or Heinrich):
            - May 25, 2005, July 18, 2007, August 7, 2007, and August 28, 2007.
        - Early Fall
            - Seek approval by Departments and College
            - Seek approval by University Graduate Program committee
        - Late Fall
            - Seek approval from Board of Governors
    - 2008
        - Spring
            - First courses offered
    - 2009
        - Fall
    - First graduates of MSDF program (Typically those who already have the graduate certificate in computer forensics)

VII. Program Quality Indicators - Reviews and Accreditation

Identify program reviews, accreditation visits, or internal reviews for any university degree programs related to the proposed program, especially any within the same academic unit. List all recommendations and summarize the institution's progress in implementing the recommendations.

The most recent reviews for UCF programs occurred in the period of spring 2005 through summer 2006. Both Computer Science and Engineering Technology were reviewed. Dr. Richard A. DeMillo, Dean of the School of Computing at Georgia Tech, and Dr. Larry Davis, Chair of Computer Science at the University of Maryland, served as the external

reviewers for Computer Science. Dr. Warren R. Hill, Dean of the College of Applied Science and Technology at Weber State University, served as the sole external reviewer for Engineering Technology. The Computer Science program offers two Bachelor's degrees (Computer Science, Information Technology), along with a master of science degree and Ph.D. in Computer Science. Engineering Technology offers three Bachelor's degrees (Engineering Technology, Electrical Engineering Technology, and Information Systems Technology). The Appendix of this proposal contains details of the review reports, including departmental data, enrollment figures, graduation rates, program highlights, and recommendations for program enhancement. Recommendations from the reviewers and progress made that addresses these reviews are described below.

Computer Science Program review

Recommendations on the Graduate Programs (M.S. and Ph.D.) in Computer Science:

- **If the decision is made to increase online Web courses (participation in new iCLASS initiative), create an assessment design to determine the quality of student outcomes compared with student outcomes in other modes.**

  Response:
  While most Computer Science graduate-level courses are still taught in classroom settings, the courses of the proposed MSDF degree will offer online sections using the University's WebCT system for course delivery. In particular, two existing computer forensics courses, CGS 5131 and CGS 5132, will start using WebCT and its online features to offer web-based sections beginning in fall 2007.

- **Strengthen ties to local industry for internships, fellowships, and joint funding proposals. Seek funding, support, internships, and collaboration with the high tech cluster in this region.**

  Response:
  The MSDF degree program provides a unique opportunity for local and state law enforcement agencies, IT security industry, and the university's faculty and graduate students to work together in identifying issues related to digital forensics and attempting to solve them. This collaboration is expected to lead to internships and funding for the university. It is also expected to provide training, education and career development opportunities for the working professionals. Support letters from local sheriff's offices for the MSDF degree are included in Appendix G. These offices will assist the University in providing internship opportunities.

- **Enhance recruitment of female and under-represented minorities for faculty.**

  Response:
  One female faculty member of Electrical Engineering, Dr. Damla Turgut, has been recruited to develop and offer an elective course that supports the MSDF degree. More generally, the School of EECS has been actively engaged in recruiting female

and minority faculty members for its graduate programs, and one female professor, Dr. Gita Sukthankar, has joined the School of EECS in fall 2007.

- **Convene appropriate faculty groups–such as faculty teaching in the program and the graduate curriculum committee–to evaluate the efficacy of the change to 30 semester hours for non-thesis M.S. options. All curricular changes for any M.S. program should have documentation of standard practice nationally.**

Response:
Computer Science M.S. curriculum has been revised and now requires 30 credit hours for the degree, consisting of 3 required courses for 9 hours, plus 21 elective hours.

- **Consolidate/streamline course offerings with CPE and M&S.**

Response:
This issue is being considered but no concrete resolution has been made.

- **Consider a CECS digital media degree with CS emphasis.**

Response:
The Computer Science graduate committee is actively working on a proposal to implement a collaborative degree with Digital Media.

- **Encourage interdisciplinary research and education by participating with other academic units, research centers and institutes, possibly by identifying areas of focus that can be organized with groups of faculty from around campus, including CS faculty; encourage joint appointments of faculty with CS.**

Response:
The MSDF degree program is an interdisciplinary program between EECS, ENT, Forensic Science of Chemistry, Criminal Justice and Legal Studies. Other degree programs including Digital Media, Modeling and Simulation may also be involved in the future. Several participating faculty members already have joint appointments; more opportunities are expected once the program is approved and started.

- **Recruit for 2-3 more senior faculty members in specific foci areas where you want to establish the reputation.**

Response:
The School of EECS hired Dr. Marwan Simaan, the Bell of PA/Bell Atlantic engineering professor at the University of Pittsburgh, who will join UCF in the spring of 2008 as the Florida Chair and a distinguished professor of Electrical Engineering and Computer Science. Dr. Simaan brings to the university extensive research strengths in the areas of control and signal processing. He will be the First National Academy of Engineering Scientist at UCF. In addition, Dr. Gary T. Leavens who specializes in programming languages and software engineering, joined the School of EECS in fall 2007 from Iowa State University as a full professor.

- **Reexamine the graduate curriculum and update to keep pace with other programs of this kind. Consider the consultant's request to include an internship in the master's program.**

  Response:
  The MSDF degree program will partner with law enforcement agencies and private industry, which will serve as hosts for student internships. The internship program will be monitored by an assigned student advisor, and the participating student will receive course credit for the work performed.

- **Enhance mentoring of junior faculty members.**

  Response:
  Research groups and research labs are formed in the School of Engineering and Computer Science that strongly encourage collaborations between faculty members sharing common research interests and expertise.

- **Reexamine the graduate curriculum and update to keep pace with other programs of this kind. Consider the consultant's request to include an internship in the master's program.**

  Response:
  The Computer Science graduate committee is actively studying issues related to curriculum updates including the addition of an internship program.

- **Get faculty more involved in career placement for their graduates through relationships with national and regional companies and through the Career Resource Center at UCF.**

  Response:
  Many graduate students at both master's and Ph.D. levels of Computer Science have found internship or co-op opportunities with local or non-Florida businesses in various areas of computer science specializations, including compute graphics, architecture, databases, web systems, etc. Many faculty members of Computer Science have established relationships with the businesses supporting student interns.

  Within the MSDF curriculum the internship and practicum courses will be hosted by law enforcement agencies or private industry, providing valuable experience for the students in the program prior to completing their degrees. Dr. Lang has already started working with UCF's Career Resource and Experiential Learning Center to place students from the computer forensics certificate program for co-op jobs with EarthLink, Inc., in Orlando. More meetings are scheduled to pursue long-term commitment for internship/co-op jobs in EarthLink's Orlando and Atlanta offices. Several students of the Graduate Certificate program in Computer Forensics have done internship work at the Orange County Sheriff's Office through its volunteer program.

Engineering Technology Program review

Below are the results of the program review for the Department of Engineering Technology, including responses.

- **Faculty felt good about leadership and program in department. Concern that Dr. Eaglin does not spread himself too thin with research, teaching, and administrative duties.**
    - **Current Status**: Dr. Eaglin now delegates many duties to program coordinators and also seeks the ability to delegate research duties to focus on priorities with the department.

- **Faculty have broad range of experience and care about students. Small sampling of students and very satisfied with programs with what they were learning and being taught (happy with content and delivery).**
    - **Current Status**: ENT continues to gather feedback from students and assess content and delivery, and to ensure that the primary goal of employability of the students is being met.

- **Excellent potential for growth in ET. Two issues: where do you get your students (good input from community colleges for recruitment enrollment). High demand for ET graduates because of hands-on experience in program**.
    - **Current Status**: ENT has developed a strategic growth plan for the department that will investigate and implement actions based on potential new programs and existing programs. ENT will continue to seek faculty and laboratory resources to allow the growth.

- **Look at admissions process for AS degree students; ENT has developed an AS to BS program, not under AS to BS umbrella but directly into the program concentration area and not into ENT in general. Need articulation for example with students from Daytona into Space program. ENT general BAS can develop into this type of program. Probably get funding from legislatures and board of governors to do this type of program.**
    - **Current Status:** ENT continues to work with branch campus programs to develop more AS to BS articulation agreements, as well as purse fixed goals for the development of AS to BS articulation agreements.

- **Utah has university centers funded by legislature that provides years 3 and 4 on regional campuses (2+2). Florida has same type of structure. Cocoa Campus and Valencia West Campus possibilities.**
    - **Current Status**: ENT is working on a local 2+2 program at a minimum of two community colleges (Brevard and Valencia). Hire faculty and seek resources to make this operational.

ENT Program Weaknesses

- **Lack of lab space complaint by faculty and student. Not sufficient for size of program. Will severely limit ability to grow program.**
    - **Current Status: Ongoing**: ENT has sought and is seeking additional laboratory space, possibly looking for space at off-campus locations. ENT has and is lobbying College and University Administration regarding the critical space needs of the program. Additionally, ENT has worked with other departments to acquire use of lab space as needed.

- **Department has 7 programs in 3 degree areas. Department has not clearly articulated the goals for each of those 7; this will have to be done for ABET. Also of benefit to faculty and students, who can articulate specific learning outcomes, then decide which courses meet those learning outcomes.**
    - **Current status: COMPLETE**: ENT has developed clear and published goals for each program, as well as completed an internal review of programs and need for programs to reduce number of programs. All proposed actions accomplished: BSET curriculum changed; Design - Mechanical and Design - Construction are new concentrations.

- **Department currently offers a large number of courses (over 3+ pages); need to look at course offerings and pare it down with only 13 faculty.**
    - **Current status: COMPLETE**: ENT performed a curriculum audit to remove unnecessary or outdated courses from the catalog. Offerings have been reduced and catalog listings have been reduced.
- **There needs to be a resolution with IST and IT. Confusion on part of students (maybe employers) regarding difference between IST and IT. IST is computer-related technology work. IT for CS students who cannot make it in CS is not as academically rigorous**.
    - **Current status: COMPLETE**: ENT reviewed curriculum to reduce overlap in IST and IT. For example, the security minor in the junior and senior years include almost the same courses for both CS and IT. Advisement is available and required to place students in correct program.

- **Faculty stretched in teaching and not enough time to do research. Yet giant overlap in instruction and streamlining courses can free up time.**
    - **Current status: COMPLETE:** ENT has streamlined courses to free up faculty time.

Suggestions

- **ET has different teaching load from the rest of the college; need to look at different PNT since ENT faculty have higher teaching loads.**
    - Information: UNC has PNT requirements for ENT different from those for engineering faculty.

- **Current Status: COMPLETE:** ENT Reviewed and developed PNT requirements that truly meet the goals and objectives of the department.

- **Need more faculty to support growth in ENT.**
  - **Current status: Ongoing**: ENT developed a strategic growth plan for the department that outlines the program growth and new program development objectives, and it working to obtain more lines to meet strategic growth plan of the department. Faculty have been hired; however, faculty attrition has presented a challenge. Faculty lines will be filled once hiring freeze is gone.

- **With program growth, there will be a need to develop a different advising model**.
  - Information: Program coordinators are advising 100-200 students each. (There is a staff coordinator, Kim Small, who is also advising.) Also, another advisor position is open in Cocoa.
  - **Current Status: COMPLETE**: ENT worked with the undergraduate advising office to ensure adequate advising occurs for all ENT students. A review of advising procedures showed them to be adequate.

- **Look at adding a graduate program for ENT as it grows.**
  - Information: ENT usually has a technical type of MS that is an extension of the ENT program, or a broad-based management of technology program typically offered with the School of Business (or IEMS). The market is there for ENT graduates who will be attracted to this type of program.
  - Information: The best examples are Arizona State or Purdue for a technical ENT MS program. We may get a great deal of corporate support for an ENT MS program. It is very important to keep curriculum current; very easy to become obsolete in technology.
  - Information: The only graduate outlet at the moment for UCF ENT students is to enter the IEMS MS track. CECS is considering merging the ENT and IEMS programs; IEMS has low BS enrollment but high graduate enrollment, while ENT has high BS enrollment but no graduate program. Course content is related in certain fields (e.g., management). The Technology Administration course should be required in all programs; this is only course that provides an introduction into supervision and lots of grads will end up in supervision. It also has an Ethics component, which is an ABET requirement.
  - **Current Status: Ongoing:** ENT began researching development of an MS program. ENT is adding graduate programs; Senior Design is being added as a requirement for IST.

- **IST Program should require Senior Design.**
  - **Current Status: Ongoing:** ENT looking at adding Senior Design to the required courses in IST.

General Comments

- For future program reviews, IAA/OEAS provide a set of guidelines for reviewers. The www.weber.edu website provides a good example of expectations for program reviewers.

VIII. Curriculum

A. Describe the specific expected student learning outcomes associated with the proposed program. If a bachelor's degree program, include a web link to the Academic Learning Compact or include the document itself as an appendix.

The proposed Master of Science in Digital Forensics degree is composed of two tracks, Professional and Science/Computing, that use common core courses and tailored electives to achieve common educational goals with different focus areas. The Professional Track is directed toward current professionals in the field who will pursue the degree as part-time students, or those who would like to gain the knowledge and skills required to work as an examiner in the field. The Science/Computing Track is directed toward those with an interest in scientific applications and research in the field. These students will be full-time, conducting research with faculty resulting in a thesis, and may be interested in pursuing a doctoral degree in a related field or a law degree afterward. The MS degree in Digital Forensics addresses a local, state and national need for state-of-the-art education in the area of digital forensics.

B. Describe the admission standards and graduation requirements for the program.

Admission Requirements

The admission requirements for both the Professional Track and Science/Computing Track are consistent with those of most M.S. programs in the U.S. Students will be selected on a competitive basis and must meet the following minimum requirements:

- An earned Bachelor's degree from an accredited university.
- A minimum G.P.A. of 3.0 (on a scale of 4.0) for the Bachelor's degree.
- Completion of the Graduate Record Examination (Quantitative and Verbal sections)
- A personal statement (essay) not exceeding 500 words describing the applicant's academic and professional experiences and goals.
- Three letters of recommendation assessing the applicant's potential to do master's-level work.
- Due to the sensitivity of the subject matter being studied, all candidates must pass a criminal background check prior to formal admission to the Professional Track. The candidate will pay for this background check.

Graduation Requirements

The graduation requirements for the M.S. in Digital Forensics are summarized below. A more detailed description of each requirement is included in Part C of this section.

Professional Track:
Total Credit Hours to complete the degree: 30
Total Required Credit Hours: 24
Total Elective Credit Hours: 6

(Note: At least 15 of the 30 credit hours must be taken at the 6000 level.)

Science/Computing Track:
Total Credit Hours to complete the degree: 30
Total Required Credit Hours: 12
Total Elective Credit Hours: 18

(Note: At least 15 of the 30 credit hours must be taken at the 6000 level.)

Culminating Experience and Independent Learning Experience for the Professional Track

Students enrolled in the Professional Track are expected to demonstrate independent learning experience throughout the curriculum. First, students must prepare a portfolio for their work performed in each course required of the curriculum. Advisors will work with the students to provide guidance on the content and format of the course portfolio. A portfolio is a requirement for the completion of each course. Students in the Professional Track must also successfully complete the capstone course CET6xxx Practice of Digital Forensics. This is a culminating experiential class where students work on several different computer crime cases, applying the knowledge and skills acquired in their previous course work. Students must demonstrate competence in the identification, recovery, examination, analysis, and investigative elements of computer crime cases. Students must also exhibit proficiency in written reporting and oral expert testimony. Additionally, students are required to complete an independent learning experience in the form of a graduate internship. Students must complete a minimum three-hour, maximum six-hour internship working in the field. A faculty member will supervise and track the students' progress in their fieldwork.

Culminating Experience and Independent Learning Experience for the Science/Computing Track

Students enrolled in the Science/Computing Track are expected to demonstrate independent learning experience throughout the curriculum. First, students must prepare a portfolio for their work performed in each course required of the curriculum. Advisors will work with the students to provide guidance on the content and format of the course portfolio. A portfolio is a requirement for the completion of each course. Second, for students who choose the non-thesis option, a graduate internship/practicum course is available each semester to provide opportunities for applying the knowledge and skills learned in classes to solving real-world problems. A course instructor or faculty advisor will be assigned to be the mentor. Students are expected to prepare a written report and oral presentation after completion of the internship/practicum course to receive course

credit. Students who take the thesis option are expected to conduct independent research leading to a master thesis of publishable quality, under the supervision of a thesis advisor.

C. Describe the curricular framework for the proposed program, including number of credit hours and composition of required core courses, restricted electives, unrestricted electives, thesis requirements, and dissertation requirements. Identify the total numbers of semester credit hours for the degree.

Core Courses

There are four courses common to the two tracks. These courses will provide students with an overview of all forensics sciences, and perhaps more importantly, provide them a solid foundation in the technical aspects of digital forensics. These four courses are the following:

1. CHS 5503 Topics in Forensic Science. This is a survey course of topics in forensic science that provides students with a broad knowledge of the field.
2. CGS 5131 Computer Forensics 1. This course provides students with technical knowledge regarding media forensics as well as laws pertaining to computer crime.
3. CGS 5132 Computer Forensics 2. This course provides students with technical knowledge regarding the identification and analysis of evidence generated by and gathered from a network.
4. CET 6xxx (previously DIG 5835) Practice of Digital Forensics. This course is a capstone course that requires students to draw upon knowledge acquired from the other courses taken as a means of demonstrating competence in the field.

The four core courses provide students with a solid technical foundation, as is required for both tracks.

Tracks

The Master of Science in Digital Forensics degree is composed of two tracks: Professional and Science/Computing. Each track is directed at a different audience. The Professional Track is directed toward current professionals in the field, or those who would like to gain the knowledge and skills required to work as an examiner in the field. Students in the Professional Track will most likely be employed, and therefore are more likely to be part-time students. In is crucial that courses comprising the Professional Track be online to meet the needs of these students. The Science/Computing Track is directed toward those with an interest in the scientific applications and research in the field. These students could be full-time, conducting research with faculty resulting in a thesis, and these students might be interested in doctoral or legal study afterwards. Although there is a small set of courses common to the two tracks, each track has several different electives. We first describe the Professional Track.

Professional Track

The philosophy of the Professional Track curriculum is to provide each student not only with technical expertise, but also with a well-rounded and practical education. In particular, we developed the Professional Track based on **industry-driven competencies**, derived from the Technical Working Group on Training and Education (described below), so that students graduate with the following:

1. A solid technical computer foundation, including detailed knowledge of computers and networks;
2. A solid digital forensics foundation, covering all aspects of digital forensics, including all procedures to be used in the identification, collection, and examination/analysis of digital evidence from a myriad of digital devices;
3. A solid legal foundation so that the student understands the legal implications that may occur as a result of his/her actions;
4. Numerous practical experiences to reduce the transition time from student to working professional.

The Professional Track includes no thesis option; instead, all students must complete a number of technical and practical assignments in each course in order to demonstrate the fundamental skills required to be a proficient digital forensics examiner, and additionally a (minimum) three-hour internship to demonstrate their competence.

These students will likely enroll part-time, while working in the field. They will likely continue in their current employment or seek a more challenging position after degree completion. UCF has a ready audience of these students who are enrolled in its graduate certificate program. All courses in the Professional Track will be fully online in order to provide these working students with flexibility in taking these courses.

Students in the Professional Track must complete 30 hours, 24 of which are required courses. These students must complete an internship for graduation. Students must take an additional six hours to reach the 30-hour requirement. These final six hours may come from one of the elective sets below, or another course that is related to digital forensics, and must be acceptable to the graduate program committee.

Professional Track Courses

Below are the courses comprising the Professional Track. (These courses are described in more detail later in this document.)

- **24 hours required**
  - CHS 5503 Topics in Forensic Science
  - CGS 5131 Computer Forensics 1
  - CGS 5132 Computer Forensics 2
  - CHS 5518 Collection and Examination of Digital Evidence
  - CET 6xxx Incident Response Technologies
  - CET 6xxx OS & File System Forensics

- CET 6xxx Practice of Digital Forensics (capstone/project)
- CET 6946 Graduate Internship/Practicum (minimum three hours, maximum six hours)

- **Six hours of free electives:** An additional six hours of electives must be taken for a total of 30 hours. The student may propose any course that is related to digital forensics, the law, or criminal justice, or an additional three hours of internship. The course must meet the graduate program committee's oversight.

Science/Computing Track:

The Science/Computing Track is directed toward those with an interest in scientific applications and research in the field. These students will be full-time, with a strong background in computing and networking. A total of 30 hours are required, including at least 15 hours at the 6000 level. The curriculum consists of 4 required courses that cover the fundamental issues in technical, legal, practical, and forensic science aspects of digital forensics. Elective courses are grouped into three categories: computing, criminal justice and investigative methods, and forensic sciences. Students must choose either the thesis option or non-thesis option for this track. A thesis option is available for those students who are interested in R&D work and plan to pursue a doctoral degree in a related discipline or to attend a law school afterward. Students choosing the non-thesis option must take an internship course supervised by a faculty advisor. Sponsors for the internship program will include local, state, and federal agencies, and corporate partners from the private sector.

The School of EECS has been offering graduate programs at both MS and Ph.D. levels for over 20 years. The core faculty of the Science/Computing Track consists of active researchers and experienced instructors with an interest in digital forensics or closely related subjects (see the appendix for the faculty vitas). Overall, the curriculum of the Science/Computing Track attempts to maintain a balance between research topics and those practiced by professionals in the digital forensics field. The basic philosophy of the curriculum is to cover foundational topics required of the digital forensics discipline, and offer advanced topics as electives for more in-depth study.

The Science/Computing Track includes 6 courses outside the College of Engineering and Computer Science, indicative of the interdisciplinary nature of the digital forensics field. Three of the courses are part of Chemistry's Forensic Science program (CHS 5503, CHS 5518, CHS 5596), and three are from Criminal Justice/Legal Studies (CCJ 6074, CCJ 6706, PLA 5587). All these courses are regularly offered and are part of the master's or Ph.D. programs of the respective departments.

There are three new courses proposed in the computing category: wireless security and forensics, distributed processing of digital evidence, and malware and software vulnerability. These topics are of genuine research interest due to, respectively, the prevalence of wireless communication devices, large volumes of digital data, and the

ubiquitous nature of malware (viruses, worms, spyware). These topics are also selected based on faculty research expertise.

The curriculum of the Science/Computing Track consists of a small set of required courses (4) along with a collection of restricted electives (6). This division offers the most flexibility in tailoring the student's interests and strengths while achieving academic quality and standards. A student must choose between a thesis option and a non-thesis option. A thesis is worth 6 credit hours and typically requires two semesters of work under the supervision of an academic advisor. In the case of the non-thesis option, an internship/practicum course of 3 credit hours is required.

Required courses (12 hours):
- CGS 5131, Computer Forensics I
- CGS 5132, Computer Forensics II
- CHS 5503, Topics in Forensic Science
- CET 6xxx (previously DIG 5835), The Practice of Digital Forensics

Restricted Elective Courses (12 hours):
Group A: (computing, choose two courses, 6 hours)
- CAP 6133, Advanced Topics in Computer Security and Computer Forensics
- CAP 6xxx, Wireless Security and Forensics
- COP 6xxx, Malware and Software Vulnerability Analysis
- COP 6xxx, Distributed Processing of Digital Evidence

Group B: (criminal justice/legal studies, choose one course, 3 hours)
- CCJ 6074, Investigative and Intelligence Analysis, Theory and Methods
- CCJ 6706, Quantitative Methods and Computer Utilization in Criminal Justice
  or ESI 5219 Engineering Statistics
  or STA 5206 Statistical Analysis
- PLA 5587, Current Issues in Cyberlaw

Group C: (forensic science, choose one course, 3 hours)
- CHS 5596, The Forensic Expert in the Courtroom
- CHS 5518, Forensic Examination of Digital Evidence
  or CJE 5688, Cybercrime and Criminal Justice

Thesis Option (6 hours):
- CAP 6971, Master's thesis

Non-Thesis Option (6 hours):
- CAP 6946, Graduate Internship (3 hours)
- Choose one course from the groups listed in the restricted electives section (Groups A, B, C)

D. Provide a sequenced course of study for all majors, concentrations, or areas of emphasis within the proposed program.

Professional Track:

A 'Typical' Program of Study Outline for the Professional Track:

Fall Year 1 – Nine hours:

CHS 5503 Topics in Forensic Science (three hours)
CGS 5131 Computer Forensics 1 (three hours)
Elective (three hours typical)

Spring Year 1 – Nine hours:

CHS 5518 Collection and Examination of Digital Evidence (three hours)
CGS 5132 Computer Forensics 2 (three hours)
CET 6xxx OS & File System Forensics (three hours)

Fall Year 2 – Six hours

CET 6xxx Incident Response Technologies (three hours)
Elective (three hours typical)

Spring Year 2 – Six hours

CET 6xxx Practice of Digital Forensics (capstone/project) (three hours)
CET 6946 Internship (three hours)

TOTAL: 30 hours

Table. 5-year Course Schedule for the Professional Track

5 Year Schedule	**Instructor**
Spring 2008	
CHS 5518: Collection/Examination DE	Sadaka
CGS 5132: Computer Forensics 2	Lang
CET 6xxx: Practice of Digital Forensics	Pollitt
CET 6xxx: Intrusion Response Technologies	Craiger
Elective	
Fall 2008	
CHS 5503: Topics in Forensic Science	Whitcomb
CGS 5131: Computer Forensics 1	Lang
CET 6xxx Operating/File System Forensics	Craiger
Internship	Craiger
Elective	
Spring 2009	
CHS 5518: Collection/Examination DE	Sadaka
CGS 5132: Computer Forensics 2	Lang
CET 6xxx: Practice of Digital Forensics	Pollitt
CET 6xxx: Intrusion Response Technologies	Craiger
Internship	Craiger
Elective	
Fall 2009	
CHS 5503: Topics in Forensic Science	Whitcomb
CGS 5131: Computer Forensics 1	Lang
CET 6xxx Operating/File System Forensics	Craiger
Internship	Craiger

Elective	
Spring 2010	
CHS 5518: Collection/Examination DE	Sadaka
CGS 5132: Computer Forensics 1	Lang
CET 6xxx Practice of Digital Forensics	Pollitt
Internship	Craiger
CET 6xxx: Intrusion Response Technologies	Craiger
Elective	
Fall 2010	
CHS 5503: Topics in Forensic Science	Whitcomb
CGS 5131: Computer Forensics 1	Lang
CET 6xxx Operating/File System Forensics	Craiger
Internship	Craiger
Elective	
Spring 2011	
CHS 5518: Collection/Examination DE	Sadaka
CGS 5132: Computer Forensics 2	Lang
CET 6xxx:Practice of Digital Forensics	Pollitt
Internship	Craiger
CET 6xxx: Intrusion Response Technologies	Craiger
Elective	
Fall 2011	
CHS 5503: Topics in Forensic Science	Whitcomb
CGS 5131: Computer Forensics 1	Lang
CET 6xxx Operating/File System Forensics	Craiger
Internship	Craiger
Elective	
Spring 2012	
CHS 5518: Collection/Examination DE	Sadaka
CGS 5132: Computer Forensics 2	Lang
CET 6xxx: Practice of Digital Forensics	Pollitt
CET 6xxx: Intrusion Response Technologies	Craiger
Internship	Craiger

Science/Computing Track:

A sample program of study (non-thesis option):

Fall semester, Year 1 (9 hours):
CGS 5131 Computer Forensics I
CHS 5503 Topics in Forensic Science
5000 or 6000-level elective in restricted courses

Spring semester, Year 1 (9 hours):
CGS 5132 Computer Forensics II

CHS 5596 Forensic Expert in the Courtroom
CET 6xxx Practice of Digital Forensics

Fall semester, Year 2 (6 hours):
CAP 6946 Graduate Internship
6000-level elective in computing

Spring semester, Year 2 (6 hours):
6000-level elective in computing
6000-level elective in criminal justice

A sample program of study (thesis option):

Fall semester, Year 1 (9 hours):
CGS 5131 Computer Forensics I
CHS 5503 Topics in Forensic Science
5000 or 6000-level elective in criminal justice

Spring semester, Year 1 (9 hours):
CGS 5132 Computer Forensics II
CHS 5596 Forensic Expert in the Courtroom
CET 6xxx Practice of Digital Forensics

Fall semester, Year 2 (6 hours):
CAP 6971 Thesis
6000-level elective in computing

Spring semester, Year 2 (6 hours):
CAP 6971 Thesis
6000-level elective in computing

Table. 5-year Course Schedule for the Science/Computing Track

Spring 2008	**Instructor**
CHS 5596 The Forensic Expert in the Courtroom	Smith (Chemistry)
CJE 5688 Cybercrime and Criminal Justice	CJ faculty
CGS 5132 Computer Forensics 2	Lang
CET 6xxx Practice of Digital Forensics	Pollitt
CCJ 6074 Investigative and Intelligence Analysis	CJ faculty
CAP 6xxx Wireless Security and Forensics	Turgut

Fall 2008	**Instructor**
CHS 5503 Topics in Forensic Science	Whitcomb
CGS 5131 Computer Forensics 1	Lang
COP 6946 Graduate Internship	Turgut
CCJ 6706 Quantitative Methods & Computer Utilization in Criminal Justice	CJ faculty
COP 6xxx Malware and Software Vulnerability Analysis	C. Zou

Spring 2009	**Instructor**
CHS 5596 The Forensic Expert in the Courtroom	Smith (Chemistry)
CJE 5688 Cybercrime and Criminal Justice	CJ faculty
CGS 5132 Computer Forensics 2	Lang
CET 6xxx Practice of Digital Forensics	Pollitt
CCJ 6074 Investigative and Intelligence Analysis	CJ faculty
COP 6xxx Distributed Processing of Digital Evidence	R. Guha

Fall 2009	**Instructor**
CHS 5503 Topics in Forensic Science	Whitcomb
CGS 5131 Computer Forensics 1	Lang
CAP 6946 Graduate Internship	R. Guha
CCJ 6706 Quantitative Methods & Computer Utilization in Criminal Justice	CJ faculty
CAP 6133 Advanced Topics in Computer Security and Computer Forensics	C. Zou

Spring 2010	**Instructor**
CHS 5596 The Forensic Expert in the Courtroom	Smith (Chemistry)
CJE 5688 Cybercrime and Criminal Justice	CJ faculty
CGS 5132 Computer Forensics 2	Lang
CET 6xxx Practice of Digital Forensics	Pollitt
CCJ 6074 Investigative and Intelligence Analysis	CJ faculty
CAP 6xxx Wireless Security and Forensics	Turgut

Fall 2010	**Instructor**
CHS 5503 Topics in Forensic Science	Whitcomb
CGS 5131 Computer Forensics 1	Lang
COP 6946 Graduate Internship	Turgut
CCJ 6706 Quantitative Methods & Computer Utilization in Criminal Justice	CJ faculty
COP 6xxx Malware and Software Vulnerability Analysis	C. Zou

Spring 2011	**Instructor**
CHS 5596 The Forensic Expert in the Courtroom	Smith (Chemistry)
CJE 5688 Cybercrime and Criminal Justice	CJ faculty
CGS 5132 Computer Forensics 2	Lang
CET 6xxx Practice of Digital Forensics	Pollitt
CCJ 6074 Investigative and Intelligence Analysis	CJ faculty
COP 6xxx Distributed Processing of Digital Evidence	R. Guha

Fall 2011	**Instructor**
CHS 5503 Topics in Forensic Science	Whitcomb
CGS 5131 Computer Forensics 1	Lang
CAP 6946 Graduate Internship	R. Guha
CCJ 6706 Quantitative Methods & Computer Utilization in Criminal Justice	CJ faculty
CAP 6133 Advanced Topics in Computer Security and Computer Forensics	C. Zou

Spring 2012	**Instructor**
CHS 5596 The Forensic Expert in the Courtroom	Smith (Chemistry)
CJE 5688 Cybercrime and Criminal Justice	CJ faculty
CGS 5132 Computer Forensics 2	Lang

CET 6xxx Practice of Digital Forensics	Pollitt
CCJ 6074 Investigative and Intelligence Analysis	CJ faculty
CAP 6xxx Wireless Security and Forensics	Turgut

Fall 2012	**Instructor**
CHS 5503 Topics in Forensic Science	Whitcomb
CGS 5131 Computer Forensics 1	Lang
CAP 6946 Graduate Internship	R. Guha
CCJ 6706 Quantitative Methods & Computer Utilization in Criminal Justice	CJ faculty
CAP 6133 Advanced Topics in Computer Security and Computer Forensics	C. Zou

E. Provide a one- or two-sentence description of each required or elective course.

Required or Elective Courses for the Professional Track:

a. CHS 5503 – Topics in Forensic Science. (3 credits) Topics in Forensic Science will include the history of forensic science, basic forensic science principles as applied in various forensic specialties, current issues in digital evidence, and professionalism.

b. CGS 5131 – Computer Forensics 1. (3 credits) This course covers legal issues regarding seizure and chain of custody, technical issues in acquiring computer evidence, popular computer file systems, and reporting issues in the legal system.

c. CGS 5132 – Computer Forensics 2. (3 credits) The purpose of this course is to teach the concepts of computer system security models, fundamentals of computer networking and the layered protocol architectures, detection and prevention of intrusion and attack, digital evidence collection and evaluation, and the legal issues involved in computer forensic analysis.

d. CET 6xxx – Operating System and File Systems Forensics (new course). (3 credits) The course will provide students with a practical understanding of the fundamental procedures required to correctly conduct digital forensics on Windows, Linux, and Macintosh operating systems, file systems, and associated applications.

e. CET 6xxx – Practice of Digital Forensics. (3 credits) This is a capstone course that allows students to demonstrate the ability to combine all they have learned. Students will work on several case studies that require them to apply the knowledge and skills they have acquired to practical assignments.

f. CET 6946 Graduate Internship or Practicum. (minimum 3 credit hours) Inclusion of an internship underscores the importance of students' applying the knowledge and skills learned during their studies in the real world. Three credit hours are required.

g. PLA 5587 Current Issues in Cyberlaw. (3 credits) Advanced examination and discussion of free speech, copyright, trademark, patent and privacy issues in the online environment through interactive class discussions, online discussions, postings, case study reviews, and legal research projects.

h. CJE 5688 Cybercrime and Criminal Justice. (3 credits) Deals with the problem of

cybercrime and the criminal use of the Internet. Includes investigation, enforcement and legal issues.

i. CHS 5518: Collection/Examination DE. (3 credits) This course will cover the nature of digital evidence collection and examination under the constraints of law and courtroom procedures.

j. CHS 5596 The Forensic Expert in the Courtroom. (3 credits) A study of the uses of technically- and scientifically-trained expert witnesses at trial.

k. CET 6xxx Incident Response Technologies (new course). (3 credits) An advanced course covering topics related to computer incidents and intrusion response.

l. CAP 6133 Advanced Topics in Computer Security and Computer Forensics. (3 credits) Advanced topics in computer security and forensics such as cryptography, automatic intrusion detection, pattern matching and statistical techniques, firewalls, and vulnerability scanning.

Required or Elective Courses for the Science/Computing Track:

- CHS 5503 Topics in Forensic Science. (3 credits) Topics in Forensic Science will include the history of forensic science, basic forensic science principles as applied in various forensic specialties, current issues in digital evidence, and professionalism.
- CGS 5131 Computer Forensics 1. (3 credits) This course covers legal issues regarding seizure and chain of custody, technical issues in acquiring computer evidence, popular computer file systems, and reporting issues in the legal system.
- CGS 5132 Computer Forensics 2. (3 credits) The purpose of this course is to teach the concepts of computer system security models, fundamentals of computer networking and the layered protocol architectures, detection and prevention of intrusion and attack, digital evidence collection and evaluation, and the legal issues involved in computer forensic analysis.
- CET 6xxx Practice of Digital Forensics. (3 credits) This is a capstone course that allows students to demonstrate the ability to combine all they have learned. Students will work on several case studies that require them to apply the knowledge and skills they have acquired to practical assignments.
- CAP 6133, Advanced Topics in Computer Security and Computer Forensics. (3 credits) Advanced topics in computer security and forensics such as cryptography, automatic intrusion detection, pattern matching and statistical techniques, firewalls, and vulnerability scanning.
- CAP 6xxx, Wireless Security and Forensics. (3 credits) This course provides advanced study for those students with an interest in areas such as wireless computer security, security management, cryptography, computer forensics, and related areas.
- COP 6xxx, Malware and Software Vulnerability Analysis. (3 credits) Analysis of malicious code including viruses, worms, Trojans, and buffer overflow vulnerabilities encountered in software packages.
- COP 6xxx, Distributed Processing of Digital Evidence. (3 credits) Study of parallel and distributed processing techniques using MPI in a cluster environment, along with

data mining techniques used in analyzing large quantities of digital data.

- CCJ 6074, Investigative and Intelligence Analysis, Theory and Methods. (3 credits) This course is designed to familiarize the student with the complex analytical techniques and procedures used to support criminal investigations and criminal intelligence efforts.
- CCJ 6706, Quantitative Methods and Computer Utilization in Criminal Justice. (3 credits) Application of statistical software to quantitative and qualitative methods in Criminal Justice.
- ESI 5219 Engineering Statistics. (3 credits) Discrete and continuous probability distributions, hypothesis testing, regression, nonparametric statistics, and ANOVA.
- STA 5206 Statistical Analysis. (3 credits) Data analysis; statistical models; estimation; tests or hypotheses; analysis of variance, covariance, and multiple comparisons; regression and nonparametric methods.
- PLA 5587, Current Issues in Cyberlaw. (3 credits) Advanced examination and discussion of free speech, copyright, trademark, patent, and privacy issues in the online environment through interactive class discussions, online discussions, postings, case study reviews, and legal research projects.
- CHS 5596, The Forensic Expert in the Courtroom. (3 credits) A study of the uses of technically- and scientifically-trained expert witnesses at trial.
- CHS 5518, Forensic Examination of Digital Evidence. (3 credits) This course will cover the nature of digital evidence collection and examination under the constraints of law and courtroom procedures.
- CJE 5688, Cybercrime and Criminal Justice. (3 credits) Deals with the problem of cyber crime and the criminal use of the Internet. Includes investigation, enforcement and legal issues.
- CAP 6946, Graduate Internship. (3 credit hours)
- CAP 6971, Master's thesis. (6 credit hours)

F. For degree programs in the science and technology disciplines, discuss how industry-driven competencies were identified and incorporated into the curriculum and identify if any industry advisory council exists to provide input for curriculum development and student assessment.

Professional Track: Alignment of Curriculum with National Standards

In 2003, the National Institute of Justice created a committee composed of academicians and industry practitioners from the various forensic sciences to develop a model curriculum. This curriculum was published as "Education and Training in Forensic Science: A Guide for Forensic Science Laboratories, Educational Institutions, and Students." The curriculum was targeted at biological and physical sciences, as the core requirements are fairly homogenous. What was not included was digital forensics, for the primary reason that the subject matter and student outcomes are significantly different from those of the "traditional" forensic sciences.

As a consequence, in 2005 the National Institute of Justice created a similar committee – the Technical Working Group for Education and Training in Digital Forensics - to

develop a model curriculum for associate, undergraduate, and graduate degrees in digital forensics. The model curriculum is expected to be completed in early 2007 and published as "Education and Training in Digital Forensics: A Guide for Forensic Science Laboratories, Educational Institutions, and Students."

Below is a list of competencies allowing evidence to be entered into a court of law that our graduating students will exhibit, along with the courses that cover those competencies:

1. **Identify and preserve a variety of digital devices:** Digital evidence can be found on many types of devices, including hard drives, cell phones, music players, embedded devices (e.g., black boxes in cars or aircraft), and game consoles. It is crucial that professionals understand not only where to look for evidence, but how to gather that evidence in a forensically sound manner.

2. **Preserve and collect digital evidence in the field on a network:** Network intrusions may produce evidence located on disparate machines throughout the world, and in many different formats. Professionals should be able to understand where this evidence may reside, and how to gather it in a forensically sound manner.

3. **Acquire, validate, and restore forensic images**: Professionals must be able to gather evidence, make copies of the evidence, and validate that the copies are exactly the same as the original evidence.

4. **Develop and validate new forensic techniques and solve problems using the scientific method:** Professionals must be able to validate the tools they use to ensure that the results are as expected.

5. **Identify, analyze, and solve both technical and investigative problems:** Professionals must understand the investigative process, and how non-digital sources of information may provide clues as to what types of evidence could be expected on the digital media.

6. **Demonstrate an understanding of computer and network components and their interactions**: Professionals must understand the intricacies of the interplay between computers and networks, and how these interactions affect the types of evidence that may exist.

7. **Effectively communicate technical findings in both oral and written form**: Digital forensics is technical by nature, and a professional must be able to explain technical procedures and findings in a clear and accurate format.

8. **Demonstrate an understanding of expert testimony:** Professionals must be able to explain technical subject matter in a way that lay persons (jurors) can understand.

9. **Demonstrate understanding of current laws pertaining to computer crime:** Professionals must understand how and whether information found on a computer may be relevant to particular local, state and Federal laws.

10. **Demonstrate an understanding of forensic sciences:** Professionals must understand how the various forensic sciences affect each other. For instance, bloody fingerprints on a computer monitor should be gathered as evidence before any processing of the hard drive takes place.

11. **Demonstrate an understanding of ethics and professionalism:** Professionals should understand the importance of ethics and professionalism, as this has an effect not only on the individual's credibility, but also on the field as a whole.

Tables 5 and 6 map the courses for the Professional Track to the competencies listed above. (A description of courses is located below the tables).

Table 5. Mapping of core competencies to **required** courses. (Professional Track)

Competencies			Required Courses			
	CHS5503	CGS5131	CGS5132	CET6001	CET6002	CET6496
1		**x**		**x**	**x**	**x**
2			**x**	**x**		**x**
3		**x**		**x**	**x**	**x**
4	**x**	**x**	**x**	**x**	**x**	**x**
5	**x**	**x**	**x**	**x**	**x**	**x**
6			**x**	**x**		**x**
7	**x**	**x**	**x**	**x**	**x**	**x**
8					**x**	
9					**x**	
10					**x**	
11	**x**	**x**	**x**	**x**	**x**	**x**

Table 6. Mapping of core competencies to **electives** (Professional Track)

Competencies			Electives	
	PLA5587	CJE5688	CHS5518	CET6003
1				**x**
2				**x**
3				**x**
4				
5				**x**
6				**x**
7				**x**
8			**x**	

9	**x**	**x**	**x**	
10	**x**	**x**		
11	**x**	**x**	**x**	**x**

Science/Computing Track:

The Science/Computing Track is directed toward those with an interest in scientific applications and research in the field. The core courses of the Science/Computing Track, CHS 5503, CGS 5131, CGS 5132, and CET 6XXX, cover the essential knowledge and skills required of a forensic examiner (as can be seen from Tables 5 and 6 from the preceding sub-section); the elective courses provide a broader range of topics in related disciplines to further the understanding of scientific and technical issues for advanced investigation and research. The combination of core and elective courses strives to satisfy the competencies required of the digital forensics discipline.

To advance the state-of-the-art of the discipline and to tackle current challenges, three new courses most urgently needed in the computing category are proposed: wireless security and forensics, distributed processing of digital evidence, and malware and software vulnerability. These topics are of genuine research interest due to, respectively, the prevalence of wireless communication devices, large volumes of digital data, and the ubiquitous nature of malware (viruses, worms, spyware). These topics are also selected based on faculty research expertise. Further, these topics are significant from a practitioner's perspective, as can be seen from the agenda of the 2006 GMU International Training Symposium in Computer Forensics, which included topics such as Large Scale Forensics, Malware and Bluetooth, Search Site Processing, Tool Test & Software Library, Distributed Computing to Process High Volumes of Evidence, and Wireless Forensics.

The GMU (George Mason University) symposium has been a premier training conference since 1999 for digital forensics professionals to learn about the state-of-the-art practice and technologies of the discipline. Since there are still no industry-driven competency standards in digital forensics at this point, topics covered in the GMU symposium are used to gauge whether the proposed curriculum in the Science/Computing Track will satisfy the needs of the discipline. A summary of the GMU 2006 topics, and how they map to the curriculum of the Science/Computing Track, are given below.

Summary of Topics on GMU 2006 Agenda:

The GMU (George Mason University) symposium is sponsored by RCFG, Inc. The RCFG (Regional Computer Forensics Group, http://www.rcfg.org/) is a non-profit Virginia corporation supporting the training needs of the law enforcement and computer forensics communities. The GMU symposium started in 1999, and has been providing computer forensics training for thousands of participants. The symposium is attended by researchers, practitioners, and technology vendors.

We list the training topics of the GMU 2006 Symposium by appropriate categories. Those topics that are not directly covered in the Science/Computing Track of MSDF are so noted:

(1) Basic:

Topics covered in CGS 5131 and CGS 5132:
A+ Prep Class, Basic DOS/Wintel, Linux,
Topics not covered: Mac

(2) General:

Topics covered in CGS 5131, CGS 5132, CAP 6133, both COP 6XXX:
Basic Seizure, Chat & E-mail Examination Labs, Finding Hacker Tools, Compromised Computer, Free Software, Incident Response, IP Ver6, Malware and Bluetooth, New HASHING, Registry Viewer, TCP / IP, Windows Live Response, Windows Mem Analysis, Large Scale Forensics
Topics not covered: Proactive Online, Proactive Forensics, Search Site Processing, Tool Test & Software Library

(3) Vendor-specific:

Topics covered in CGS 5131 and CGS 5132:
AccessData 2.0, Encase, FTK 2.0, Spada / Helix & RAM
Topics not covered: I-Look, Maresware, NetAnalysis labs, Pro Discover

(4) Specialized Technology:

Topics covered in CAP 6XXX and COP 6XXX:
Decryption Technology, Distributed Computing to Process High Volumes of Evidence, Password Cracking Lab, Steganography, Tracking USB devices, Voice Over IP, Wireless Forensics
Topics not covered: Cell/Mobile Evidence Handling, Handheld Forensics labs, Image fly a-way kit, MAC Forensics, PDA Evidence Handling, PGP & GnuPG.

(5) Legal and Investigation:

Topics covered in CHS 5518, DIG 5835, CCJ 6074, and CJE 5688:
Corporate Investigations, Fed Legal Overview, Prosecution Case Study, RIAA, Cybercrime Profiler, FBI Cyber Investigations

The design of the Science/Computing Track's curriculum is based on the academic strengths of UCF's existing courses, the scientific and interdisciplinary nature of the discipline; it is also guided by practical needs from working professionals using the GMU symposium's agenda as a guide. The preceding comparison shows that the Science/Computing Track's curriculum covers all major topics of digital forensics. The areas that are not covered are those due to lab environment (such as Proactive Online and Proactive Forensics), tools from specific vendors (such as I-Look and Maresware), or specialized devices (such as cell phones and PDAs).

Program Administration

Graduate Program Coordinator

The Graduate Program Coordinator will administer the M.S. Program in Digital Forensics. In consultation with the Department Chair, the members of the Digital Forensics faculty elect the Graduate Program Coordinator for a three year term. This

process will occur in the spring semester of the Graduate Program Coordinator's third year of service. The start of the new term of service will coincide with the beginning of the next contract year (August). The Graduate Program Coordinator must be active in the graduate program (i.e., during the previous two years s/he must have taught a graduate course). The Graduate Program Coordinator will receive .11 FTE for this responsibility each semester, including summer. The Chair will periodically re-assess this assignment for possible additional FTE to be allocated to the Graduate Program Coordinator as the program grows.

The duties of the Graduate Program Coordinator will include, but not be limited to, the following:

- Coordinating the recruitment of students into the M.S. program.
- In consultation with the Department Chair, developing the annual budget for the graduate program.
- In consultation with the Graduate Committee, assigning incoming students to a temporary Academic Advisor if necessary, and assisting students in selecting a permanent Academic Advisor if necessary.
- Serving as Chair of the Graduate Committee (see below).
- Monitoring the progress of graduate students.
- In consultation with the Graduate Committee, assigning duties of Teaching Assistants.
- Informing graduate students of opportunities such as fellowships, awards, professional meetings, or other forms of professional advancement.
- Ensuring compliance to all rules and guidelines at all levels of university governance.
- In consultation with the Graduate Committee, allocating office space to graduate students.
- In consultation with the Graduate Committee, establishing and monitoring a mentoring program for Digital Forensics faculty who have not had experience in chairing an M.S. or other similar type of committee such as Honors in the Major.

Graduate Committees. There will be separate graduate committees for the two tracks due to the distinct audiences they serve. The Professional Track Graduate Committee shall consist of all faculty members who participate in the Professional Track through teaching, advising, or committee service. The Science/Computing Track committee will consist of faculty members who regularly teach courses and/or conduct research in the digital forensics discipline. Both committees shall report to the Graduate Program Coordinator.

The duties of these Graduate Committees shall include, but not be limited to, the following:

- Assisting the program coordinator in student admissions.
- Awarding assistantships funded with E&G money to graduate students.
- Deciding on any student appeals or petitions relating to program requirements or any other academic issue.
- Recommending changes in graduate policies and procedures to the Digital Forensics faculty and, in consultation with the Department Chair, securing appropriate

authorization for changes if necessary.

- Approving new graduate courses prior to their submission to Department faculty.
- Determining the status of graduate students whose grades fall below acceptable.
- Approving curriculum revisions such as changes in course requirements, addition of new courses, and course substitutions.
- Serving as internship faculty advisors.
- Handling student appeals.

G. For all programs, list the specialized accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program if it is available? If not, why? Provide a brief timeline for seeking accreditation, if appropriate.

The field of digital forensics is so new that there are no accrediting bodies. However, Ms. Whitcomb, Mr. Pollitt, and Dr. Craiger are members of the development committee for the Digital Forensics Certification Board (DFCB), a nationally recognized committee of digital forensics professionals and academics that is developing certification criteria for digital forensics examiners and is sponsored by the National Institute of Justice. The committee is expected to have completed their certification criteria by 2008. At that time, the graduate program committee for the degree will evaluate the current curriculum against the certification criteria. Although the DFCB will not accredit forensics labs or academic programs, it will be the first to certify individuals based on their demonstrated knowledge, skills, and abilities in digital forensics.

Dr. Craiger is a member of the planning panel of the Technical Working Group for Education and Training in Digital Evidence (TWGDE), whose charge is to develop a nationally recognized curriculum at the associate's, bachelor's, and master's levels. He is also a member of the International Federation for Information Processing Working Group 11.9 Digital Forensics, a member of the Digital Forensics Working Group, and an Associate Member of the American Academy of Forensic Sciences.

Mr. Pollitt served as the Chairman of both the International Organization on Computer Evidence (IOCE) and the Scientific Working Group on Digital Evidence (SWGDE). He currently serves as the Co-Chair of the Digital Forensic Educator's Working Group and is Vice-Chair of IFIP WG 11.9. Mr. Pollitt is a member of the American Academy of Forensic Sciences, and received the General Section Lifetime Achievement Award in 2006.

Ms. Whitcomb served as founding Vice-Chair of the Scientific Working Group on Digital Evidence (SWGDE). She also served as a member of the International Organization on Computer Evidence (IOCE). Ms. Whitcomb is a Fellow in the American Academy of Forensic Sciences.

H. For doctoral programs, list the accreditation agencies and learned societies that would be concerned with corresponding bachelor's or master's programs associated with the proposed program. Are the programs accredited? If not, why?

N/A.

I. Briefly describe the anticipated delivery system for the proposed program (e.g., traditional delivery on main campus; traditional delivery at branch campuses or centers; or nontraditional delivery such as distance or distributed learning, self-paced instruction, or external degree programs). If the proposed delivery system will require specialized services or greater than normal financial support, include projected costs in Table 2. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.

Importance of Providing Professional Track Classes Online (Distance Learning)

As described previously, the primary audience for the Professional Track consists of students who are employed in our local region or state, as has been the case with the majority of students in the Graduate Certificate program. To meet the needs of these students, the courses comprising the Professional Track will be fully online (web-based) by spring of 2008. Most of the courses comprising the Professional Track are already online, and are composed of video and audio feeds and online resources (such as assignments, readings, and discussion groups). All of the current faculty members have successfully completed a course on how to develop online courses that is offered by UCF Course Development and Web Services. Prior to the first semester MSDF courses are taught, any courses that serve as required courses for the Professional Track and are not currently offered in a purely online format (including video and audio feeds and online resources) will be modified to be consistent with this format.

The online format provides several advantages over traditional classroom delivery, including the ability to reach non-traditional, working, and mature students, and the ability to reach a geographically dispersed student population.

Professional Track Advisory Committee

We have chosen four nationally and internationally recognized individuals in their fields, from academia, law enforcement, and industry, to serve as the advisory committee for the Professional Track. These members will review the progress of the Professional Track and provide feedback when necessary. The members are listed here:

- Sujeet Shenoi, Ph.D., is the F.P. Walter Chair in Math and Computer Science at the University of Tulsa.
- Marcus Rogers, Ph.D., is a Professor at the Center for Education and Research in Information Assurance and Security (CERIAS), Purdue University, and head of their Digital Forensics program.
- Eric Thompson is the CEO and founder of AccessData, one of the largest makers of digital forensics software.

- Special Agent Keith Hoover (2003-2006) served as Criminal Squad Supervisor, Criminal Investigative Division, as Assistant to the Special Agent in Charge – Electronic Crimes Special Agent Program Manager, U.S. Secret Service (currently assigned to the Orlando Field Office as Assistant to the Special Agent in Charge).

Science/Computing Track Advisory Committee

There will be a separate advisory committee for the Science/Computing Track. The committee members are recruited from three sectors within the digital forensics community: academia, law enforcement, and industry. There will be representatives from the local/state level, as well as national and international levels. The advisory committee is expected to provide guidance mostly on curriculum issues; the organizations they represent may also provide internship opportunities to our students. The committee is expected to meet at least once annually at UCF.

Online Delivery Status of Graduate Certificate in Computer Forensics

Independently, but in anticipation of the MSDF degree program, UCF has converted the Graduate Certificate in Computer Forensics to an online format starting in the fall of 2006. Students who choose online instruction need to provide evidence of adequate access to computing and networking facilities and that they must sufficient computer background through education and/or work related experience. The exact online delivery format is described as follows:

- CHS 5503: completely taught online via WebCT
- CGS 5131 and CGS 5132: both courses hold face-to-face lectures and open labs, plus an online section using WebCT for course delivery
- DIG 5835: online instruction via WebCT plus one in-class meeting for moot court practice; the instructor works with online students on the moot court component via teleconferencing or use of regional labs
- Choice of either CHS 5518 or CHS 5596: CHS 5518 uses face-to-face instruction; CHS 5596 is an alternative class and is scheduled for online instruction in spring 08

Online delivery for the Science/Computing Track:

The primary audience for the Science/Computing Track includes recent graduates of a computing related degree and experienced professionals interested in pursuing an advanced graduate degree. Course instruction will emphasize both scientific principles and hands-on lab work. Therefore, all computing related courses will hold face-to-face lectures assisted by online access to course materials. We will use the same policy as in the graduate certificate in computer forensics for students seeking online instruction; that is, students with adequate facilities and sufficient background, who can conduct the assigned lab work using their own equipment, will be able to complete the degree requirements online by choosing appropriate elective courses. Faculty members who teach the online courses are expected to ensure the quality and integrity of students' work and learning outcomes.

Collaboration with Other Institutions:

Dr. Lang has made contact with faculty of the Computer Information Sciences (CIS) Department at Florida A&M University (FAMU) in Tallahassee to pursue collaboration related to teaching and research in digital forensics. FAMU is classified as a Historically Black College or University (HBCU), and its CIS faculty is very interested in working with UCF to develop both undergraduate and graduate courses in digital forensics using UCF's graduate certificate program in computer forensics as a model. A small group of FAMU CIS Department's faculty and staff members attended a Digital Forensics Workshop organized by UCF in June of 2007 to learn more about UCF's graduate-level courses in computer forensics and to explore collaborative opportunities.

Dr. Craiger works with several universities in both research and teaching capacities, including the University of Tulsa, Marshall University, Purdue University, as well as serving on the board of advisors for Valencia Community College's (Orlando) Security and Forensics degree.

IX. Faculty Participation

A. Use Table 4 to identify existing and anticipated ranked (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenure-earning, or multi-year annual [MYA]); (f) contract length in months; and (g) percent of annual effort that will be directed toward the proposed program (instruction, advising, supervising internships and practica, and supervising thesis or dissertation hours).

TABLE 4

ANTICIPATED FACULTY PARTICIPATION

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Specialty	Rank	Contract Status	Initial Date for Participation in the Program	Mos. Contract Year 1	FTE Year 1	% Effort for Prg. Year 1	PY Year 1	Mos. Contract Year 5	FTE Year 5	% Effort for Prg. Year 5	PY Year 5
A	Carrie Whitcomb, M.S. Forensic Science	Instructor	Non-tenure	2009	12	1.00	0%	0.00	12	1.00	11%	0.11
A	Philip Craiger, Ph.D. Digital Forensics (internship coord)	Assistant Prof	TE	2008	9	0.75	11%	0.08	9	0.75	44%	0.33
A	Sheau Lang, Ph.D. Computer Science (prog director)	Associate Prof	Tenured	2008	9	0.75	11%	0.08	9	0.75	44%	0.33
A	Joohan Lee, Ph.D. Computer Science	Assistant Prof	TE	2009	9	0.75	0%	0.00	9	0.75	11%	0.08
A	Damla Turgut, Ph.D. Electrical Engineering	Assistant Prof	TE	2008	9	0.75	11%	0.08	9	0.75	11%	0.08
A	Cliff C. Zou. Ph.D. Computer Science	Assistant Prof	TE	2009	9	0.75	0%	0.00	9	0.75	11%	0.08
A	Mark Pollitt, M.S. Digital Forensics	Assistant Prof	Non-tenure	2008	9	0.75	0%	0.00	9	0.75	0%	0.00
A	Robert Ford, Ph.D., Criminal Justice	Instructor	TE	2008	9	0.75	0%	0.00	9	0.75	11%	0.08
A	Ray Surette, Ph.D. Criminal Justice	Professor	TE	2008	9	0.75	0%	0.00	9	0.75	0%	0.00
C	New Hire, Ph.D. Computer Forensics	Assistant Prof	TE	2008	9	0.75	0%	0.00	9	0.75	22%	0.17
	Total Person-Years (PY)							0.25				1.27

Faculty CODE		Source of Funding	PY Workload by Budget Classification Year 1	Year 5
A	**Existing faculty on a regular line**	**Current Education & General Revenue**	**0.25**	**1.10**
B	**New faculty to be hired on a vacant line**	**Current Education & General Revenue**		
C	**New faculty to be hired on a new line**	**New Education & General Revenue**	**0.00**	**0.17**
D	**Existing faculty hired on contracts/grants**	**Contracts/Grants**		
E	**New faculty to be hired on contracts/grants**	**Contracts/Grants**		
		Overall Totals for	**Year 1 0.25**	**Year 5 1.27**

Faculty CODE	Corresponding Faculty Position Category in TABLE 3 for the Fifth Year	Proposed Source of Funding for Faculty	TOTAL 5th Year Workload by Budget Classification
A	Current General Revenue	Existing Faculty - Regular Line	0.00
B	Current General Revenue	New Faculty - To Be Hired on Existing Vacant Line	0.00
C	New General Revenue	New Faculty - To Be Hired on a New Line	0.00
D	Contracts & Grants	Existing Faculty - Funded on Contracts & Grants	
E	Contracts & Grants	New Faculty - To Be Hired on Contracts & Grants	
		Overall Total for 5th Year -page 2	0.00

Overall Total for 5th Year	

B. Use Table 2 to display the costs and associated funding resources for existing and anticipated ranked faculty (as identified in Table 2). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.

Table 2 details the projected costs for Year 1 and Year 5 and their sources. In Year 1, there are three sources for the program costs: (1) E&G money for faculty salaries to teach existing courses that can be used toward the MSDF degree, and to teach two new courses, for $51,419; (2) E&G money for library books and a half-time program assistant, for $19,875; and (3) contracts and grants (C&G) money to pay for graduate assistants and travel expenses for advisory board meetings, for $18,000.

Similar to Year 1, Year 5's program costs consist of the following: (1) E&G money for faculty salaries to teach existing courses that can be used toward the MSDF degree but with additional sections to accommodate increased enrollment, and to teach four new courses, for $166,529; (2) E&G money for library books, a newly hired faculty member (continued from Year 4), and a half-time program assistant, for $42,154; and (3) contracts and grants (C&G) money to pay for graduate assistants and travel expenses for advisory board meetings, for $18,000.

The exact figures for the program costs are given in Section III A on page 21 for Year 1 and Year 5, and in Appendix A for years 2 through 4.

C. Provide the number of master's theses and/or doctoral dissertations directed, and the number and type of professional publications for each existing faculty member (do not include information for visiting or adjunct faculty).

Faculty	MSs Directed	Ph.D.s Directed	Articles and Chapters
Lang	20	5	80
Craiger	1	2	68
Pollitt	0	0	12
Whitcomb	0	0	2
Sadaka	0	0	0
Guha	59	9	150
Turgut	5	5	40
Zou	0	3	18

D. Provide evidence that the academic unit(s) associated with this new degree have been productive in teaching, research, and service. Such evidence may include trends over time for average course load, FTE

productivity, student HC in major or service courses, degrees granted, external funding attracted, as well as qualitative indicators of excellence.

The productivity for Engineering Technology and for Computer Science is given below including an assessment.

Productivity for Professional Track Faculty (Engineering Technology)

Current productivity levels in the Engineering Technology department are high by both College and University standards. The standard course load for ENT faculty is 3/3 with at least 2 courses taught in the Summer term. The program review data given in the appendix provide quantitative indicators of productivity in student enrollments and research funding support.

Table 7 demonstrates the research productivity for the Department of Engineering Technology for years 1999-2007.

Table 7. Engineering Technology Research Productivity.

Engineering Technology

FY	# Faculty*	Researchers	New Funding	Pre Encumb.	Total Expenditures
1999	9	4	$43,765.00	$0.00	$30,624.09
2000	9	3	$49,442.00	$0.00	$33,343.64
2001	10	5	$169,241.00	$0.00	$103,347.85
2002	9	4	$103,465.80	$0.00	$95,362.04
2003	12	4	$249,674.50	$0.00	$195,362.64
2004	10	6	$362,900.80	($636.29)	$332,982.05
2005	11	7	$946,150.95	($40,815.85)	$668,135.10
2006	13	7	$728,899.14	$40,815.85	$885,675.57
2007	16	7	$1,375,270.38	$2,244.60	$538,363.85

Table 8 below shows the head counts for the Engineering Technology courses taught between 2004 and 2005.

Table 8: Head counts of Engineering Technology Courses, Fall 2004 through Spring 2007.

Course #	**Course Description**	**FA 04**	**SP 05**	**SU 05**	**FA 05**	**SP 06**	**SU 06**	**FA 06**	**SP 07**
		L/D/T	L/D/T	L/D/T	L/D/T				
CET 2123	Microprocessors Electr I								
CET 2364	Systems Applications in C	32/40/72	37/36/73		32/47/79	58		70	75
CET 3010	Introduction to Information Tech.	50/34/84	32/38/70		46/30/76	55		70	72
CET 3144C	Applied Microprocessor Tech.								
CET 3198C	Digital Systems		39/39-15/24/39			39			35
CET 3323C	Digital Technology	60/60-14/46/60			64/64-23/41/64	40		38	32
CET 3383	Applied Systems Analysis I	13/19/32	30/42/72			78			77
CET 3503	Microcomputer Technology I				12/20/32				
CET 3529	Linux/ Unix Sys Administration				30/28/58	57		38	57
CET 3752	Intro to Telephony	35/39/74			37/25/62				
CET 3930	Linux Administration and Applications		52/20/72						
CET 4134C	Microprocessor Electronics II			0/19/19-6/13/19			31		
CET 4138	Digital Programmable Devices			0/19/19-9/10/19					
CET 4333	Computer Organization and Design						87		
CET 4334C	Applied Computer Systems II								
CET 4427	Applied Database I	30/28/58	30/31/61		34/24/58	55		53	40

CET 4429	Applied Database II		20/11/31			28			22
CET 4469C	Applied Infobases								
CET 4483	Intro to Local Area Network Tech.		55/46/101			94			88
CET 4505	Applied Operating Systems I	35/21/56			47/38/85				
CET 4523	Applied Systems Analysis II			7/8/15					
CET 4583	Web-based Systems I			58/36/94			70		
CET 4584	Web-based Systems II	22/9/31			24/18/42				
CET 4663	Computer and Network Security				45/44/89				48
CET 4741L	Computer Networking Laboratory								
CET 4748	Wide Area Network I	24/36/60			35/17/52				
CET 4749	Wide Area Network II		10/8/18			16			19
CET 4884	Security Method & Practice(	0/16/16				62		2	42
CET 4932	Investigative Digital Technologies		40/30/70				15		
CET 4889	Sec Senor & Biometrics					26			21
CET 4915C	Senior Design Project								
CET 4931	Current Topics Tech			31/15/46					
CET 4932	Prac Info Secty						16		
EET 3085C	Electricity and Electronics	40/40-40/40	20/18/38-38/38	34/34-34/34	70/70-70/70	47	29		35
EET 3143C	Elect Devices/Circuits						11		
EET 3716	Network Analysis		7/11/18	9/8/17		16	13		32
EET 3930	Photonics Simulation								21
EET 4158C	Linear Integrated Circuits	20/20			0/22/22				
EET 4329C	Communications Systems								11
EET 4339C	Antennas and Propagation								
EET 4359C	Digital Communications Systems								

EET 4389C	Satellite Communications Systems								
EET 4548	Power Systems	5/12/17			11/15/26				
EET 4732C	Feedback Control Systems		20/20			20			18
EET 4915C	Senior Design Project								
EMA 4103	Space Environment					14			
EST 3211	Wave Photonics		5/9/14			16			11
EST 3213	Photonics Simulation	0/6/6			0/8/8				
EST 3222	Photonics Technology			12/18/30	4/9/13				
EST 3543C	Prog Logic Apps and Devices	20/20-20/20	20/20-20/20	20/20-9/11/20	19/19-3/16/19	20	18	20	19
EST 4227	Photonics Sensors & Devices		0/8/8			4			
EST 4236	Laser Systems Technology	11/7/18			7/3/10				
EST 4256	Photonics Communication		1/9/10			5			5
EST 4502C	Metrology and Instrumentation		0/37/37-15/22/37			33			40
ETC 4206	Construction Estimating		0/0/0						17
ETC 4241C	Construction Materials and Methods				10/16/26				
ETC 4242	Construction Contracts & Specs		6/11/17			15			20
ETC 4243	Building Systems					11			
ETC 4414C	Applied Structural Design I	7/10/17							
ETC 4415C	Applied Structural Design II				3/3/06				
ETD 3350C	Applied CADD	0/29/29			0/31/31				
ETG 3533C	Applied Engr Strength and Materials		19/13/32-13/19/32			38			38

ETG 3541	Applied Mechanics	11/31/42	22/27/49	0/0/0	11/33/44	42		77	47
ETG 4950C	Senior Design Project	0/24/24	0/29/29		27/0/27	38		32	38
ETI 3116	Applied Engr. Quality Assurance	20/30/50		7/18/25	18/38/56				
ETI 3418C	Comp Numerical Controls, Mach Apps			5/20/25-9/16/25			20		
ETI 3421	Materials and Processes	13/22/35			17/26/43				
ETI 3651C	Computer Applications	0/30/30	0/52/52	0/49/49	0/26/26	16	30	35	34
ETI 3671	Technical Economic Analysis		26/36/62	10/24/34		64	52	64	75
ETI 3690	Technical Sales						24		
ETI 4186	Applied Reliability		######						18
ETI 4205	Applied Logistics	6/10/16			14/6/20				
ETI 4448	Applied Project Management		28/26/54	31/32/63		46	68		
ETI 4635	Technical Administration	19/14/33	14/18/32		21/20/41	25			
ETI 4640	Process Planning & Work Measure	11/6/17			7/8/15				
ETI 4661C	Applied Facilities Planning & Design								
ETI 4700	Occupational Safety						62		
ETI 4835	Rocket Propulsion Technology	3/2/05			13/3/16				
ETI 4836	Space Systems Technology	11/7/18			10/3/13				
ETI 4837	Tech. of Small Space Payloads				0/12/12				
ETI 4838	Flight Dynamics Technology		11/4/15			7			
ETI 4839	Space Electro-Optics Technology								
ETI 4932									
ETM 4220	Applied Energy Systems		14/20/34			46			
ETM 4225	Manuf of Photonics				2/6/08				
ETM 4232C	Applied Heat Transfer		0/0/0						
ETM 4331C	Applied Fluid Mechanics			15/5/20					
ETM 4403C	Applied Kinematics								

ETM 4512C	Applied Design of Machine Elements								
ETM 4755	Applied Air Conditioning				0/0/0				
MAP 3401	Problem Analysis	8/18/26	6/14/20		14/9/23	16			
STXXXX	Introduction to IT								
SUR 3930									2
Totals		380/746/1126	540/818/1358	218/409/627	557/868/1425				

Productivity for EECS Faculty (Science/Computing Track)

Computer Science has been productive in terms of its research funding and generated SCH's over the years of 2003-4 and 2004-05. The total funding level for the period of 2000 - 2005 has been stable and is between 5.7 million and 7.4 million. The number of students awarded a bachelor's degree in Computer Science has experienced a decline in recent years, a trend consistent with other schools in the nation. The number of awarded bachelor's degree in IT has been rising although it is expected to reach its peak and start to decrease since there are fewer IT majors now compared to only a few years back. The number of completed Master's Ph.D. degrees in computer science has increased drastically in 2004. Details of the productivity figures are given below.

Table 9. Total Student Credit Hours by Level (Computer Science only):

Category	Computer Science Total SCH	
	2003-04	2004-05
Lower	16,155	16,158
Upper	15,647	13,687
Graduate	4,282	3,825
Thesis	347	399
Total	36,431	34,069

Table 10. Faculty Information (Computer Science only):

Computer Science Fall 2004	Count
Tenured or Tenure-Earning	21
Non-Tenure track	4
Visiting	9
Adjunct	14
GTA	63

Table 11. Research productivity for the School of EECS for years 2000-2005.

School of Electrical Engineering and Computer Science*			
Year	Federal	Non-federal	Total
2000-01	$3,567,911	$2,614,731	$6,182,642
2001-02	$5,035,934	$2,426,329	$7,462,263
2002-03	$3,541,237	$3,839,338	$7,380,575
2003-04	$3,593,851	$2,121,984	$5,715,835
2004-05	$3,157,097	$3,797,594	$6,954,691

*By the end of the program period, the departments of Electrical and Computer Engineering and Computer Science had combined to create the School of Electrical Engineering and Computer Science.

Table 12. Enrollment and Graduation Rate by Level (Computer Science and Information Technology only):

Year	Enrollment	Academic	Degrees Granted

	Computer Science, B.S.	Year	Computer Science, B.S.
Fall 2000	1,149	2000-01	139
Fall 2001	1,097	2001-02	132
Fall 2002	917	2002-03	132
Fall 2003	831	2003-04	111
Fall 2004	719	2004-05	103

Year	Enrollment Information Technology, B.S.	Academic Year	Degrees Granted Information Technology, B.S.
Fall 2000		2000-01	
Fall 2001	270	2001-02	15
Fall 2002	421	2002-03	58
Fall 2003	402	2003-04	90
Fall 2004	376	2004-05	95

Year	Enrollment Computer Science, M.S.	Academic Year	Degrees Granted Computer Science, M.S.
Fall 2000	86	2000-01	41
Fall 2001	103	2001-02	38
Fall 2002	125	2002-03	35
Fall 2003	135	2003-04	46
Fall 2004	90	2004-05	61

Year	Enrollment Computer Science, Ph.D.	Academic Year	Degrees Granted Computer Science, Ph.D.
Fall 2000	59	2000-01	5
Fall 2001	76	2001-02	6
Fall 2002	115	2002-03	6
Fall 2003	134	2003-04	6
Fall 2004	144	2004-05	14

X. Non-Faculty Resources

A. Describe library resources currently available to implement and/or sustain the proposed program through Year 5. Provide the total number of volumes and serials available in this discipline and related fields. List major journals that are available to the university's students. Include a signed statement from the Library Director that this subsection and subsection B have been reviewed and approved for all doctoral level proposals.

Library volumes (Provide the total number of volumes available in this discipline and related fields.)

As library resources are essential to any new degree program, an analysis of library holdings (monographs and periodicals) was conducted at the request of the National Center for Forensic Science to assist in preparing a program proposal for the new Master of Science in Digital Forensics program.

A library program review was completed by Marcus Kilman and reviewed by Jeannette Ward of the UCF Library on September 29, 2005. The review compared the library holdings of the University of Central Florida (UCF), George Washington University (GWU), University of New Haven, Connecticut (UNHC), and John Jay College of Criminal Justice (CUNY), and are intended to provide an assessment of current and anticipated future resources for the program. These benchmark universities were selected at the recommendation of Dr. Craiger.

Digital Forensics is a new area of study and a historical collection is neither available nor appropriate. The quantity of resources at the University of Central Florida is comparable to or greater than that of resources at institutions offering a similar program. Specifically, the library review determined that the average number of monographs in relevant fields at GWU, UNHC, and CUNY is 608. In comparison, UCF has 1272 monographs, 664 above the mean. A detailed listing of the fields related to digital forensics, and the number of library volumes at UCF by subject heading compared to GWU, UNHC, and CUNY, is given in Appendix C.

Serials (Provide the total number available in this discipline and related fields, and list those major journals which are available at your institution.)

The library review determined that UCF has 142 periodicals in criminal justice and legal areas, and has 215 periodicals in computer science areas. Appendix C contains the listing of these periodicals.

B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 3.

Library volumes

Additional funds were not recommended for the Library to support the program.

The Library currently plans to spend the following in 2005/06:

	Total	Approvals	Orders	Journals
Computer Science	$139,314	$68,500	$23,300	$47,500
Legal/Criminal	$53,550	$16,300	$15,600	$21,650

Serials

Many of these journals are not owned by UCF, but are subscribed to by two or more of the benchmark universities. The estimated cost to subscribe to these journals is $493, with a cost of $1234 to purchase the 5-year back-files. These may be purchased on an as-needed basis.

_____ _____

Library Director **Date**

C. Describe classroom, teaching laboratory, research laboratory, office, and other types of space that are necessary and currently available to implement the proposed program through Year 5.

Classroom

The Professional Track courses will be entirely online, and therefore will require no classroom usage. In the interim, the National Center for Forensic Science has hosted the UCF Graduate Certificate in Computer Forensics since the certificate's inception in 2001. NCFS is located in the UCF Research Park at 12354 Research Parkway, approximately 2 miles south of the main UCF Orlando campus. NCFS shares its facility with the United States Navy and also has an agreement to share two classrooms: a lecture room capable of seating approximately 60 and a smaller classroom capable of seating approximately 30. The proposed master's degree program can use these two classrooms if classes are held in the evenings. The agreement between the Navy and NCFS would not allow for these rooms to be used on a permanent basis for classes during the regular workday.

The larger of the two rooms contains approximately 60 chairs with folding table tops. The podium includes an instructor's computer system with a projector and presentation screen. This computer system is approximately 4 years old. The podium also includes a laptop/external computer system connection and a document camera. The smaller classroom contains 15 tables and 30 chairs. It also contains a sink and countertop system, as it is used by both the NCFS biological and physical evidence sections for classes that require the use of chemicals, reagents, and solutions. In addition to the two classrooms, one computer training laboratory is available at NCFS. This laboratory allows for 24 students to work on PCs networked to the Internet through the main UCF network infrastructure.

The main NCFS offices comprise a small conference room, break room, and 10 offices. These offices are used by the Director of NCFS, her deputy, the UCF PD officer, a budget specialist, two research assistants, the Associate Director for Digital Evidence, one faculty member, and one administrative assistant.

There is one research laboratory used for digital evidence at NCFS. This laboratory contains 12 laboratory desks with storage drawers and 8 upright storage cabinets. Students may be given access to the research laboratory during normal business hours on an as-needed basis as determined by the lab director.

Equipment, focusing primarily on instructional and research requirements

The computer training laboratory contains 12 desks and 24 chairs, plus an instructor's station. The instructor's station is equipped with a computer system (installed in 2002), a laptop/external computer system connection, a computerized projector, and a presentation screen. This laboratory allows 24 students to work on PCs networked to the Internet

through the main UCF network infrastructure. In addition, a network server is used for the "imaging" of the computer systems. The process of imaging involves installing system and application software from the network server onto the hard disk drives on each student computer system. This server is approximately three years old.

The digital evidence research laboratory contains a 4 terabyte SAN (Storage Area Network) on loan from the XioTech Corporation. In addition, the laboratory contains several high-end Dell servers, several Mac iBooks, and a high-end iMac. NASA donated 30 computer systems for our research. Several of these computers have been used in a cluster to parallelize password decryption. NCFS purchased an Apple Xserve and SAN that can hold seven terabytes of data, Cisco switches, and several servers to run the examination software. We are currently in the process of purchasing two high-end servers (Intel XEON dual-quad processors) along with VMWare ESX server to support our research and teaching.

The School of EECS has a networking lab consisting of 7 stations of networking devices (CISCO switches and routers) and computers (Sun Microsystems workstations and Intel-based PCs). The lab is used for both teaching and research purposes. The School also has a wireless network lab and a 32-node cluster machine, which has been used for teaching and research on topics related to parallel and distributed processing. These labs will be most useful in the new courses of the Science/Computing Track for providing hands-on experience.

D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 2. Do not include costs for new construction because that information should be provided in response to X (J) below.

Teaching and research lab facilities described in Subsection C are maintained by the School of Electrical Engineering and Computer Science or by the National Center for Forensic Science for existing programs. There is no additional cost for the proposed MSDF degree in sharing the use of these facilities.

E. Describe specialized equipment that is currently available to implement the proposed program through Year 5. Focus primarily on instructional and research requirements.

The SAN (Storage Area Network) on loan from XioTech to NCFS may be used for research opportunities for students of the MSDF degree. The cluster machine and the networking and wireless labs of the School of Electrical Engineering and Computer Science may be used for both teaching and research purposes for students of the MSDF degree.

F. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include

projected costs of additional equipment in Table 2.

N/A.

G. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 2.

N/A.

H. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2.

Because UCF currently does not have a graduate program in digital forensics, it does not have any graduate fellowships, scholarships, or dedicated graduate assistantships allocated to the program. We plan to use funds from research grants to provide our best students with graduate assistantships. A stipend of $15,000 for two students is projected in Table 2 for each of the first 5 years.

I. Describe currently available sites for internship and practicum experiences, if appropriate to the program. Describe plans to seek additional sites in Years 1 through 5.

Previous graduates of the Graduate Certificate in Computer Forensics have found internships with local law enforcement (e.g., Orange County Sheriff's Office), and several local businesses. We are in contact with other local law enforcement agencies and businesses regarding potential internship positions. We expect the high-quality students from our program will have no problem being accepted as interns. As an example, the Internet Threat Research Branch of EarthLink, Inc. in Orlando currently has four co-op job openings for UCF students with backgrounds in computer science and computer forensics. Dr. Lang is working with UCF's Career Services and Experiential Learning Center to meet with EarthLink personnel and pursue long-term commitment in providing internship and co-op opportunities at EarthLink's Orlando and Atlanta offices. In addition, county sheriff's offices (Orange and Seminole) have internship positions through their volunteer program. Letters in support of the proposed MSDF degree program from two sheriff's offices are included in Appendix G. A recent email from the Director of Forensic Investigations at Microsoft expressed an interest in providing internship positions at Microsoft for UCF students of digital forensics. We are in the process of pursuing this lead. A copy of the email message is included in Appendix G.

J. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university's fixed capital outlay priority list. Table 2 includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting

libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.

Since the MSDF degree will be available online, we do not anticipate expanded needs placed on library facilities or other student services. The major cost of the MSDF degree will be on faculty salary in developing two new courses that are required for Professional Track of the degree, program administration, and internship and thesis supervision.

Appendix

A. Financial Working Tables

Summary Analysis

Name of Program: Master of Science in Digital Forensics

Level of program: Masters

CIP code: 11.1003

Author: Sheau Lang

			Additional resources needed for new program					
Estimated Costs	Total	Current	Reallocation		New E&G	C&G	Cost/fte*	Cost/fte**
Year 1	$89,294	$51,419	$51,419	58%	$19,875	$18,000	$21,160	$ 16,894
Year 2	$167,272	$129,397	$129,397	77%	$19,875	$18,000	$11,241	$ 10,032
Year 3	$189,551	$129,397	$129,397	68%	$42,154	$18,000	$7,616	$ 6,892
Year 4	$226,684	$166,529	$166,529	73%	$42,154	$18,000	$7,803	$ 7,184
Year 5	$226,684	$166,529	$166,529	73%	$42,154	$18,000	$6,795	$ 6,256

* based upon total costs

** based upon current and new costs only, does not include C&G

FTE/Headcount

	Year 1	Year 2	Year 3	Year 4	Year 5
Headcount	15	48	80	90	100
FTE	4.22	14.88	24.89	29.05	33.36

Criteria for Program Approval (8 criteria)

Met with Strength	Met	Met with Weakness	Unmet
		0	0

Estimated revenue generated through student enrollment

Revenue	Year 1	Year 2	Year 3	Year 4	Year 5
	$970,867	$60,251	$212,448	$355,366	$414,760

Current and New faculty contributing to New program

Proposed Graduate Program Faculty Assignments - Master of Science Digital Forensics

% Effort for Program

Faculty Name	Year 1	Year 2	Year 3	Year 4	Year 5
Carrie Whitcomb, M.S. Forensic Science	0.00	0.00	0.00	0.11	0.11
Philip Craiger, Ph.D. Digital Forensics (internship coord)	0.11	0.44	0.44	0.44	0.44
Sheau Lang, Ph.D. Computer Science (prog director)	0.11	0.22	0.22	0.44	0.44
Ratan Guha, Ph.D. Computer Science	0.00	0.11	0.11	0.11	0.11
Damla Turgut, Ph.D. Electrical Engineering	0.11	0.11	0.11	0.11	0.11
Cliff C. Zou. Ph.D. Computer Science	0.00	0.11	0.11	0.11	0.11
Mark Pollitt, M.S. Digital Forensics	0.00	0.00	0.00	0.00	0.00
Robert Ford, Ph.D. Criminal Justice and Legal Studies	0.00	0.11	0.11	0.11	0.11
Ray Surette, Ph.D. Criminal Justice and Legal Studies	0.00	0.00	0.00	0.00	0.00

Note: Dr. Whitcomb, Mr. Politt, Dr. Ford, and CJ 2 are teaching existing classes that would be offered anyway, not specifically for this program.

TABLE 4
ANTICIPATED FACULTY PARTICIPATION

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Speciality	Rank	Contract Status	Initial Date for Participation in the Program	Mos. Contract Year 2	FTE Year 2	% Effort for Prg. Year 2	PY Year 2	Mos. Contract Year 3	FTE Year 3	% Effort for Prg. Year 3	PY Year 3	Mos. Contract Year 4	FTE Year 4	% Effort for Prg. Year 4	PY Year 4
A	Carrie Whitcomb, M.S. Forensic Science	Instructor	Non-tenure	2009	12	1.00	0%	0.00	12	1.00	0%	0.00	12	1.00	11%	0.11
A	Philip Craiger, Ph.D. Digital Forensics (internship coord)	Assistant Prof	TE	2008	9	0.75	44%	0.33	9	0.75	44%	0.33	9	0.75	44%	0.33
A	Sheau Lang, Ph.D. Computer Science (prog director)	Associate Prof	Tenured	2008	9	0.75	22%	0.17	9	0.75	22%	0.17	9	0.75	44%	0.33
A	Ratan Guha, Ph.D. Computer Science	Professor	TE	2009	9	0.75	11%	0.08	9	0.75	11%	0.08	9	0.75	11%	0.08
A	Damla Turgut, Ph.D. Electrical Engineering	Assistant Prof	TE	2008	9	0.75	11%	0.08	9	0.75	11%	0.08	9	0.75	11%	0.08
A	Cliff C. Zou. Ph.D. Computer Science	Assistant Prof	TE	2009	9	0.75	11%	0.08	9	0.75	11%	0.08	9	0.75	11%	0.08
A	Mark Pollitt, M.S. Digital Forensics	Assistant Prof	Non-tenure	2008	9	0.75	0%	0.00	9	0.75	0%	0.00	9	0.75	0%	0.00
A	Robert Ford, Ph.D., Criminal Justice	Instructor	TE	2008	9	0.75	11%	0.08	9	0.75	11%	0.08	9	0.75	11%	0.08
A	Ray Surette, Ph.D. Criminal Justice	Professor	TE	2008	9	0.75	0%	0.00	9	0.75	0%	0.00	9	0.75	0%	0.00
C	New Hire, Ph.D. Computer Forensics	Assistant Prof	TE	2008	9	0.75	0%	0.00	9	0.75	22%	0.17	9	0.75	22%	0.17
	Total Person-Years (PY)							0.83				0.99				1.27

Faculty CODE		Source of Funding	PY Workload by Budget Classification				
			Year 2	Year 3			Year 4
A	Existing faculty on a regular line	Current Education & General Revenue	0.83		0.83		1.10
B	New faculty to be hired on a vacant line	Current Education & General Revenue					
C	New faculty to be hired on a new line	New Education & General Revenue	0.00		0.17		0.17
D	Existing faculty hired on contracts/grants	Contracts/Grants					
E	New faculty to be hired on contracts/grants	Contracts/Grants					
		Overall Totals for	Year 2	0.83	Year 3	0.99	Year 4 1.27

This table can be used for interdisciplinary programs where faculty salaries
are different between departments. Used to compute total fte and average cost

	# fac	fac salaries	9 month avg salary	12 month avg salary
Dept 1			82000	109333
Dept 2				
Dept 3				
12 month salary total:			82000	109333

Existing faculty fte to the new program - reallocated base

	1st yr	2nd yr	3rd yr	4th yr	5th yr
Dept 1-	**0.25**	**0.83**	**0.83**	**1.10**	**1.10**
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

New faculty fte to the new program - enrollment growth

	1st yr	2nd yr	3rd yr	4th yr	5th yr
Dept 1	**0.00**	**0.00**	**0.17**	**0.17**	**0.17**
Total	**0.00**	**0.00**	**0.17**	**0.17**	**0.17**
Total-check					

New Faculty fte to new program - other new recurring monies (give source)

	1st yr	2nd yr	3rd yr	4th yr	5th yr
Dept 1	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

New faculty fte to new program - new non-recurring monies (give source)

	1st yr	**2nd yr**	**3rd yr**	**4th yr**	**5th yr**
Dept 1	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

New faculty fte to new program - C&G

	1st yr	**2nd yr**	**3rd yr**	**4th yr**	**5th yr**
Dept 1	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Faculty costs without benefits

Existing faculty cost	27060	90200	90200	120267	120267
New faculty cost -enrollment growth	0	0	18040	18040	18040
New faculty cost - other recurring monies	0	0	0	0	0
New faculty cost - new non-recurring monies	0	0	0	0	0
New E&G faculty cost	0	0	18040	18040	18040
New C&G faculty cost	0	0	0	0	0
Total faculty costs without benefits	27060	90200	108240	138307	138307

IDENTIFICATION OF CURRENT BASE FUNDS TO SUPPORT THE NEW PROGRAM

NAME OF PROGRAM__ Digital Forensics

PROGRAM LEVEL__ MS

CIP IDENTIFICATION__

DATE SUBMITTED__ Fall 2007

- - - - - -

	FIRST YEAR					SECOND YEAR					THIRD YEAR				
		New from Enrollment Growth	New from New Recurring	New from Non-Recurring	New from		New from Enrollment Growth	New from New Recurring	New from Non-Recurring	New from		New from Enrollment Growth	New from New Recurring	New from Non-Recurring	New from
	Reallocated BASE RESOURCES	NEW PROGRAMS	E&G REVENUE	E&G REVENUE	C&G REVENUE	Reallocated BASE RESOURCES	NEW PROGRAMS	E&G REVENUE	E&G REVENUE	C&G REVENUE	Reallocated BASE RESOURCES	NEW PROGRAMS	E&G REVENUE	E&G REVENUE	C&G REVENUE
	---	---	---	---		---	---	---	---		---	---	---	---	
POSITIONS (in FTE):															
FACULTY	0.25	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.83	0.17	0.00	0.00	0.00
A&P			0				0	0					0		
USPS		0					0								
TOTAL	0.25	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.83	0.17	0.00	0.00	0.00
	=========	=========	=========	=========		=========	=========	=========	=========		=========	=========	=========	=========	
A&P	0	USPS	0			A&P	0	USPS	0		A&P	0	USPS	0	
SALARY RATE:															
FACULTY	27060	0	0	0	0	90200	0	0	0	0	90200	18040	0	0	0
A&P			0					0				0	0		
USPS		0										0			
TOTAL	27060	0	0	0	0	90200	0	0	0	0	90200	18040	0	0	0
	=========	=========	=========	=========		=========	=========	=========	=========		=========	=========	=========	=========	
Faculty Salaries and Benefits	33419	0	0	0	0	111397	0	0	0	0	111397	22279	0	0	0
A&P Salary and Benefits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USPS Salary and Benefits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Personnel Services	18000					18000					18000				

Assistantships and Fellowships					15000					15000					15000
Library		500					500					500			
Expenses		19375			3000		19375			3000		19375			3000
Operating Capital Outlay															
Special Categories															
TOTAL	51419	19875	0	0	18000	129397	19875	0	0	18000	129397	42154	0	0	18000

IDENTIFICATION OF CURRENT BASE FUNDS TO SUPPORT THE NEW PROGRAM

NAME OF PROGRAM__

PROGRAM LEVEL__

CIP IDENTIFICATION__

DATE SUBMITTED__

- -

	FOURTH YEAR					FIFTH YEAR			
	Reallocated BASE RESOURCES	New from Enrollment Growth NEW PROGRAMS	New from New Recurring E&G REVENUE	New from Non-Recurring E&G REVENUE	New from C&G REVENUE	Continuing BASE RESOURCES	New Enrollment Growth E&G PROGRAMS	Other (E&G) REVENUE	C&G NEW REVENUE
	---	---	---	---		---	---	---	---
POSITIONS (in FTE):									
FACULTY	1.10	0.17	0.00	0.00	0.00	1.10	0.17	0.00	0.00
A&P			0					0	
USPS									
TOTAL	1.10	0.17	0.00	0.00	0.00	1.10	0.17	0.00	0.00
	=========	=========	=========	=========		=========	=========	=========	=========
A&P	A&P	0	USPS	0		A&P	0	USPS	0
SALARY RATE:									
FACULTY	120267	18040	0	0	0	120267	18040	0	0

A&P		0	0				0	0	
USPS		0					0		
TOTAL	120266.6667	18040	0	0	0	120266.6667	18040	0	0
	=========	=========	=========	=========		=========	=========	=========	=========
Faculty Salaries and Benefits	148529	22279	0	0	0	148529	22279	0	0
A&P Salary and Benefits	0	0	0	0	0	0	0	0	0
USPS Salary and Benefits	0	0	0	0	0	0	0	0	0
Other Personnel Services	18000					18000			
Assistantships and Fellowships					15000				15000
Library		500					500		
Expenses		19375			3000		19375		3000
Operating Capital Outlay									
Special Categories									
TOTAL	166529	42154	0	0	18000	166529	42154	0	18000

TABLE 2
PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 2					Year 3					Year 4				
	Funding Source				Subtotal E&G and C&G	Funding Source				Subtotal E&G and C&G	Funding Source				Subtotal E&G and C&G
	Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	
Faculty Salaries and Benefits	$111,397	$0	$0	$0	$111,397	$111,397	$22,279	$0	$0	$133,676	$148,529	$22,279	$0	$0	$170,809
A&P Salaries and Benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
USPS Salaries and Benefits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Personnel Services	$18,000	$0	$0	$0	$18,000	$18,000	$0	$0	$0	$18,000	$18,000	$0	$0	$0	$18,000
Assistantships and Fellowships	$0	$0	$0	$15,000	$15,000	$0	$0	$0	$15,000	$15,000	$0	$0	$0	$15,000	$15,000
Library	$0	$500	$0	$0	$500	$0	$500	$0	$0	$500	$0	$500	$0	$0	$500
Expenses	$0	$19,375	$0	$3,000	$22,375	$0	$19,375	$0	$3,000	$22,375	$0	$19,375	$0	$3,000	$22,375
Operating Capital Outlay	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Special Categories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs	$129,397	$19,875	$0	$18,000	$167,272	$129,397	$42,154	$0	$18,000	$189,551	$166,529	$42,154	$0	$18,000	$226,684

*Identify reallocation sources in Table 3.

**Includes recurring E&G funded costs ("reallocated base", "enrollment growth", and "other new recurring") from Years 1-4 that continue into Year 5.

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions (person-years)	Year 2	Year 3	Year 4
Faculty	0.83	0.99	1.27
A&P	0	0	0
USPS	0	0	0

Calculated Cost per Student FTE

		Year 2	Year 3	Year 4
Total E&G Funding		$149,272	$171,551	$208,684
Annual Student FTE		14.88	24.89	29.05
E&G Cost per FTE		$10,032	$6,892	$7,184

TABLE 3
ANTICIPATED REALLOCATION OF EDUCATION AND GENERAL FUNDS

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
16 27 0074 Engineering Technology	$791,949	$12,674.00	$779,275
16 40 2074 Computer Science	$6,409,214	$22,890	$6,386,324
Totals			

Worksheet Table 3 Reallocation	11% Craiger	$9,749	$12,673.66
	11% of Sheau	$9,166	$11,915.80
	11% of Turget	$8,442	$10,974.60
		sum	$22,890.40

B. Academic Program Review, 2005-2006:

College of Engineering and Computer Science

Department of Computer Science

(B.S., M.S. and Ph.D. and B.S. Information Technology)

Department Data

Total Student Credit Hour by Level

Category	Computer Science Total SCH	
	2003-04	2004-05
Lower	16,155	16,158
Upper	15,647	13,687
Graduate	4,282	3,825
Thesis	347	399
Total	36,431	34,069

Faculty Information

Computer Science Fall 2004	Count
Tenured or Tenure-Earning	21
Non-Tenure track	4
Visiting	9
Adjunct	14
GTA	63

Sponsored Research

(These data have been provided by the Office of Research and include only external funds that flow through that office.)

School of Electrical Engineering and Computer Science*			
Year	Federal	Non-federal	Total
2000-01	$3,567,911	$2,614,731	$6,182,642
2001-02	$5,035,934	$2,426,329	$7,462,263
2002-03	$3,541,237	$3,839,338	$7,380,575
2003-04	$3,593,851	$2,121,984	$5,715,835
2004-05	$3,157,097	$3,797,594	$6,954,691

*By the end of the program period the departments of Electrical and Computer Engineering and Computer Science had combined to create the School of Electrical Engineering and Computer Science.

Program Data

Enrollment and Graduation Rate by Level and Ten-year Projection (from Spring 2004)

Year	Enrollment Computer Science, B.S.	Academic Year	Degrees Granted Computer Science, B.S.
Fall 2000	1,149	2000-01	139
Fall 2001	1,097	2001-02	132
Fall 2002	917	2002-03	132
Fall 2003	831	2003-04	111
Fall 2004	719	2004-05	103

Year	Enrollment Projection Computer Science, B.S.	Academic Year	Degree Projection Computer Science, B.S.
Fall 2004	860	2004-05	107
Fall 2005	840	2005-06	104
Fall 2006	821	2006-07	102
Fall 2007	804	2007-08	100
Fall 2008	786	2008-09	98
Fall 2009	768	2009-10	95
Fall 2010	751	2010-11	93
Fall 2011	726	2011-12	90
Fall 2012	709	2012-13	88
Fall 2013	684	2013-14	85

Year	Enrollment Computer Science, M.S.	Academic Year	Degrees Granted Computer Science, M.S.
Fall 2000	86	2000-01	41
Fall 2001	103	2001-02	38
Fall 2002	125	2002-03	35
Fall 2003	135	2003-04	46
Fall 2004	90	2004-05	61

Year	Enrollment Projection Computer Science, M.S.	Academic Year	Degree Projection Computer Science, M.S.
Fall 2004	140	2004-05	54
Fall 2005	140	2005-06	54
Fall 2006	140	2006-07	54
Fall 2007	140	2007-08	54
Fall 2008	150	2008-09	57
Fall 2009	150	2009-10	57
Fall 2010	150	2010-11	57
Fall 2011	150	2011-12	57
Fall 2012	150	2012-13	57
Fall 2013	150	2013-14	57

Year	Enrollment Computer Science, Ph.D.	Academic Year	Degrees Granted Computer Science, Ph.D.
Fall 2000	59	2000-01	5
Fall 2001	76	2001-02	6
Fall 2002	115	2002-03	6
Fall 2003	134	2003-04	6
Fall 2004	144	2004-05	14

Year	Enrollment Projection Computer Science, Ph.D.	Academic Year	Degree Projection Computer Science, Ph.D.
Fall 2004	141	2004-05	9
Fall 2005	141	2005-06	9
Fall 2006	141	2006-07	9
Fall 2007	141	2007-08	9
Fall 2008	151	2008-09	10
Fall 2009	151	2009-10	10
Fall 2010	151	2010-11	10
Fall 2011	151	2011-12	10
Fall 2012	151	2012-13	10
Fall 2013	151	2013-14	10

Year	Enrollment Information Technology, B.S.	Academic Year	Degrees Granted Information Technology, B.S.
Fall 2000		2000-01	
Fall 2001	270	2001-02	15
Fall 2002	421	2002-03	58
Fall 2003	402	2003-04	90
Fall 2004	376	2004-05	95

Year	Enrollment Projection Information Technology, B.S.	Academic Year	Degree Projection Information Technology, B.S.
Fall 2004	492	2004-05	72
Fall 2005	552	2005-06	81
Fall 2006	611	2006-07	90
Fall 2007	668	2007-08	98
Fall 2008	724	2008-09	107
Fall 2009	778	2009-10	115
Fall 2010	832	2010-11	122
Fall 2011	881	2011-12	130
Fall 2012	933	2012-13	137
Fall 2013	981	2013-14	144

Highlights

Computer Science Department

- Computer Science Goals:
  - Enhance the national and international visibility of UCF CS.
  - Expand CS faculty in both size and diversity from 23 to 35 faculty members.
  - Double research productivity of CS faculty in the next five years.
  - Achieve national leadership in CS education.
  - Foster activities that stimulate partnerships and support outreach programs.
  - Create an academic environment that fosters learning, promotes diversity, and produces students who become contributing members of a technological society.
- The Departments of Computer Science, Computer Engineering, and Electrical Engineering have recently been merged. CS maintains its own exceptional computing staff who have taken over all duties for the merged EECS school.
- The faculty includes eight Society Fellows, three journal Associate Editors, one journal Editor-in-Chief and one Category Editor.
- The UCF Computer Vision Laboratory is one of the leading labs in the world (according to Google, the lab's Web site is the third most popular).
- Local and national industry support UCF CS research via contracts and grants. Over the past two years, these companies include ATI, Canon, Electronic Arts, Harris, IBM, IIT Industries, Imagesoft, Intel, Lockheed Martin, Northrop Grumman, Oracle, Perceptek, Symantec, and Sun Microsystems. State and federal government agencies include NSF, Florida Department of Transportation, PEOSTRI, NASA, ONR, ARO, and other agencies of the Department of Defense.
- The Computer Science IT Program has an Industry Advisory Board consisting of representatives from BellSouth, Disney, the Golf Channel, Harris Corporation, Lockheed Martin, Mind Comet, Orlando International Airport, Siemens Westinghouse, STRICOM, and the cities of Ocoee, Orlando, and Winter Park.
- These programs have high student/faculty teaching ratios compared with top research universities. CS has a high-quality faculty but has 10-15 fewer tenure/tenure-track faculty compared to most top CS departments (see benchmarking data). Faculty hiring is the department's number one priority.

B.S. Computer Science

- CS program last accredited by the Accreditation Board for Engineering & Technology (ABET) in 2003.
- Engineering Workforce has ranked UCF CS program as second largest undergraduate program behind the University of Maryland.
- ASEE ranks UCF CS 7th in B.S. degrees awarded by CS departments within engineering colleges.
- The CS degree program at UCF is the only CS program in the state and in the nation to use a qualifying foundation exam for an undergraduate degree.
- Undergraduate students in CS have participated in the ACM Sponsored Programming Contest for over 20 years and have consistently ranked high in regional, national and international contests, winning the region 11 times and finishing as high as second internationally.
- CS offers a very active Research Experience of Undergraduates (REU funded by NSF) for more than 10 years running and were the first in the state to offer this opportunity to our majors.
- There are 80 Honors in the Major students for Computer Science (10% of CS students). It has the majority of National Merit students (seven out of nine) for the college.

- CS demonstrates strong undergraduate scholarship and research: 7 publications in refereed journals, co-authored with a faculty member, in the last 5 years; and 16 publications in refereed conferences, co-authored with a faculty member, in the past 5 years.
- CS majors are among the best and brightest in the college and the university. Average HS GPA, SAT, and ACT scores for CS majors in 2004 are higher than the college and UCF averages.
- UCF CS undergraduate majors have achieved national recognition for their performance in the ACM-sponsored Programming Contest, where our students compete with the best computer science students in the world and consistently rank high in these competitions (as high as second place internationally).
- Approximately 91% of FTIC majors finish in less than or equal to five years (64% less than or equal to four).
- Recent data on placement of CS graduates in the work force show that a majority remain in the central Florida area, and approximately 90% remain in the state of Florida.
- CS majors hold the highest average HS GPA, SAT, and ACT scores among all majors in the college.

B.S. Information Technology

- The objectives of the Information Technology degree program are to:
    - Provide a solid understanding of the methodologies and foundations of computer science and engineering.
    - Provide practical, hands-on, small team experience designing, implementing and administering distributed information systems.
    - Provide a strong background in at least one discipline in which IT plays a critical role. Many students will choose this discipline from an area other than IT.
- The IT curriculum is highly interdisciplinary by design. The IT program was mainly developed by the faculty in Computer Science in 2000, and, as such, a majority (10 out of 14) of the core courses are taught by the CS/IT faculty.
- "Frontiers of IT" (COP 4910) is a required capstone course in which the students form teams and research on emerging technologies. This course involves teamwork, literature search, conducting interviews or surveys, writing a technical report, and an oral presentation.
- IT program offers an internship program available to students with a GPA of 3.0 or higher who have completed the beginning IT core courses. Students enrolled in the internship course are matched with a company for their interested areas and IT skills. Our records show over 40% of the IT students take the internship course before graduation.
- The IT Internship program has been very successful and in the past academic year, there have been a total of 62 students who signed up and 57 students matched to an internship; there were also a total of 87 companies signed up with internship requests with 55 companies matched to student interns.
- The number of degrees awarded for the 2004-05 academic year was 95, a 31.9% increase when compared to the projected number (72 for 20004-05).
- IT students have equal or better scores compared to the UCF student body in all three areas (high school GPA, SAT, and ACT) but are 5% lower in HS GPA, 1.16% lower in SAT scores, and even in ACT scores when compared to the CECS students.
- Undergraduate IT students have multiple research and/or experiential learning opportunities available. The IT program itself has an internship program in effect since summer 2004 and the university's Career Services and Experiential Learning department has a Co-op program.

- The number of students enrolled in the Information Technology program experienced a decrease of about 6.9% from 402 students in Fall 2003 to 376 students in Fall 2004. However, the number of degrees awarded increased by about 5.5% from the 2003-04 academic year (90 degrees awarded) to the 2004-05 academic year (95 degrees awarded).
- There is a need to hire faculty with an IT background who can relate IT education to the business world while engaging students in IT research.

M.S. Computer Science

- Program faculty members are aggressively seeking to increase domestic population, recruiting of the best and brightest starting in the sophomore years and occasionally in the first year. This has involved giving CS undergraduates opportunities to serve as undergraduate researchers and bringing them into the CS REU programs. As regards other universities, faculty members have made contacts with research colleagues, encouraging them to send their best students to UCF.
- The School of Film and Digital Media is developing an MFA degree program that will require computer science graduate classes for at least one of its tracks.
- Strong faculty collaborations between CS, Physics and the newly-created Burnett School of Biomedical Science will lead to demands for more CS graduate offerings in areas like high performance computing and bioinformatics—courses that are naturally populated by a mixture of disciplines, perhaps requiring team teaching.
- Although the CS master's program is not formally associated with any center or institute, there are many interactions among our faculty members/students and researchers at the Center for Research and Education in Optics and Lasers (CREOL) and at the Institute for Simulation and Training. There are also interactions with the Biomolecular Science Center and the Nanoscience Technology Center.
- About 60% of computer science M.S. students are from the university service area, and that is increasing as we move closer to achieving our goal of having a larger domestic representation.
- The number of female M.S. students has been shrinking as we are now serving a larger domestic population that typically has a lower percentage of females than are seen with students from countries like China, India, and Turkey.
- Hispanic and African American minority representations among domestic students are average (each is about 9% of the domestic population).
- M.S. students often participate as members of the ACM Programming Team that has made it to the international competition in nearly every one of the 22 years of UCF's participation.
- The M.S. CS program enrollment rose from 86 in 2000 to 135 in 2003. It then dropped to 90 in 2004 and approximately 60 in 2005. There are some external reasons for the reduction in M.S. candidates related to the better availability of graduate education and jobs in India, a former source of many of our M.S. students. Additionally, UCF CS stopped supporting M.S. students with GTAs and GRAs.

Ph.D. Computer Science

- CS faculty members have initiated joint research programs with many local industries, including Lockheed Martin, Electronic Arts, ATI, Nickelodeon, Disney IDEAS and Harris; our government partners such as Army RDECOM; and our local community partners including the Orlando Science Center, the Orange County History Center and Preserve Eatonville Community, Inc.
- In 2000, the CS Ph.D. program was a modest one with 55 students. The program has since grown steadily to 144 students in 2004, respectively.

- The percentage of females has increased from under 14% in 2000 to almost 19% in 2004. In Fall 2004, In Fall 2004, one-third of our entering Ph.D. students were US citizens and in Fall 2005 60% (13 out of 22) of entering students were domestic, and 9 of these 13 were from our service area.
- With the increase in demand, we have attained an increase in productivity, with Ph.D. production rising from five in AY 2000-01 to 14 in AY 2004-05.
- Although the CS Ph.D. program is not formally associated with any center or institute, there are many interactions among our faculty members/students and researchers at the Center for Research and Education in Optics and Lasers (CREOL) and at the Institute for Simulation and Training. There are also interactions with the Biomolecular Science Center and the Nanoscience Technology Center.
- U.S. minority recruitment is a priority. Hispanic minority representation among CS Ph.D. domestic students is small (6% of the domestic population). Our representation of African Americans is quite low (just 3% of the domestic population).
- In AY 2003-04, of the graduating Ph.D. students, 80% had at least one refereed journal paper and 89% had at least one conference presentation.
- The CS Ph.D. faculty includes eight Society Fellows, three journal Associate Editors, one journal Editor-in-Chief and one Category Editor.
- CS produced 14 Ph.D.s last year and will likely produce slightly more this coming year.
- CS has a high-quality faculty but has 10-15 fewer tenure/tenure-track faculty compared to most top CS departments (see benchmarking data). Faculty hiring is the department's number one priority.
- The number of faculty is much too low for the large number of Ph.D. students. The ratio of over 6:1 significantly exceeds that of even the top ranked schools, such as Cornell with a 4:1 ratio.

Recommendations from Consultants, Dean, and Program Review Committee:

B.S. Computer Science

1. Increase faculty count to improve the quality of contact with students and to strengthen their research agenda (reduce number of visiting and adjunct professors).
2. Follow the consultants' feedback when updating the curriculum, listening to the national conversation about curriculum reform, which has gone beyond "Curriculum 2001."
3. Make computer science an exciting part of the general education curriculum by considering national trends and models.
4. Expand offerings to include emerging areas of bioinformatics, quantum information/communication (threads), entertainment engineering, and the overlap of CS and the cognitive sciences.
5. Expand undergraduate lab facilities and invest in equipment to meet institutional demands and student hands-on, experiential learning. Look into partnership with digital media and electronic arts for use of space in downtown facilities.
6. Consider a CECS Digital Media degree with CS emphasis if there are sufficient resources and if it fits into the school's strategic plan.
7. Enhance recruitment of minority and female students (trends indicate graduating females declined from 23% in 1998 to 7% in 2005), including summer camps, summer institutes, and high school outreach programs.
8. Enhance recruitment of minority and female faculty.
9. Implement an internship program (similar to IT).
10. Emphasize software problem solving skills (similar to a senior design for engineering as a capstone experience for students).
11. If the decision is made to increase online Web courses (participation in new iCLASS initiative), create an assessment design to determine the quality of student outcomes compared with student outcomes in other modes.

B.S. Information Technology

1. Enhance recruitment of female faculty and students.
2. Invest in lab space and equipment to meet instructional demands and student hands-on experience.
3. Offer required courses more often each semester to improve time to degree.
4. Evaluate a Modeling & Simulation degree in IT. Potential exists.
5. Combine/consolidate/streamline IST, IT, CS, and CPE courses where appropriate but especially IT and IST programs. While the IT program was originally designed for students with AA degrees and IST for those with A.S. degrees, the two programs do overlap in course content taught. The security minor (SCAN) is one such successful collaboration between IT and IST. The recent merger of ECE and IT creates more opportunity for collaboration (CpE, IT, and CS).
6. Deliver IT/IST B.S. programs in partnership with SCC in Lake Mary/Heathrow area.
7. Seek collaborations with digital media. A CECS digital media degree with CS emphasis is desirable and is different from the CAH digital media degree with an arts emphasis.

M.S. Computer Science

1. If the decision is made to increase online Web courses (participation in new iCLASS initiative), create an assessment design to determine the quality of student outcomes compared with student outcomes in other modes.
2. Strengthen ties to local industry for internships, fellowships, and joint funding proposals. Seek funding, support, internships, and collaboration with the high tech cluster in this region.

3. Enhance recruitment of female and under-represented minorities for faculty.
4. Convene appropriate faculty groups–such as faculty teaching in the program and the graduate curriculum committee–to evaluate the efficacy of the change to 30 semester hours for non-thesis M.S. options. All curricular changes for any M.S. program should have documentation of standard practice nationally.
5. Consolidate/streamline course offerings with CPE and M&S.
6. Consider a CECS digital media degree with CS emphasis.
7. Encourage interdisciplinary research and education by participating with other academic units, research centers and institutes, possibly by identifying foci areas that can be organized with groups of faculty from around campus, including CS faculty; encourage joint appointments of faculty with CS.
8. Recruit for 2-3 more senior faculty members in specific foci areas where you want to establish the reputation.
9. Enhance mentoring of junior faculty members.
10. Reexamine the graduate curriculum and update to keep pace with other programs of this kind. Consider the consultant's request to include an internship in the master's program.
11. Get faculty more involved in career placement for their graduates through relationships with national and regional companies and through the Career Resource Center at UCF.

Ph.D. Computer Science

1. Offer joint and secondary appointments to build critical mass.
2. Seek funding, support, internships, and collaboration with the high tech cluster in this region.
3. Invest in lab space to foster cross-disciplinary partnerships.
4. Streamline and consolidate course offerings (especially with CPE) for a less structured curriculum.
5. Recruit 2-3 more senior faculty members in specific foci areas where you want to establish the reputation.
6. Follow senior faculty recruitment with cluster hires of faculty.
7. Enhance recruitment of faculty with prominent research and scholarly works.
8. Broaden curricula to include emerging application areas (such as bioinformatics, modeling and simulation, etc).
9. Encourage interdisciplinary research and education by participating with other academic units, research centers and institutes, possibly by identifying foci areas that can be organized with groups of faculty from around campus, including CS faculty; encourage joint appointments of faculty with CS.
10. Enhance mentoring of students by faculty.
11. Enhance mentoring of junior faculty members**.**
12. Reexamine the graduate curriculum and update to keep pace with other programs of this kind.

School of Electrical Engineering and Computer Science

1. Develop a strategic plan that addresses all three disciplines and use a process that includes outside CS consultants and outside industry representatives who are knowledgeable in current curriculum and career opportunities for graduates of the programs.
2. Establish disciplinary leadership so that there is an advocate for each of the program areas: computer engineering, computer science, and electrical engineering.
3. Develop recruiting plan for each of the three programs in the school that identifies the target audience and shows that the student quality increases each year.

4. Develop an operational plan for the school that will align aspirations with resources, identify areas of foci and strength where you want to build your reputation, and then collaborate with others around campus to develop the research, curriculum, etc., to support them.

College of Engineering and Computer Science
Department of Engineering Technology
(B.S.E.T., B.S.E.E.T., B.S.I.S.T.)

Department Data

Total Student Credit Hours by Level:

Category	Engineering Technology Total SCH	
	2003-04	2004-05
Lower	270	432
Upper	7,465	7,931
Graduate		
Thesis		
Total	7,735	8,363

Faculty Information:
(Tenured or tenure-earning, non-tenure track, visiting, adjunct, GTA)

Category	Engineering Technology Total SCH	
	2003-04	2004-05
Lower	270	432
Upper	7,465	7,931
Graduate		
Thesis		
Total	7,735	8,363

Sponsored Research:
(These data have been provided by the Office of Research and include only external funds that flow through that office.)

Engineering Technology			
Year	Federal	Non-federal	Total
2000-01	$129,200	$40,041	$169,241
2001-02	$5,285	$96,552	$101,837
2002-03	$323,290	$165,238	$488,528
2003-04	$237,298	$329,667	$566,964
2004-05	$298,607	$578,803	$877,410

Program Data

Enrollment and Degree Production by Level and Ten-year Projections (from Spring 2004):

Year	Enrollment Engineering Technology, B.S.	Academic Year	Degrees Granted Engineering Technology, B.S.
Fall 2000	93	2000-01	20
Fall 2001	118	2001-02	15
Fall 2002	117	2002-03	26
Fall 2003	137	2003-04	20
Fall 2004	169	2004-05	23

Year	Enrollment Projection Engineering Technology, B.S.	Academic Year	Degree Projection Engineering Technology, B.S.
Fall 2004	145	2004-05	25
Fall 2005	157	2005-06	28
Fall 2006	168	2006-07	30
Fall 2007	179	2007-08	31
Fall 2008	195	2008-09	33
Fall 2009	211	2009-10	35
Fall 2010	217	2010-11	36
Fall 2011	221	2011-12	37
Fall 2012	227	2012-13	38
Fall 2013	232	2013-14	39

Year	Enrollment Electrical Engineering Technology, B.S.	Academic Year	Degrees Granted Electrical Engineering Technology, B.S.
Fall 2000	156	2000-01	28
Fall 2001	189	2001-02	34
Fall 2002	216	2002-03	28
Fall 2003	190	2003-04	29
Fall 2004	111	2004-05	29

Year	Enrollment Projection Electrical Engineering Technology, B.S.	Academic Year	Degree Projection Electrical Engineering Technology, B.S.
Fall 2004	215	2004-05	31
Fall 2005	290	2005-06	38
Fall 2006	339	2006-07	41
Fall 2007	387	2007-08	46
Fall 2008	462	2008-09	54
Fall 2009	467	2009-10	55
Fall 2010	466	2010-11	54
Fall 2011	464	2011-12	54
Fall 2012	463	2012-13	54
Fall 2013	462	2013-14	53

Year	Enrollment Information Systems Technology, B.S.	Academic Year	Degrees Granted Information Systems Technology, B.S.
Fall 2000		2000-01	
Fall 2001		2001-02	
Fall 2002		2002-03	
Fall 2003	85	2003-04	19
Fall 2004	169	2004-05	38

Year	Enrollment Projection Information Systems Technology, B.S.	Academic Year	Degree Projection Information Systems Technology, B.S.
Fall 2004	68	2004-05	0
Fall 2005	76	2005-06	6
Fall 2006	84	2006-07	7
Fall 2007	92	2007-08	8
Fall 2008	100	2008-09	8
Fall 2009	107	2009-10	9
Fall 2010	115	2010-11	10
Fall 2011	121	2011-12	10
Fall 2012	130	2012-13	11
Fall 2013	136	2013-14	11

Highlights

Department of Engineering Technology

- Engineering Technology Department goals are:
  - Goal 1: A national caliber, diverse faculty who are recognized leaders in teaching.
  - Goal 2: Distinguished, innovative undergraduate and graduate programs.
  - Goal 3: A model for university outreach, globalization, and partnerships.
  - Goal 4: An organization committed to obtaining the highest quality standards in all phases of its operations, processes, and management.
  - Goal 5: An organization successful in obtaining resources to support academic development.
- There are three faculty members in the department currently active in research with the Public Safety Technology Center working on software development and application in information systems; one faculty member has a joint appointment with the MMAE department, one faculty member is actively engaged in NSF curriculum development grant work; one faculty member holds a joint appointment with the National Center for Forensic Sciences working primarily in digital forensics. One faculty member holds a joint appointment with the Center for Research and Education in Optics and Lasers (CREOL).
- Provide faculty and staff with more opportunities for professional development (organized development). Provide faculty with more financial resources for equipment purchases and lab development.
- The lower level and upper level required courses are delivered using the following formats because many students are employed:
  a) Live (face-to-face)instruction

b) FEEDS/Live (lecture on FEEDS, lab is live)
c) FEEDS (video streamed over Internet)

B.S. Electrical Engineering Technology

- Last accredited by the Accreditation Board for Engineering & Technology (ABET) in 2003. The next accreditation visit is in 2009.
- Engineering Technology ranked 36th by ASEE in 2003-04 for engineering technology bachelor's degrees awarded by school; ranked 22nd in terms of degrees awarded to women by school; and ranked 47th in terms of enrollment by school.
- The number of degrees granted has maintained since 2000-01. The program enrollment is expected to grow at an average of 20 percent per year over the next ten-year period. The decrease in enrollment seen from 2001-03 was due to the opening of the IST program.
- 16.2% of the Engineering Technology B.S.E.E.T. students were female (Fall 2004), compared to 16.7% in the Fall 2000. This compares to 13.8% of the students in the College of Engineering and Computer Science being female.
- Student Enrollment Status: 36.9% of our B.S.E.E.T. students were full time and 63.1% part time (Fall 2004) compared to 25% full time and 75% part-time students in Fall 2000.
- Compared to the college and university, there is a higher percentage of ethnic minority students and a higher percentage of community college transfers.
- 100% of the FTIC (first time in college) students graduate in five years or less.
- To remain current, the program would like to hire a faculty member with the expertise in RF and Analog/Digital Communications.
- There are three concentrations: in Engineering Technology B.S.E.E.T. Program: electrical systems, computer systems, and photonics. The photonic concentration is a new concentration within the B.S.E.E.T. major that was added based on the needs of the local community.
- A very high percentage (over 70%) of the Electrical Engineering Technology graduates remain employed in the state of Florida. The average annual first year salary is in the high $40,000 range. The program serves the state of Florida very well by providing education and skills necessary for successful employment.

B.S. Engineering Technology

- Last accredited by the Accreditation Board for Engineering & Technology (ABET) in 2003. The next accreditation visit is in 2009. It is the only Engineering Technology Distance ABET accredited degree program offered in Florida and one of only a few in the country.
- Engineering Technology ranked 36th by ASEE in 2003-04 for engineering technology bachelor's degrees awarded by the school; ranked 22nd in terms of degrees awarded to women by the school. Also ranked 47th in terms of enrollment by the school.
- There are three concentrations in the Engineering Technology B.S.E.T. Program,: operations, design, and space systems. The entire degree of the B.S.E.T., Operations, is delivered using state-of-the-art technology, which includes real-time video streaming (FEEDS) and course management software assisted instruction.
- Space systems is taught at KSC and is able to use up-to-date labs on site. Many of the classes use virtual teams as a part of teaching.
- Fall 2005, the B.S.E.T. program has 5.5 full-time faculty members, one adjunct. Two females, one minority (international). Sixty-three are tenured. Several teaching and research labs support the program including Harris Computer Laboratory, Manufacturing and Development Lab, ENT Computer Lab, PLC/Feedback Control Lab.

- Enrollment was projected for Fall 2004 at 145. Actual count for Fall 2004 was 169. Now the enrollment for Fall is projected at 232, a 37% increase.
- The number of males has increased from 80.6% in 2000 to 85.2% in 2004, with CECS higher at 86.2%. The percentage of full-time students has increased to 60.9% from 40.9%.The number of minorities has gone from 22.3% to 25.9%.
- 69.2% of our CC transfer students graduate in 4 years or less, compared to 94.2% of all UCF students. Many of our students are older and are working full time.

B.S. Information Systems Technology

- The only A.S. to B.S. program IST in the state of Florida and is one of a few A.S. to B.S. programs to offer a degree totally online. It requires 33 hours of lower level technical course work in the networking area. All upper level courses are hands-on or very practical.
- The IST program enrollment has grown 242.4% since program inception in 2002 through 2005. The IST program enrollment is expected to grow at an average of 10% per year over the next ten-year period.
- The number of IST degrees granted has increased 200% from AY 2003-04 to 2004-05.
- Student enrollment status: 40.2% of the IST students were full time and 59.8% part time (Fall 2004). (College: full time 73.7%, part time 26.3%)
- Student ethnicity (Fall 2004): White - 65.7%; African American - 5.3%; Hispanic - 16%; Asian - 3.6%; American Indian - 2.4%; Non-Resident Alien - 1.2% ; Not Reported - 5.8%
- Community college transfer rates (Fall 2004): FTIC - 21.9%; CC Transfer - 74.6%; Other Transfer - 3.6% Female Representation: 10.7% of the IST students were female (Fall 2004). This compares to 13.8% of the students in the College of Engineering and Computer Science being female.
- The program is not accredited by ABET because there are no completely established criteria for this program.

Recommendations from Consultants, Dean and Program Review Committee:

Department of Engineering Technology

1. Develop joint courses where appropriate with other departments such as the security minor, Secure Computing and Networks (SCAN) developed with IT.
2. Consolidate and streamline programs.
3. Establish a core curriculum for all ENT programs.
4. Develop M.S. programs for ENT; e.g., M.S. IT in collaboration with IT in CS, a general ENT M.S., etc.
5. Develop curricula for construction engineering and construction management undergraduate programs in collaboration with the Civil Engineering and Industrial Engineering and Management Systems departments.
6. Involve more departmental faculty in academic and professional career advising.
7. Explore 2+1+1 (A.S. at the community college, junior level at UCF regional campus, senior level at UCF Orlando campus) programs at UCF regional campuses

Recommendations for all B.S. Programs in Engineering Technology

1. Increase program offerings and increase courses with consideration of student-faculty ratios.
2. Expand program opportunities and space at Cocoa Campus and consider expansion to other regional campuses.

SUMMARY OF 2005-06 PROGRAM REVIEWS

Program Name	CIP	Level	Result of Review
Computer Science	11.0101	B.S.	Enhance
Computer Science	11.0101	M.S.	Enhance
Computer Science	11.0101	Ph.D.	Enhance
Information Technology	11.0103	B.S.	Enhance
Electrical Engineering Technology	15.0303	B.S.	Maintain
Engineering Technology	15.0899	B.S.	Maintain
Information Systems Technology	15.1202	B.S.	Maintain

C. Library Volumes

The proposed Master of Science in Digital Forensics program is multidisciplinary, encompassing the fields of

Computer Forensics
Computer Crime and the Law
Computer Hacking
Ethics and Technology
Constitutional Law and Technology
Computer Fraud
Computer Network Security and Crime
Computer Viruses
Internet Fraud
Audio/Video Enhancement
Cryptography

Relevant subject headings were identified and the UCF Library's holdings were compared with those of the above mentioned benchmark universities via the library catalog of each institution.

Relevant monographs and periodicals are assigned the following Library of Congress Subject Headings:

Computer Crimes
Computer Hackers
Computer Networks – Law and Legislation
Computer Networks – Moral and Ethical Aspects
Computer Networks – Security Measures
Computer Security
Computer Viruses
Computers – Law and Legislation
Criminal Justice, Administration of – Data Processing
Criminal Justice, Administration of – Information Services
Forensic Accounting
Forensic Engineering
Information Storage and Retrieval Systems – Criminal Justice, Administration
Information Technology – Moral and Ethical Aspects
Internet Fraud

Monographs - details the total number of books cataloged in relevant Library of Congress Subject Headings at UCF and at the benchmark universities. The average or mean number of monographs, as calculated from the total number of monographs at GWU, UNHC, and CUNY

equals 608. In comparison, UCF has 1272 monographs, 664 above the mean.

Periodicals - provides lists of related periodicals subscribed to by UCF. These lists were compared to related journals subscribed to by the benchmark universities to determine titles not currently subscribed to by UCF.

SUBJECT HEADING	UCF	GWU	UNHC	CUNY
Computer Crimes	82	123	12	64
Computer Hackers	38	44	8	18
Computer Networks – Law and Legislation	48	82	3	4
Computer Networks – Moral and Ethical Aspects	2	5	0	1
Computer Networks – Security Measures	339	343	16	57
Computer Security	521	537	35	108
Computer Viruses	28	47	6	12
Computers – Law and Legislation	54	20	5	56
Criminal Justice, Administration of – Data Processing	4	4	0	16
Criminal Justice, Administration of – Information Systems	10	8	3	11
Forensic Accounting	33	6	3	12
Forensic Engineering	20	10	4	11
Information Storage and Retrieval Systems – Criminal Justice, Administration of	28	12	11	41
Information Technology – Moral and Ethical Aspects	28	30	2	2
Internet Fraud	37	12	11	9
TOTAL	1272	1283	119	422
Average of Totals for GWU, UNHC, and CUNY	608			
UCF Excess	664			

Monographs

Criminal Justice and Legal Periodicals

Acta Juridica Hungarica
American Bar Foundation Research Journal
American Journal of Comparative Law
American Journal of International Law
American Journal of Legal History
Art, Antiquity and Law
Artificial Intelligence and Law
Asia Pacific Journal of Environmental Law
Asia Pacific Journal on Human Rights and the Law 2000
Asia Pacific Law Review
Behavioral Sciences & the Law
British Journal of Criminology
Business Law Review
Cambridge Law Journal
Child Maltreatment
Columbia Law Review
Common Market Law Review
Contemporary Justice Review
Contemporary Security Policy
Crime and Delinquency
Crime, Law and Social Change
Criminal Justice
Criminal Justice and Behavior
Criminal Justice Policy Review
Criminal Justice Studies: A Critical Journal of Crime, Law and Society
Criminal Law Forum
Critical Criminology
Deutsches und Europäisches Familienrecht (DEuFamR) 1999
EDI Law Review, The
Education and the Law
Entertainment Law
European Business Organization Law Review (EBOR)
European Constitutional Law Review (EuConst)
European Journal for Education Law and Policy
European Journal of Crime, Criminal Law and Criminal Justice
European Journal of Health Law
European Journal of International Law
European Journal of Law and Economics
European Journal of Law Reform
European Journal of Migration and Law
European Journal on Criminal Policy and Research
European Law Journal
European Public Law
European Review of Private Law
Feminist Legal Studies

Global Crime
Global Society
Homicide Studies
Howard Journal of Criminal Justice
Human Rights Case Digest
Indiana Journal of Global Legal Studies
Industrial Law Journal
Information & Communications Technology Law
Intelligence & National Security
International and Comparative Corporate Law Journal
International and Comparative Law Quarterly
International Insurance Law Journal
International Journal for the Semiotics of Law
International Journal of Comparative Labour Law and Industrial Relations
International Journal of Constitutional Law
International Journal of Franchising and Distribution Law
International Journal of Human Rights
International Journal of Intelligence and CounterIntelligence
International Journal of Law and Information Technology
International Journal of Law in Context
International Journal of Law, Policy and the Family
International Journal of Offender Therapy and Comparative Criminology
International Journal of Refugee Law
International Journal of the Legal Profession
International Law FORUM du droit international
International Review of Law, Computers & Technology
Journal of African Law
Journal of Comparative Legislation and International Law
Journal of Conflict and Security Law
Journal of Contemporary Criminal Justice
Journal of Environmental Law
Journal of Family Violence
Journal of International Arbitration
Journal of International Criminal Justice
Journal of International Economic Law
Journal of Internet Law
Journal of Interpersonal Violence
Journal of Law and Economics
Journal of Law and Society
Journal of Law, Economics, and Organization
Journal of Legal History
Journal of Legal Studies
Journal of Offender Rehabilitation
Journal of Quantitative Criminology
Journal of Research in Crime and Delinquency

Journal of Scandinavian Studies in Criminology and Crime Prevention
Journal of Social Welfare & Family Law
Journal of Supreme Court History
Journal of the History of International Law
Journal of the Society of Comparative Legislation
Justice Professional
Law & Policy
Law and Critique
Law and Human Behavior
Law and Philosophy
Law and Policy
Law and Society Review
Law Probability and Risk
Legal History Review
Legal Information Management
Legal Issues of European Integration
Legal Theory
Leiden Journal of International Law
Liverpool Law Review
Low Intensity Conflict & Law Enforcement
Managerial Law
Medical Law Review
Modern Law Review
Netherlands International Law Review
Netherlands Quarterly of Human Rights
Netherlands Yearbook of International Law
Nordic Journal of International Law, The
Ocean Development & International Law
Oxford Journal of Legal Studies
Police Practice and Research
Police Quarterly
Policing & Society
Policing: An International Journal of Police Strategies and Management
Prison Journal
Prison Journal
Probation Journal
Problems of the War
Psychology, Crime and Law
Punishment and Society
Ratio Juris
Review of European Community and International Environmental Law
Security Studies
Social Justice Research
Statute Law Review

Statute Law Review
Supreme Court Review
Survival
Theoretical Criminology
Transactions of the Grotius Society
Trauma, Violence & Abuse
University of Toronto Law Journal
Violence Against Women
Women & Criminal Justice
Yale Law Journal
Yearbook of International Humanitarian Law

Computer Science Periodicals

ACM Computing Surveys
ACM Journal of Computer Documentation
ACM Proceedings
ACM Transactions on Architecture and Code Optimization
ACM Transactions on Asian Language Information Processing
ACM Transactions on Computational Logic
ACM Transactions on Computer Systems
ACM Transactions on Computer-Human Interaction
ACM Transactions on Database Systems
ACM Transactions on Design Automation of Electronic Systems
ACM Transactions on Embedded Computing Systems
ACM Transactions on Graphics
ACM Transactions on Information and System Security
ACM Transactions on Information Systems
ACM Transactions on Internet Technology
ACM Transactions on Mathematical Software
ACM Transactions on Modeling and Computer Simulation
ACM Transactions on Programming Languages and Systems
ACM Transactions on Software Engineering and Methodology
ACM Transactions on Speech and Language Processing
ACM Transactions on Applied Perception
Ad Hoc Networks
Annual Review in Automatic Programming
Applied Artificial Intelligence
Artificial Intelligence
Automated Software Engineering
Automation and Remote Control
Autonomous Agents and Multi-Agent Systems
Bell Labs Technical Journal
Bioresource Technology

British Journal of Criminology
BT Technology Journal
Campus-wide Information Systems
Chaos, Solutions & Fractals
Cluster Computing
Computational Intelligence
Computational Optimization and Applications
Computer
Computer Bulletin
Computer Fraud and Security
Computer Journal
Computer Languages
Computer Methods in Applied Mechanics and Engineering
Computer Networks and ISDN Systems
Computer Physics Communications
Computer Standards and Interfaces
Computer Supported Cooperative Work (CSCW)
Computer-Aided Design
Computers & Chemical Engineering (Plus 1 Supplement)
Computers & Electrical Engineering
Computers & Fluids
Computers & Graphics
Computers & Industrial Engineering
Computers & Mathematics With Applications
Computers & Operations Research
Computers & Security
Computers & Structures
Computers and the Humanities
Computers in Industry
Computers, Environment And Urban Systems
Computing
Computing in Science & Engineering
Concurrency and Computation: Practice and Experience
Concurrency: Practice and Experience
Concurrency: Practice and Experience
Cybernetics and Systems Analysis
Cybernotes
Data and Knowledge Engineering
Data Mining and Knowledge Discovery
Decision Support Systems
Design Automation for Embedded Systems
Distributed Systems Engineering
Education and Information Technologies

Electronics & Communication Engineering Journal
Electronics Letters
Endeavour
Engineering Applications of Artificial Intelligence
Ethics and Information Technology
European Journal of Information Systems
Formal Aspects of Computing
Future Generation Computer Systems
IEEE Annals of the History of Computing
IEEE Antennas and Propagation Magazine
IEEE Circuits and Devices Magazine
IEEE Communications Letters
IEEE Communications Magazine
IEEE Computational Science and Engineering
IEEE Computer Applications in Power
IEEE Computer Graphics and Applications
IEEE Concurrency
IEEE Control Systems Magazine
IEEE Design & Test of Computers
IEEE Electron Device Letters
IEEE Intelligent Systems
IEEE Internet Computing
IEEE Journal of Solid-State Circuits
IEEE Journal on Selected Areas in Communications
IEEE Journal on Selected Topics in Quantum Electronics
IEEE Micro
IEEE Microwave and Guided Wave Letters
IEEE Multimedia
IEEE Network
IEEE Personal Communications
IEEE Potentials
IEEE Security and Privacy
IEEE Signal Processing Letters
IEEE Signal Processing Magazine
IEEE Software
IEEE Spectrum
IEEE Technology and Society Magazine
IEEE Transactions on Antennas and Propagation
IEEE Transactions on Automatic Control
IEEE Transactions on Broadcasting
IEEE Transactions on Circuits and Systems for Video Technology
IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications

IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing
IEEE Transactions on Communications
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
IEEE Transactions on Computers
IEEE Transactions on Control Systems Technology
IEEE Transactions on Electron Devices
IEEE Transactions on Evolutionary Computation
IEEE Transactions on Image Processing
IEEE Transactions on Information Theory
IEEE Transactions on Knowledge and Data Engineering
IEEE Transactions on Multimedia
IEEE Transactions on Neural Networks
IEEE Transactions on Parallel and Distributed Systems
IEEE Transactions on Pattern Analysis and Machine Intelligence
IEEE Transactions on Professional Communication
IEEE Transactions on Reliability
IEEE Transactions on Signal Processing
IEEE Transactions on Software Engineering
IEEE Transactions on Speech and Audio Processing
IEEE Transactions on Systems, Man and Cybernetics, Part A
IEEE Transactions on Systems, Man and Cybernetics, Part B
IEEE Transactions on Systems, Man, and Cybernetics, Part C
IEEE Transactions on Very Large Scale Integration (VLSI) Systems
IEEE Transactions on Visualization and Computer Graphics
IEEE/ACM Transactions on Networking
IFCC Internet Fraud Report
Information & Management
Information and Software Technology
Information Management & Computer Security
Information Processing & Management
Information Processing Letters
Information Retrieval
Information Sciences
Information Systems
Information Systems Frontiers
Information Systems Journal
Information Technology & People
Interacting With Computers
International Journal of Computer Vision
International Journal of Intelligent Systems
International Journal of Network Management

International Journal of Technology and Design Education
International Journal of Wireless Information Networks
International Journal on Document Analysis and Recognition
International Journal of Software Tools for Technology Transfer
International Review of Law, Computers & Technology
IT Professional
Journal of Computational And Applied Mathematics
Journal of Digital Information
Journal of Information Technology
Journal of Intelligent Information Systems
Journal of Lightwave Technology
Journal of Logic and Computation
Journal of Logic Programming
Journal of Scientific Computing
Journal of Software Maintenance and Evolution
Journal of Strategic Information Systems
Journal of Supercomputing
Journal of Systems And Software
Journal of Systems Integration
Journal of Technology Transfer
Journal of the Association for Computing Machinery
Journal of Visualization and Computer Animation
Knowledge and Process Management
Knowledge-Based Systems
Letters on Programming Languages and Systems
lII-Vs Review
Logic Journal of the IGPL
Mathematical And Computer Modeling
Mathematical Programming
Microprocessors and Microsystems
Mobile Networks and Applications
Multidimensional Systems and Signal Processing
Natural Computing
Network: Computation in Neural Systems
netWorker
New Review of Information Networking
Parallel Computing
Pattern Recognition
Pattern Recognition Letters
Proceedings of the IEEE
Queue
Robotics and Autonomous Systems
Science of Computer Programming

Software Focus
Software Process
Software Quality Journal
Software Testing
Software: Practice and Experience
StandardView
Systems and Computers in Japan
Technology in Society
Telecommunication Systems
Telecommunications Policy
Theoretical Computer Science
Theory of Computing Systems (formerly: Mathematical Systems Theory)
Virtual Reality
Wireless Communications and Mobile Computing
Wireless Networks
World Wide Web

Benchmark Journals - is a list of the journals not owned by UCF, but subscribed to by two or more of the benchmark universities. The estimated cost to subscribe to these journals is $493 and $1234 to purchase the 5-year back-files.

JOURNALS NOT OWNED BY UCF	ISSN	SUBSCRIPTION	5-YR BACKFILE
Information Systems Security	1065-898x	$175	$438
John Marshal Journal of Computer and Information Law	1078-4128	$98	$245
Journal of Law Technology and Policy	1532-3242	$30	$75
Privacy Journal	0145-7695	$125	$313
Security Technology and Design	1069-1804	$65	$163
TOTAL		$493	$1234

D. New Course Proposals

Department of Engineering Technology
College of Engineering
University of Central Florida
Dr. Philip Craiger

Title: OS and File System Forensics
CET 6xxx

Course Description: In-depth coverage of computer forensics-related issues associated with multiple operating systems, multiple file systems, and applications.

Prerequisites: PR: CGS 5131 or CI.

Course Objectives:

By the end of the semester students should be able to :

(i) Demonstrate an understanding of the following file systems including their structure and functioning:
   1. NTFS
   2. EXT2/3
   3. FAT
   4. HFS/HFS+

(ii) Demonstrate an understanding of the following operating systems including their structure and functioning:
   1. Linux distributions
   2. Windows
      a. Non NT
      b. NT-based (2K, XP, 2003, Vista)
   3. Mac OS X
   4. UNIX (*BSD)

(iii) Demonstrate an understanding of major applications under multiple operating systems, including the ability to identify sources of trace evidence.

(iv) Demonstrate the ability to recover trace evidence from multiple file and operating systems.

(v) Demonstrate an understanding and appreciation of sound forensic procedures.

Course Outline :

1. Introduction
2. Review of computer forensics procedures

3. File Systems
    a. EXT2
    b. EXT3 (journalized EXT2)
    c. NTFS
    d. HFS/HFS+
    e. Others (UFS, FFS, HPFS)
4. Operating Systems & Applications
    a. Linux distributions
        i. Redhat-based
        ii. Debian-based
        iii. Trace evidence locations
        iv. Recovery methods
        v. Applications
            1. Mail
            2. Web
            3. Documents
    b. Windows (non NT)
        i. 95
        ii. 98/ME
        iii. Trace evidence locations
        iv. Recovery methods
        v. Applications
            1. Mail
            2. Web
            3. Documents
    c. Windows NT-based
        i. 2K, XP
        ii. 2003,Vista
        iii. Trace evidence locations
        iv. Recovery methods
        v. Applications
            1. Mail
            2. Web
            3. Documents
    d. Mac OS X
        i. Pre OS X systems
        ii. Trace evidence locations
        iii. Recovery methods
        iv. Applications
            1. Mail
            2. Web
            3. Documents

Textbook:

Required:

- Brian Carrier, File System Forensic Analysis, Addison-Wesley Professional, March 17, 2005, ISBN: 0321268172

Optional:

- Advances in Digital Forensics, Volume 1, International Federation of Information Processing, 2006.
- NOTE: There is NO perfect textbook for this course. Therefore, the majority of the readings will be derived from online readings and other sources. See below.

Required Readings:

1. Craiger, P. (2006) *Computer forensics methods and procedures* In H. Bigdoli, (Ed), *Handbook of Information Security* John Wiley & Sons.
2. Craiger, P., Pollitt, M & Swauger, J (2006) *Digital Evidence and law enforcement.* In H Bigdoli, (Ed), *Handbook of Information Security* John Wiley & Sons.
3. Craiger, P. (2006). Recovering digital evidence from Linux systems. In S. Shenoi & M Pollitt (Eds), *Advances in Digital Forensics* International Federation of Information Professing, pp. 233-234.
4. Craiger, P., Swauger, J, & Marberry, C. (2005). Digital evidence obfuscation: recovery techniques. T*he Proceedings of the International Society for Optical Engineering.*
5. Craiger, P, Swauger, J., Marberry, C., (in press). Digital forensic software tool validation In P. Kanellis (Ed) *Digital Crime and Forensic Science in Cyberspace.* Idea Group.
6. Craiger, P., & Burke, P. (in press). Mac Forensics: OS X and the HFS+ File System. To appear in M. Olivier and S. Shenoi (Eds.), Advances in Digital Forensics Volume 2. International Association of Information Processing.
7. Burke, P., & Craiger, J.P. (in press). Digital Trace Evidence from Secure Deletion Programs. To appear in M. Olivier and S. Shenoi (Eds.), Advances in Digital Forensics Volume 2. International Association of Information Processing.
8. NTFS. http://www.ntfs.com/
9. Apple Computer, Target Disk Mode. (http://developer.apple.com/documentation/Hardware/Developer_Notes/Macintosh _CPUs-G4/PowerMacG4_16Jan01/3Input-Output/Target_Disk_Mode_.html), 002.
10. Apple Computer, Technical Note TN1150: HFS Plus Volume Format. (http://developer.apple.com/technotes/tn/tn1150.html), 2004.
11. Microsoft Corporation, How the Recycle Bin Stores Files. (http://support.microsoft.com/default.aspx?scid=kb;en-us;13617&Product=w95), 2004.
12. Network Working Group, RFC 4155 - The application/mbox Media Type. (http://www.faqs.org/rfcs/rfc4155.html), 2005.

13. EXT2/3 File System. http://olstrans.sourceforge.net/release/OLS2000-ext3/OLS2000-ext3.html

14. Apple Computer, Working with Spotlight. (http://developer.apple.com/macosx/spotlight.html), 2005.

Student Products: Products include: written reports; assignments to include acceptable use and security policies; analyzing and correlating log files from multiple devices to determine incident source; demonstration of procedures to recover from various incidents on various operating systems and platforms. Students must be able to demonstrate effective communication skills in order to pass this course.

Course Policies:

- Unless explicitly stated by me, all assignments must be completed individually. Discussion of course topics is welcomed, but each student must complete his/her own assignments and exams. Each of you will sign an ethics statement on day one indicating your understanding of the consequences of cheating and/or plagiarism in this course.
- All assignments must be completed on time to receive credit.
- All assignments must be submitted via WebCT to receive credit.
- All course related communication with the instructor should be done through the WebCT email system.
- The only exceptions to the above rule will be in extreme circumstances and must be arranged with the instructor ***before*** the assignment due date.
- Assignments are graded on the following factors:
    - Technical accuracy
    - Completeness
    - Professionalism
        - The quality of communicating your ideas
            - THIS IS CRITICAL.
        - The overall appearance of your document

EVALUATION

Grades will be determined on the basis of the student's participation and performance on approximately seven hands-on assignments, including a report with an executive summary written for managers, and a technical summary written for technical peers.

Grading Scale

97 - 100 = A+	77 - 79 = C+
94 - 96 = A	74 - 76 = C
90 - 93 = A-	70 - 73 = C-
87 - 89 = B+	67 - 69 = D+
84 - 86 = B	64 - 66 = D

80 - 83 = B- 60 - 63 = D-
Below 60 is an F

Department of Engineering Technology
College of Engineering
University of Central Florida
Dr. Philip Craiger

Title: Incident Response Technologies
CET 6xxx

Course Description: Covers security incidents and intrusions, including identifying and categorizing incidents; responding to incidents; log analysis; network traffic analysis; tools; and creating an incident response team.

Prerequisites: PR: CGS 5131 or CI.

Course Goals :

1. Detect and characterize various incident types
2. Demonstrate a practical understanding of the analysis of artifacts left on a compromised system
3. Demonstrate an understanding of the complexity of and effectively respond to privileged and major event incidents.
4. Obtain practical experience in the analysis of vulnerabilities and the coordination of vulnerability handling tasks
5. Formulate effective advisories, alerts, and management briefings

Course Outline :

5. Introduction to incident and intrusion handling
    a. Definition of incident
    b. Criteria for incidents
    c. Categories of incidents
    d. Types of incidents
    e. Response level to incidents
6. Definition of incident handling
    a. Purpose of incident handling
    b. Steps in incident handling
        i. Preparation
        ii. Identification
        iii. Containment
        iv. Eradication
        v. Recovery
        vi. Follow up
7. Technical Analysis
    a. Log Analysis
        i. utmp/wtmp

        ii. messages
        iii. dmesg
    b. Configuration files
        i. /etc/<services>
        ii. passwd/shadow
        iii. access control
        iv. initab
        v. fstab
    c. Network Traffic analysis
        i. Protocol analyzers
        ii. Traffic signatures
8. System Devices
    a. Windows servers
    b. Mac OS X servers
    c. Unix servers
        i. Solaris
        ii. BSD
        iii. Linux
9. Creating a CIRT
    a. Motivation
    b. Benefits
    c. Task of CIRT
    d. Stage of CIRT development
    e. Information gathering
    f. Implementation
10. Common problems
    a. CIRT component & constituency
11. Policies & Procedure
    a. Standard Operating Procedure (SOP)
12. Case Studies

Textbook: Required:

Grance, T., Kent, K., & Kim, B. (2004). *Computer Security Incident Handling Guide: Recommendations of the National Institute of Standards and Technology*. National Institute of Standards and Technology.

West-Brown, M.J., Stikvoort, D., & Kossakowski, K. (2003). *Handbook for Computer Security Incident Response Teams (CSIRTs)*. Computer Emergency Response Team, Carnegie-Mellon University.

Student Products: Products include: written reports; assignments to include acceptable use and security policies; analyzing and correlating log files from multiple devices to determine incident source; demonstration of procedures to recover from

various incidents on various operating systems and platforms. Students must be able to demonstrate effective communication skills in order to pass this course.

Course Policies:

- Unless explicitly stated by me, all assignments must be completed individually. Discussion of course topics is welcomed, but each student must complete his/her own assignments and exams. Each of you will sign an ethics statement on day one indicating your understanding of the consequences of cheating and/or plagiarism in this course.
- All assignments must be completed on time to receive credit.
- All assignments must be submitted via WebCT to receive credit.
- All course related communication with the instructor should be done through the WebCT email system.
- The only exceptions to the above rule will be in extreme circumstances and must be arranged with the instructor ***before*** the assignment due date.
- Assignments are graded on the following factors:
    - Technical accuracy
    - Completeness
    - Professionalism
        - The quality of communicating your ideas
            - THIS IS CRITICAL.
        - The overall appearance of your document

EVALUATION

Grades will be determined on the basis of the student's participation and performance on approximately seven hands-on assignments, including a report with an executive summary written for managers, and a technical summary written for technical peers.

Grading Scale

97 - 100 = A+	77 - 79 = C+
94 - 96 = A	74 - 76 = C
90 - 93 = A-	70 - 73 = C-
87 - 89 = B+	67 - 69 = D+
84 - 86 = B	64 - 66 = D
80 - 83 = B-	60 - 63 = D-

Below 60 is an F

School of Electrical Engineering and Computer Science
Dr. Damla Turgut

CAP 6xxx: Wireless Security and Forensics

Prerequisites: CGS 5131 Computer Forensics I, or C.I.

Course Motivation

Security is an interest for everyone to keep their information from being stolen and used it against them. The computers in general are vulnerable to various degrees of security attacks. In wireless domain, by exchanging information in a free-space environment rather than through traditional wired networks, the difficulty of securing information becomes extremely difficult due to the nature of the wireless technology. With the assistance of computer forensics, which often investigates computer systems to determine whether they have been used for illegal or unauthorized activities, we move one big step forward in better securing our wireless systems.

This course is designed for students wishing to obtain deeper knowledge on wireless network security and forensics and gain employment in related areas such as with public and private security agencies, computer companies and consultancies, police forces, the military services, other government agencies, and so on.

Course Objectives

The course is designed for advanced level graduate students. The course objectives are to:

- understand the current wireless security and forensics theory and practice
- gain the skills to develop a management security policy for organizations
- design a secure wireless computer network
- work on project such as managing a forensic case and performing detailed technical analyses of computer-based evidence
- develop skills in the use of testing and evaluating current/future systems
- experience on reading and writing research papers

Course Description

This course provides an advanced study for those students with an interest in areas such as wireless computer security, security management, cryptography, computer forensics and related areas.

Course Topics

The course topics include a study of key security systems, management of wireless and mobile security, security in local area wireless networks. Basic wireless security topics such as cryptography, key management, and authentication will also be covered. More specifically, the key authentication methodologies to be covered include security in local area wireless networks (802.11x technologies, WEP, WPA, WPA2, and EAP), security in metropolitan wireless access networks (WiMax), security in personal area networks

(Bluetooth), and so on. The most common hacker tools such as NetStumbler, AirSnare, BlueSniff, Kismet will also be included.

Course Project

The project can involve a local industry. The student will be guided with the instructor of the course and the contact person in a company may act as a client to the students. The students are expected to provide weekly progress reports, meet and discuss the progress with their instructor.

Research Paper Presentations/Critiques:

The students will also read and present one research paper from the current literature of a given specific topic. The research papers can be found in the recent published journals and conferences proceedings in the area of wireless security and forensics. The students will also read and provide critiques of several assigned papers throughout the semester.

Textbook

There is no required textbook for this course. However, reference book(s) will be provided.

References

1. G. Kipper, "Wireless Crime and Forensic Investigation," CRC Press, Publication date: 2/2/2007, ISBN: 0849331889.
2. P. C. Lekkas, R. K. Nichols, "Wireless Security: Models, Threats, and Solutions," McGraw-Hill, 2002.
3. Selected research papers from journals, conferences and technical reports.

Grading Policy

The semester grade will be based on the following: individual/group project, research paper summaries and presentation, mid-term exam and a final report of their project and/or findings. The percentages of the items will be determined later.

School of Electrical Engineering and Computer Science
Dr. Cliff Zao

COP 6xxx: Malware and Software Vulnerability Analysis

Credit Hours: 3 hours

Prerequisite: CGS 5132, or CDA 4527 and CDA 4150, or C.I.

Catalog Description:
This course introduces and analyzes computer malicious codes, such as virus, worm, trojan, spyware, and software vulnerabilities, such as buffer-overflow.

Course Description:
This course has two major parts. First, it introduces and analyzes software vulnerabilities, such as buffer overflow, and how to discover and secure software vulnerabilities both in research area and in practice. Second, it introduces malicious codes in current computer networks and the Internet, including virus, worms, trojan, phishing, spyware etc. It provides detailed analysis of these malicious codes and the state-of-the-art approaches in defending against these attacks.

Course structure will be a combination of lectures, reading and reviewing papers, programming projects, student presentations, and a research-style term project.

Rationale:
As our society increasingly depends on computers and the Internet, keeping our computer systems secure becomes critical for most businesses and people's life. However, many research and surveys have shown that our computer systems have become increasingly vulnerable to a growing number of cyber attacks. The cost of computer attack has increased dramatically in the last several years. To cope with this increasing threat, many companies and organizations are hungry in recruiting people with security knowledge and expertise, especially on how to defend against continuous attacks from various network malicious codes, such as virus, worm, trojan, phishing, spyware. In addition, security software companies and other general software companies are in great need of researchers and programmers with knowledge on how to secure current software and program secure software.

The primary purpose of this proposed course will be educating the students majoring in computer science and information technology to have proper knowledge and skills to solve computer security issues. The new course will also help maintain our school as an educational leader through the timely education and introduction of research results into the classroom.

Semester Plan:
- Week 1: Introduction to software security
- Week 2: Insight look and analysis of buffer overflow vulnerability
- Week 3: Beyond buffer-overflow attack: integer attack, non-control data attack, etc

- Week 4: Practical tools in software vulnerability analysis
- Week 5: Strengthen software security in practice
- Week 6: Research in discovery of vulnerabilities in software
- Week 7: Research in strengthening software security
- Week 8: Review and mid-term exam
- Week 9: Introduction to computer malicious codes
- Week 10: Analysis, case studies of virus and worm
- Week 11: Analysis, case studies of Trojan, phishing, spyware
- Week 12: Monitoring, detection, and defense practice against malicious codes
- Week 13: Research in defense against virus and worms
- Week 14: Research in defense against other malicious codes
- Week 15: Term project presentation

Grading:

+/- grading system will be used. The tentative weights are as follows:

Homework	15%
Student presentation	20%
Programming	15%
Mid-term exam	15%
Term project	35%

Recommended Texts:

1. *The Software Vulnerability Guide*, by Herbert H Thompson, Scott G Chase, Charles River Media, 2005.
2. *Malware: Fighting Malicious Code*, by Ed Skoudis, Lenny Zeltser, Prentice Hall Ptr; Bundle edition, 2005.

School of Electrical Engineering and Computer Science
Dr. Joohan Lee

Syllabus

COP 6xxx: Distributed Processing of Digital Evidence

Credit Hours: 3 hours

Prerequisite: CGS 5131 and COP 5611, or C.I.

Catalog Description:
Parallel and distributed processing techniques using MPI in a cluster environment, data mining techniques used in analyzing large quantities of digital data.

Course Description:
This course has two major parts. First, it introduces parallel and distributed programming techniques. Programming exercises using MPI in a cluster environment will be demonstrated. The second part of the course discusses topics related to the handling of large quantities of data (digital evidence), from both computational and statistical perspectives. Data mining and searching techniques will be studied. These techniques are applied the design and implementation of parallel programs, using real-world data sets such as forensic copy of disk images as the input.

Goals:
1. To give a broad understanding of parallel processing models and programming techniques.
2. To give students a strong working knowledge of parallel processing techniques and design principles for large scale digital forensic data throughout the programming assignments and projects.

Textbook:
G. Andrews, Foundations of Multithreaded, Parallel, and Distributed Programming, Addison Wesley, 2000.
Reference:
K. Jones, R. Bejtlich, C. Rose, Real Digital Forensics, Addison-Wesley, 2006.

Programming Projects

Recommended Topics for Programming Assignments:
HW1 – Example: Write a simple parallel program using Pthread
Parallel matrix multiplication
HW2 – Example: Write a reader/writer problem using semaphores and condition variables
Parallel program structure with semaphores and condition variables
HW3 – Example: Write a parallel Java monitor program
Utilize Java monitor concept for a parallel program

HW4 – Parallel network forensic data analysis
Analyze TCP/IP traffic audits in parallel

Grading Policy:

1 Midterm exam
1 Final exam
4-5 Programming and Homework Assignments

Major Topics Covered in the Course:

Topic	**Readings In Text**	**Programming Assignments**
Course Introduction	P: Chapter 1	
Process and Synchronization	P: Chapter 2	
Locks and Barriers	P: Chapter 3	**HW 1**
Semaphore	P: Chapter 4	
Monitors	P: Chapter 5	**HW 2**
Message Passing	P: Chapter 7	
RCP and Rendezvous	P: Chapter 8	**HW 3**
Paradigm for Process Interaction	P: Chapter 9	
Mid Exam		
Parallel Implementation & Programming		
Digital Forensics and Parallel Processing	R: Chapter 1 and 2	
File System Analysis	R: Chapter 3	**HW4**
Network Based Forensics	R: Chapter 4 and 5	
Building Parallel Programs for Forensic Analysis	Reading Materials	
Case Studies	Reading Materials	
Final Exam		
Total		4 Programs

(Note: P: Primary text book, R: Reference)

E. Curriculum Vitae

Philip Craiger, Ph.D.

Assistant Director for Digital Evidence
National Center for Forensic Science Technology
University of Central Florida
Orlando FL 32816
Email: pcraiger@mail.ucf.edu

Assistant Professor
Department of Engineering
University of Central Florida
Orlando FL 32816
Email: philip@craiger.net

Education

Ph.D., 1992, University of South Florida, Tampa, FL Specializing in Industrial Psychology Minor in Artificial Intelligence from the Department of Computer Science

Dissertation title: A heuristic procedure for mapping knowledge skills, and abilities to tasks

Published as: Craiger, J.P., & Coovert, M.D. (1993) A fuzzy system for mapping worker attributes to task. *Behavior Research Methods, Instruments, and Computers*, 26, 107-111.

EDITED BOOKS

- P. Craiger and S. Shenoi. Advances in Digital Forensics III, Springer, New York, 2007.

CHAIRED CONFERENCES

- P. Craiger and S. Shenoi. International Federation for Information Processing Working Group 11.9 (Digital Forensics), January, 2007, Orlando FL.

PUBLICATIONS (SELECT, RECENTED, PEER-REVIEWED)

- C. Marberry and P. Craiger, CD-R Acquistion Hashes Affected by Write Options. Journal of Digital Forensic Practice, 4, 297-307.
- P. Burke and P. Craiger, Xbox Forensics. Journal of Digital Forensics Practice, 4, 275-282.
- P. Craiger, P. Burke, and C. Marberry. Forensics Analysis of Phishing Cases Using P. Burke and P. Craiger. Xbox forensics. *Journal of Digital Forensics Practice*, New York, Taylor & Francis, under review.
- C. Marberry and P. Craiger. CD-R acquisition hashes affected by write options. *Journal of Digital Forensics Practice*, New York, Taylor & Francis, under review.
- P. Craiger, P. Burke, and C. Marberry. Forensics Analysis of Phishing Cases Using Open Source and Free Tools. Anti-phishing and Online Fraud. *Journal of Digital Forensics Practice*, New York, Taylor & Francis, 223-230.
- P. Burke and P. Craiger, Forensic Analysis of Xbox Consoles. In P. Craiger and S. Shenoi (Eds.), *Advances in Digital Forensics III*, Springer, New York, to appear.
- Maryberry and P. Craiger, Burn Options Affect Cryptographic One-way Hashes of CD-R Media. In P. Craiger and S. Shenoi (Eds.), *Advances in Digital Forensics III*, Springer, New York, to appear.
- P. Craiger and P. Burke, Mac OS X Forensics. In M. Olivier and S. Shenoi (Eds.), *Advances in Digital Forensics II*, Springer, New York, 159-170.

- P. Burke and P. Craiger, Trace evidence of secure delete programs. In M. Olivier and S. Shenoi (Eds.), *Advances in Digital Forensics II. Springer*, New York, 185-198.
- P. Craiger, Training and Education in Digital Forensics. In J. Barbara (Ed.), *Handbook of Digital and Multimedia Evidence.* Humana Press, to appear.
- P. Craiger, Computer forensics methods and procedures In H Bigdoli, (Ed), Handbook of Information Security, New York, John Wiley and Sons, 2, pp. 736-755, 2006.
- P. Craiger, M. Pollitt and J. Swauger, Digital Evidence and law enforcement In H Bigdoli, (Ed), *Handbook of Information Security*, New York, John Wiley and Sons, 2, pp. 739-777, 2006.
- P. Craiger, Recovering digital evidence from Linux systems, In S. Shenoi and M. Pollitt (Eds), Advances in Digital Forensics, New York, Springer, pp. 233-243, 2006.
- P. Craiger and Swauger, J, Digital forensic software tool validation In P Kanellis (Ed) *Digital Crime and Forensic Science in Cyberspace Idea Group*, 91-108, 2006.
- P. Craiger, M. Coovert and M. Teachout, Fuzzy rule-based system for predicting job performance, *International Journal of Information Technology and Decision Making*, 2003.
- M. Coovert and P. Craiger, An expert system for integrating multiple fit-indices for structural equations modeling, *New Review of Applied Expert Systems*, 6, pp 131-140, 2001.
-

GRANTS AND CONTRACTS

2006:

- Virtual Digital Evidence Lab (Philip Craiger, PI) $140,600
- Digital Evidence Mark-Up Language (DEML) - A Plug-In to Global JXDM (Philip Craiger, PI) $57,479
- Digital Evidence Certification (Philip Craiger, PI) $ 51,922

2005:

- Digital Evidence Markup Language and Digital Evidence Certification. National Institute of Justice. Awarded $84,000.
- Virtual Digital Evidence Lab. National Institute of Justice 2006. Awarded $64,000.
- Tool Validation and Testing/Media Attribution, State of Florida, Awarded $15,000.

2003:

- Burnham, P. Craiger (Primary Author: 95%) and V. Winter, Cybercorp Scholarships at the University of Nebraska at Omaha Information Assurance Program, National Science Foundation, DUE-0313691, Awarded 2.2 Million (4 years).
- Burnham and P. Craiger (Primary author: 90%) Department of Defense Information Assurance Program Scholarships at the University of Nebraska at Omaha Information Assurance Program, Department of Defense, Awarded $294,000.
- P. Craiger, Computer and Network Forensics NASA Nebraska Space Grant and EPSCoR Seed Research Program, Awarded $1,000.

PROFESSIONAL CERTIFICATIONS

- Certified Information System Security Professional (CISSP), 2004
- SANS GIAC Certified Computer Forensic Analyst (GCFA), 2004
- American Society of Crime Labs/Laboratory Accreditation Board (ASCLD/LAB) Certified Inspector,
- 2004
- SANS GIAC Certified Security Essentials (GSEC), 2003
- EC-Council Certified Ethical Hacker (CEH), 2004=

PROFESSIONAL AFFILIATIONS

- Association for Computing Machinery (ACM) 1992-present
- American Association of Forensic Scientists 2005-present
- Digital Forensics Working Group 2002-present
- International Federation of Information Professionals 9.11 Digital Forensics Group 2004-present

Ratan K Guha, Professor of Computer Science
Modeling, Simulation and Intelligent Networking Laboratory
School of Electrical Engineering and Computer Science
University of Central Florida, Orlando, FL 32816

Education:

University of Calcutta, India	Honors in Mathematics	B. Sc. (1961)
University of Calcutta, India	Applied Mathematics	M. Sc. (1964)
Indian Statistical Institute	Data Processing	Dip (1966)
Penn State University	Computer Science-Ph. D. program	1967-1969
University of Texas at Austin		Computer Science
	Ph. D. (1970)	

Academic and Industrial Positions: R. Guha is a Professor of Computer Science at UCF since 1995. He had been a visiting professor at Indian Statistical Institute (2006), University of Genoa (2005), University of Wolverhampton (2005), University of Puerto Rico Mayaguez (2005), Thammasat University (1999), UC- Berkeley (1997), Purdue University (1996) and Beijing University (1985). He served as a Consultant to United Nation Development Programme (1987), WISE Inc. during the visit to People's Republic of China (1985), and a Member of Technical Staff, Bell Lab (1979-1980). He was an Associate Professor at UCF (1980-1995). He was an Assistant Professor, Associate Professor and Acting Chairman of Computer Science at Southern Illinois University at Carbondale (1970-1979).

Five Relevant Publications

1. R. Guha, D. Workman, H. Foroosh, A. Guha, M. Llewellyn, S. Pattanaik, "Experiences in Developing Objectives and Assessment Strategy for a Set of Core Courses in Computer Science Curriculum", Proceedings of Sixth International Conference on Engineering Education, July 23 – 28, 2006, San Juan, PR.
2. R. Guha and M. Bassiouni, **"**Modular Design for Distributed Systems and Network Security Courses in Computer Science Curriculum", Proceedings of the 6th International Conference on Information Technology Based Higher Education and Training, July 7 – 10, 2005
3. R. Guha and J. Hartman, "Teaching Parallel Processing: Where Architecture and Language Meet", Proceedings of Twenty-second Annual Conference on Frontiers in Education, pp 475-479, (1992).
4. C. Hughes, R. Guha, N. Deo and T Frederick, "Parallel Processing in the Undergraduate Curriculum", Proceedings of Twenty-second Annual Conference on Frontiers in Education, pp 475-479, (1992).
5. R. Guha, "Teaching Microprocessor Architectures," Proceedings of the Fourteenth SIGCSE, Technical Symposium on Computer Science Education, pp. 120-123 (1983).

Five Other Publications

1. R. Guha and S. Rakshit, "Selfish Users and Distributed MAC protocols in Wireless Local Area Networks (WLANs)", International Journal of Enterprise Information Systems (IJEIS), Vol. 2, No. 2, pp 28 – 44, April – June, 2006 (2005)

2. S. Rakshit and R. Guha, “Fair Bandwidth Sharing in Distributed Systems: A Game-Theoretic Approach”, IEEE Transactions on Computers, Vol. 54, No. 11, pp 1384 – 1393, November 2005.
3. J. Wang and R. Guha, “A novel data caching scheme for multimedia servers”, The International Journal of the Federation of EUROSIM: Simulation Practice and Theory, Vol. 9, Nos. 3-5, pp 193-213, 2002.
4. T.G. McDaneld and R. Guha, "The Two's Complement Quasi-Serial Multiplier", pp. 152-154, inComputer Arithmetic, Benchmark Papers in Electrical Engineering and Computer Science Vol. 21,Edited by E. E. Swartlander , Dowden, huchinson (1980).
5. R. Guha and R.T. Yeh "On Periodicity of Sequential Machines", Journal of Computer and System Sciences, Vol. 8 , pp. 41-70 (1974).

Synergistic Activities

1. Guha served as the Project Director and Principal Investigator of two large NSF grants in which special emphasis was placed on involving women and minorities.
2. Guha served as the Project Director and Principal Investigator for a multi-university DURIP project “High Performance Cluster Computing for Collaborative Large Scale Simulation", funded by ARO. The participating universities are Florida State University (FSU), George Washington University (GWU), and University of Central Florida (UCF) [May 2004 – July 2005]. In this project, Sun clusters are installed at the three universities and are used as a platform for heterogeneous cluster computing. Collaborative projects executing on these clusters are being planned.
3. Guha participated as the PI for UCF in a MURI on critical infrastructure protection sponsored by the Mathematics and Computer Sciences Division of the Army Research Office (2001- 2006). The universities include University of Wisconsin – Madison, George Washington University, Florida State University, and University of Central Florida.
4. Guha participated as the PI for UCF in a major 5-year HBCU/MI research consortium sponsored by the Mathematics and Computer Sciences Division of the Army Research Office (1995- 2002). The universities include Grambling State University (HBCU), University of Houston- Downtown (MI), Florida A & M University (HBCU), and University of Central Florida.
5. Guha has been participating in ABET/CSAB first as a Program Evaluator (89 - 94) and then as a Team Chair (95 - present). Guha served as a reviewer for the Computing Curricula 1991 Report of the ACM/IEEE-CS Joint Curriculum Task Force.

Collaborators

University of Central Florida: Kiran Anna, Mostafa Bassiouni, Wei Cui, Zeeshan Furquan, Arup Guha, Pankaj Gupta, Erin Hastings, Oleg Kachirski, Abhishek Karnik, Amit Kejirwal, Joohan Lee, Jaruwan Mesit, Shahabuddin Muhammed, Indra Mukherjee, Darshan Purandhare, Sudipta Rakshit, Mubarak Shah, Lisa Spencer, Keneth Stanley, Hua Zhang, (Computer Science), Mainak Chatterjee, Jaideep Sarkar (Electrical and Computer Engineering), Jayanta Kapat, Sudipta Seal (MMAE).
Florida State University: Daniel Schwartz, Sara Stoecklin (Computer Science). **University of Wisconsin at Madison:** Vicki Bier, Pascale Carayon, Thomas G. Kurtz, Steve Robinson, Mary Vernon. **Florida A & M University:** Didre Evans, **Grambling State University:** Y. B. Reddy, N. Gajendar, **George Washington University:** Jagdish

Chandra, Nozer Singpurwala. **University of Puerto Rico at Mayaguez:** Isidoro Couvertier, Yi Qian. **Clemson University:** James Z. Wang

Thesis Advisor:

Lisa Spencer, Sudipta Rakshit, Oleg Kachirski, James Z. Wang (Computer Science, Clemson University), Darshan Purandhare (Computer Science, UCF), Varunyu Vorachart, Fan Hai, (Fedex), Jack Zhao (Agere).

Total number of graduate students advised: 59.

Ph. D. Advisor: Raymond T. Yeh

Curriculum Vitae
Sheau-Dong Lang, Ph.D.

Associate Professor and Information Technology Program Coordinator
School of Electrical Engineering and Computer Science; and
Program Coordinator, Graduate Certificate in Computer Forensics
University of Central Florida
Orlando, FL 32816
(407) 823-2474, lang@cs.ucf.edu

Education:
B.S. Mathematics, National Taiwan University (1971)
Ph.D. Mathematics, The Pennsylvania State University (1979)
M.S. Computer Science, The Pennsylvania State University (1981)

Recent Courses Taught:
Design & Analysis of Algorithms, Computer Forensics II: Network Forensics, Network Optimization, Discrete Computation Structures, Topics in Computer Science, Database Concepts

Research Interests:
Network security and network forensics; modeling and simulation; information retrieval and data mining; algorithm design and analysis, database systems

Recent Projects:
Adaptive learning in SAF simulation systems (sponsored by STRICOM); Network intrusion detection and simulation (sponsored by NCFS)

Graduate Students Supervision:
5 Ph.D. students and over 20 Master's degree students completed, currently supervising 4 Ph.D. students.

Selected Recent Publications

- "Parallel Algorithm for the Degree-Constrained Minimum Spanning Tree Problem Using Nearest-Neighbor Chain and Heap-Traversal Technique" (with L.-J. Mao), *Information Journal*, 9 (2), March 2006
- "A non-linear dimensionality-reduction technique for fast similarity search in large databases" (with Vu, K., Hua, K.A., Cheng, H.), in *Proceedings of. SIGMOD Conference*, 2006
- "Detecting Outliers in Interval Data" (with Li, S., Lee, R.), in *Proceedings of ACM Southeastern Conference*, 2006
- "Locality-based Profile Analysis for Secondary Intrusion Detection" (with M. Zhou and R. Lee), in Proceedings of ISPAN 2005 conference, Dec. 2005.

- “Weighted Link Graphs: A Distributed IDS for Secondary Intrusion Detection and Defense” with M. Zhou, in Proceedings of SPIE 2005 Defense and Security Symposium, March 2005.
- “A Frequency-Based Approach to Intrusion Detection” with M. Zhou, Journal of Systemics, Cybernetics and Informatics, 2(3), 2004.
- “Many-To-Many Skeletal-Graphs Matching Approach To Shape Recognition” with N. Hiransakolwong et al., in Proceedings of 2004 Conference of SETIT, March 2004.
- “Mining Frequency Content of Network Traffic for Intrusion Detection” (with M. Zhou), in Proceedings of IASTED Conference on Communication, Network, and Information Security (CNIS 2003), Dec. 2003.
- “Studies of Intrusion Traffic Patterns Using OPNET” with M. Zhou, in Proceedings of OPNETWORK2003 conference, May 2003.
- A Conservative Synchronization Protocol for Dynamic Wargame Simulation (with Phuong Bui and David Workman), presented at the 2003 Spring Simulation Interoperability Workshop, March 2003.
- Network Intrusion Simulation Using OPNET (with S. Razak and M. Zhou), presented at OPNETWORK2002 conference, Sept. 2002.
- Parallel Algorithms for the Degree-Constrained Minimum Spanning Tree Problem using Nearest-Neighbor Chains and the Heap-Traversal Technique (with L.-J. Mao), in Proceedings of 2002 ICPP Workshop on High Performance Scientific and Engineering Computing with Applications (HPSECA-2002), pp. 398-404, Aug. 2002.
- Static Analysis and Validation of Composite Behaviors in Composable Behavior Technology (with J. Z. Zhang and B. Hopkinson), presented at the 2002 Spring Simulation Interoperability Workshop, March 2002.
- Using Constraint Logic Programming to Analyze the Chronology in "A Rose for Emily" (with J. Burg and A. Boyle), Journal of Computers and the Humanities, 34 (4), pp. 377-392, Dec. 2000.
- Adapting a Diagnostic Problem-Solving Model to Information Retrieval (with I. Syu), Journal of Information Processing & Management, 36 (2), pp. 313-330, Feb. 2000.
- Classification Algorithms for NETNEWS Articles (with W.-L. Hsu), in Proceedings of the 8th International Conference on Information and Knowledge Management (CIKM’99), pp. 114-121, Nov. 1999.
- An Extended Banker's Algorithm for Deadlock Avoidance, IEEE Transactions on Software Engineering, 25 (3), pp. 428-432, May/June, 1999.

- Probabilistic Analysis of the RNN-CLINK Clustering Algorithm (with L.-J. Mao and W.-L. Hsu), in Data Mining and Knowledge Discovery: Theory, Tools, and Technology, Belur V. Dasarathy, Editor, Proceedings of SPIE, Vol. 3695, pp. 31-38, April 1999.

Curriculum Vitae
Thomas Sadaka, JD

Counsel of Berger Singerman
350 E Las Olas Blvd, Suite 1000
Ft. Lauderdale, FL 33301
954-525-9900
407-921-5500 Cell
tsadaka@bergersingerman.com

Adjunct Professor, University of Central Florida, Masters Certification Program in Computer Forensics
Co-developer of National Cybercrime Training Partnership's Training CD *Prosecuting Cases That Involve Computers*.
Co-developer of National Cybercrime Training Partnership's booklet *Best Practices for Seizing Electronic Evidence.*
Author of Fl. Legislative Report, *Creating a Fraud Resistant Driver License and Identification Card*
US Secret Service High Tech Crimes Working Group
Florida Legislative Working Group Protecting Children Online
Federal Computer Investigators Committee
Law Enforcement Electronic Technical Advisement Committee
Former member of the Florida Prosecuting Attorneys Association, Education Committee.
Legal Advisor to the Florida Association of Computer Crimes Investigators
National Center for Forensic Science, Digital Evidence Planning Panel
Appointed member of the Florida Bar Computer Law Committee
Appointed member of the Florida Bar Consumer Protection Law Committee
International Journal of Digital Evidence, Editorial Board
National Center for Justice and the Rule of Law, Board of Advisors
Lecturer for the Florida Bar Association, the American Bar Association, the National Governor's Association, the National Judicial College, the National Council of State Legislatures, the National White Collar Crime Center, the National Center for Justice and the Rule of Law and the Florida Prosecuting Attorneys Association on technology related issues.

Education

B.A. in Philosophy from Florida State University (1988)
J.D. from St. Thomas University (1991)
LL. M. (in Taxation) from the University of Florida (1992)

Curriculum Vitae
Mark M. Pollitt

P.O. Box 16267
Orlando, FL 32816-2367
Phone: 407-823-0842
Email: mpollitt@mail.ucf.edu

Education:

- Master of Science – Information Management, Syracuse University, August 2002
- Diploma, Advanced Management Program, Information Resources Management College, National Defense University, 2001
- Post-graduate work in Forensic Science, George Washington University, 1996/7
- Bachelor of Science (Applied Economics), Cornell University, 1973

Honors and Awards:

2006 American Academy of Forensic Sciences General Section Achievement Award

Selected Recent Publications**:**

Pollitt, M. Computer Forensics: an Approach to Evidence in Cyberspace. *Proceedings of the 18th National Information Systems Security Conference*, Baltimore, MD, Oct. 10-13, 1995. Re-printed in *Royal Canadian Mounted Police Information Technology Security Bulletin*. *41*, April, 1996.

Pollitt, Mark M. Cyberterrorism Fact or Fancy? Proceedings of the 20th National Information Systems Security Conference, held October 10-13, 1997 at Baltimore, MD

Pollitt, Mark, Nobles, James M., Noblett, Michael G. (1997). Computer Crime Scene Procedures. *International Journal of Forensic Computing, 1*, p3.

Noblett, Michael G., Pollitt, Mark M., Presley, Lawrence A. (2000). Recovering and Examining Computer Forensic Evidence, *Forensic Science Communications, 2, no. 4* .

Pollitt, Mark M. (2002). Insuring Information Security: Commercial Insurance as an Information Security Driver, *Information Systems Control Journal, 1,* pp.44-47.

Pollitt, Mark M. "The Very Brief History of Digital Evidence Standards." In *Integrity and Internal Control in Information Systems V*, ed. Michael Gertz, 137-143. Boston: IFIP, 2003.

Yacinsac, Alec, Erbacher, Robert F., Marks, Donald G., Pollitt, Mark M., Sommer, Peter M. (2003) Computer Forensic Education, *Privacy and Security,1, No. 4, pp 15-23.*

Pollitt, M., Caloyannides, M., Novotny, J. Shenoi, S., "Digital Forensics: Operational, Legal and Research Issues." In *Data and Applications Security XVII, ed.Di Vimercati,* Ray & Ray, pp 394-403. Norwell, MA, IFIP, 2004

Teaching Experience:

- Johns Hopkins University, School of Professional Studies in Business and Education , Colombia, Maryland (Undergraduate Courses)
    - *Introduction to Digital Forensics* **–** Spring 2004
    - *Designing and Operating an Information Security Program* **–** Fall 2004/05
    - *Information Assurance Principles* – Fall 05/Spring 06
    - *Introduction to Forensic Computing* – Fall 2005
- Syracuse University, School of Information Studies (Graduate Courses)
    - *Applied Information Security* – Summer 2004/05 (Washington DC), Fall 2005 (Syracuse), Spring 2006 (Online)
    - *Introduction to Information Security (Online)* – Fall 2004
    - *Introduction to Digital Forensics* – Summer 2005 (Syracuse)
- University of Central Florida, Orlando, FL (Graduate Certificate Program)
    - *The Practice of Digital Forensics (Online)* –Spring 2005/06/07
    - *Security Methods & Practice (Online) – Fall 2006/Spring 2007*
- Norwich University, Northfield, VT (Graduate Courses)
    - *Foundations of Information Assurance (Online) – Fall 2005*
    - *Detection and Response (Online) – Spring 2006*
- Polytechnic University, Brooklyn, NY (Graduate Course)
    - *Digital Forensics (Online) – Spring 2006*
- National Judicial College, University of Nevada, Reno, NV (Professional Judicial Education)
    - Scientific Evidence – Summer 2002, 2003, 2004

Collateral Assignments:

- International Organization on Computer Evidence – Vice-Chair (1995-1997) Chair (1997-2002)
- Scientific Working Group on Digital Evidence – Chairman (1998-2003)
- FBI Representative to the G-8 High Tech Crime sub-committee (1999-2000)
- Digital Evidence Chair – INTERPOL Forensic Science Symposia (1998, 2001)
- NSA Centers of Academic Excellence in Information Assurance Review Board (2003)
- Co-Chair, Computer Forensic Educator's Working Group
- Advisory Board, School of Professional Studies in Business and Education, Johns Hopkins University (2003-2007)
- Advisory Board, Cyril H. Wecht Institute of Forensic Science and Law, Duquesne University
- Director, Digital Evidence Programs, Joint Council on Information Age Crime (2003-2005)
- Certification Committee Chair, High Tech Crime Investigator's Association
- Editorial Board, Journal of Digital Forensic Practice (2006-date)

Work Experience

2002 – 2003 **Director, Regional Computer Forensic Laboratory (RCFL) Program, Federal Bureau of Investigation (FBI)**.

- Established the National Program Office to oversee the development of new computer forensic laboratories
- Developed enterprise architecture, business processes, documentation, policies, training, fiscal, and quality management for the four existing and 11 future laboratories
- Lead a team of six contractors and one government employee
- Oversee a budget of over $9 million.
- Partner with national stakeholders including: Federal, state, local government agencies and academe

1996-2002 **Unit Chief- Supervisory Special Agent in charge of the Computer Analysis Response Team (CART), Cyber Technology Section, FBI Laboratory**

- Enlarged the CART program from 7 Headquarters examiners and 25 Field Examiners to 51 at Headquarters and over 250 Field Examiners and Technicians
- Grew CART's budget from less than $400k to over $26 million
- We brought the unit up to ASCLD accreditation standards, vastly expanded our protocols in depth and breadth, and established much higher training and qualification standards
- Led the national and international drive towards computer forensic standards
- Personally spearheaded the establishment of RCFL's San Diego and Dallas.

1983-1996 **Special Agent, FBI**

- Assigned to the Miami, St. Louis and Baltimore offices
- Investigated crimes against property, organized crime, white-collar crime, computer crime and child sexual exploitation
- Awarded four commendations and three Quality Step Increases
- Led a seven-member housing fraud task force in Baltimore, Maryland
- Founded both the computer crime and computer forensic programs in the Baltimore Division
- Obtained the first Federal computer crime conviction in the District of Maryland.
- Relief Supervisor/Acting Supervisory Special Agent for the squad that pioneered the on-line investigation of child pornography (**Operation Innocent Images**)
- Served as Critical Infrastructure Threat Assessment Center Coordinator and drafted FBI Baltimore's first Critical Infrastructure Protection Plan

1980-1983 **United States Coast Guard**

- Served as fixed and rotary wing pilot
- Law enforcement staff officer and criminal investigator
- One year tour undercover with the South Texas Drug Task Force
- Developed the Operations and Intelligence Centers for the Vice-President's Southeast United States Drug Task Force in Miami.

1973-1980 **United States Marine Corps** –

- Helicopter pilot
- Legal officer
- Investigator
- Fixed wing flight instructor.

Curriculum Vitae
Carrie Morgan Whitcomb, MSFS

Director
National Center for Forensic Science
PO Box 162367
Orlando, FL 32816-2367
whitcomb@mail.ucf.edu

Education
BS, University of Kentucky, 1967
MS in Forensic Science, George Washington University, 1976

Forensic Science Employment & Elected Position
- Director, National Center for Forensic Science, 1999 to present, ***www.ncfs.org***
- Manager, Forensic Services, 1992-1999 for the USPS five-laboratory system
- President, The American Society of Crime Laboratory Directors, 1995-96
- Director, Postal Inspection Service Headquarters Laboratory, Washington, D. C.1988
- Forensic Chemist, U. S. Postal Service's (USPS) Headquarters Laboratory, Washington, DC. 1976-88.
- Forensic Toxicologist, State of Alabama's Department of Toxicology and Criminal Investigation 1969-72.

Digital Evidence Involvement from 1988 forward
- 1988, Computer submitted to Postal Inspection Service Headquarters Crime Laboratory. As Director of the laboratory and I began researching how to deal with the forensic aspects of digital evidence stored on computers.
- 1995, Established the computer forensic capabilities at the Postal Inspection Service Forensic Laboratory, Dulles Virginia and field response teams across the US.
- 1995, Attended International Organization for Computer Evidence (IOCE) meeting, Baltimore, MD.
- 1998, Proposed to the Federal Crime Laboratory Directors in Washington, DC, the concept of Digital Evidence, which would include computer evidence, digital audio and digital video evidence.
- 1998, Became first Co-Chair of Scientific Working Group for Digital Evidence (SWGDE), which is supported by the FBI. SWGDE Chair, Mark Pollitt, was Chief of the FBI Computer

Analysis and Response Team (CART) and remained as Chair until 2003.

- 1999, Took position at UCF as Director of the National Center for Forensic Science and expanded its mission of NCFS to include Digital Evidence
- 1999, Became Executive Secretary of SWGDE as a result of being non-law enforcement.
- 2000, Digital Evidence liaison to The American Society of Crime Laboratory Directors (ASCLD)
- 2000, Digital Evidence liaison to The American Society of crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB)
- 2000, Developed impetus for a Graduate Certificate in Computer Forensics at UCF
- 2000, Named Chair of the Industry and Academia Portfolio of the National Cybercrime Training Partnership (NCTP)
- 2001-02, Delivered the Graduate Certificate in Computer Forensics at UCF
- 2002, Facilitated the development of draft standards thru SWGDE for an Accredited Section for Digital Evidence, presented to ASCLD/LAB for vote in fall of 2002.
- 2002, Named to Editorial Board of the International Journal for Digital Evidence
- 2002, Co-Chair of the NIJ Cybercrime Committee on Standards and Certification
- 2004, Forming a "Digital and Multimedia Section" in the American Academy of Forensic Sciences.

Publications Related to Digital Evidence

2002, April, International Journal for Digital Evidence, "An Historical Perspective of Digital Evidence: A Forensic Scientist's View", Carrie Morgan Whitcomb.

2002, AeroSense sponsored by *SPIE: The International Society for Optical Engineering*, "Forensic Aspects of Digital Evidence: Contributions and Initiatives by the National Center for Forensic Science", Carrie Morgan Whitcomb.

2003, McGraw Hill, *Encyclopedia of Technology* "Digital Evidence"

Curriculum Vitae

Cliff C. Zou

Assistant Professor

School of Electrical Engineering and Computer Science

University of Central Florida

Research Interests

- Computer and network security
- Network modeling and performance evaluation

Education

- Ph.D (2005) Dept. Electrical & Computer Engineering, Univ. Massachusetts, Amherst
- M.S (1999) Dept. of Automation, University of Science & Technology of China (USTC)
- B.S (1996) Dept. of Automation, University of Science & Technology of China (USTC)

Teaching

- CDA 4527: Computer Communication Networks (Fall 2005)

Student evaluation: Excellent-55%, Very good-18.2%, Good-18.2%, Fair-9.1%, Poor-0%

- CDA6938/COT4932: Special topic - Research in Computer and Network Security (Spring 2006)

Student evaluation: Excellent-45.8%, Very good-29.2%, Good-20.8%, Fair-0%, Poor-4.2%

- CDA 4527: Computer Communication Networks (Fall 2006)

Professional Service

- Program Co-Chair: second IEEE LCN workshop on network security, 2006.
- TPC Member: 4th Workshop on Rapid Malcode (WORM'06), 2006.

PhD Students

- Ryan Cunningham, Ping Wang, Sherri Sparks

Funding

- NSF Cyber Trust #0627318: "Collaborative Research: CT-ISG: Modeling and Measuring Botnets" (2006)

Publications

Referred Journal

- Cliff C. Zou, Nick Duffield, Don Towsley, Weibo Gong. "Adaptive Defense Against Various Network Attacks," *IEEE Journal on Selected Areas in Communications: High-Speed Network Security* (J-SAC), 24(10), 1877-1888, October 2006. (Acceptance ratio: 14/70= 20%, extended from workshop paper in SRUTI'05).
- Cliff C. Zou, Don Towsley, and Weibo Gong. "On the Performance of Internet Worm Scanning Strategies," Elsevier Journal of Performance Evaluation, 63(7), 700-723, July 2006.
- Cliff C. Zou, Don Towsley, Weibo Gong, Songlin Cai. "Advanced Routing Worm and Its Security Challenges," Simulation: Transactions of the Society for Modeling and Simulation International, 82(1), 75-85, 2006. (Extended from workshop paper in PADS'05).
- Cliff C. Zou, Weibo Gong, Don Towsley, and Lixin Gao. "The Monitoring and Early Detection of Internet Worms," IEEE/ACM Transactions on Networking, 13(5), 961-974, October 2005 (Extended from conference paper in CCS'03).

Referred conferences and workshops

- Jingfei Kong, Cliff C. Zou, and Huiyang Zhou, "Improving Software Security via Runtime Instruction-Level Taint Checking", *Workshop on Architectural and System Support for Improving Software Dependability (ASID) held with 12th International Conference on Architectural Support for Programming Languages and Operating Sytems (ASPLOS-XII)*, October, 2006.
- Cliff C. Zou and Ryan Cunningham. "Honeypot-Aware Advanced Botnet Construction and Maintenance," in the *International Conference on Dependable Systems and Networks* (DSN), June 25-28, Philadelphia, 2006 (Acceptance ratio: 34/187=18.2%).
- David Dagon, Cliff C. Zou, and Wenke Lee. "Modeling Botnet Propagation Using Time Zones," in 13th Annual Network and Distributed System Security Symposium (NDSS), p.235-249, Feb. 2-4, San Diego, 2006 (Acceptance ratio: 17/127=13.4%).
- Cliff C. Zou, Nick Duffield, Don Towsley, and Weibo Gong. "Adaptive Defense Against Various Network Attacks," in SRUTI: Steps to Reducing Unwanted Traffic on the Internet, p.69-75, July 7-8, Boston 2005 (Acceptance ratio: 13/35=37.1%).
- Cliff C. Zou, Don Towsley, Weibo Gong, and Songlin Cai. "Routing Worm: A Fast, Selective Attack Worm based on IP Address Information," 19th

ACM/IEEE/SCS Workshop on Principles of Advanced and Distributed Simulation (PADS'05), p.199-206, June 1-3, Monterey, 2005 (Best Paper Award Runner-up, Acceptance ratio: 22/46=48%).

- Cliff C. Zou, Don Towsley, and Weibo Gong. "Email Worm Modeling and Defense," 13th International Conference on Computer Communications and Networks (ICCCN'04), p.409-414, Oct. 11-13, Chicago, USA, 2004 (Best Paper Award Runner-up, Acceptance ratio: 73/207=35.3%).
- Cliff C. Zou, Weibo Gong, and Don Towsley. "Worm Propagation Modeling and Analysis under Dynamic Quarantine Defense," ACM CCS Workshop on Rapid Malcode (WORM'03), p.51-60, Oct. 27, Washington DC, USA, 2003 (Acceptance ratio: 10/25=40%).
- Cliff C. Zou, Lixin Gao, Weibo Gong, and Don Towsley. "Monitoring and Early Warning for Internet Worms," 10th ACM Conference on Computer and Communication Security (CCS'03), p.190-199, Oct. 27-31, Washington DC, USA, 2003 (Acceptance ratio: 35/253=13.8%).
- Cliff C. Zou, Weibo Gong, Don Towsley. "Code Red Worm Propagation Modeling and Analysis," 9th ACM Conference on Computer and Communication Security (CCS'02), p.138-147, Nov. 18-22, Washington DC, USA, 2002 (Acceptance ratio: 27/153=17.6%).

Technical reports and other publications

- Cliff C. Zou. "PCB: Physically Changeable Bit for Preserving Privacy in Low-End RFID Tags," RFID Journal "RFID White Paper Library", May 2006.

- Cliff C. Zou, Weibo Gong, and Don Towsley. "Feedback Email Worm Defense System for Enterprise Networks," Umass ECE Technical Report TR-04-CSE-05, April 2004.
- Cliff C. Zou, Don Towsley, and Weibo Gong. "A Firewall Network System for Worm Defense in Enterprise Networks," Umass ECE Technical Report TR-04-CSE-01, February 2004.
- Cassandras, C.G., C.G. Panayiotou, G. Diehl, W. Gong, Z. Liu, and C.C. Zou, "Clustering Methods for Multi-Resolution Simulation Modeling," Proceedings of SPIE's 14th Annual Internation Symposium on Aerospace/Defense Sensing, Simulation, and Control, Orlando, FL, April 24-28, 2000.
- Cliff C. Zou, Hongsheng Xi, Baoqun Yin, Yaping Zhou, and Demin Sun. "Derivative Estimates Parallel Simulation Algorithm Based on Performance Potentials Theory," International Federation of Automatic Control Conference (IFAC), Jul. 5-9, Beijing, China, 1999.

Honors

- The research work in NDSS'06 paper "Modeling Botnet Propagation Using Time Zones" was reported by the New Scientist Magazine, Mar. 4, 2006 189(2541), pg. 32.
- Best Paper Award runner-up in PADS 2005.

- Best Paper Award runner-up in ICCCN 2004.
- Interviewed by National Public Radio (NPR) on our research "dynamic quarantine of Internet worm" (by Correspondent Larry Abramson), September 2003.
- Outstanding Graduate Teaching Assistant, University of Massachusetts, 2000/2001.
- Graduate School Fellowship, University of Massachusetts, 1999/2000.
  - "Guo Moruo" Scholarship, the highest scholarship in the University of Science & Technology of China (USTC), 1996.

Curriculum Vitae

Damla Turgut

Assistant Professor in the School of Electrical Engineering and Computer Science

University of Central Florida.

Publications:

2006

- M. Z. Ahmad, D. Turgut, and R. Bhakthavathsalam. Circularity-based Medium Access Control in Mobile Ad hoc Networks. In *Proceedings of 5th International Conference on AD-HOC Networks & Wireless (AdHocNOW-2006)*, pp. 337–348, August 2006.
- X. Bai, K. Sivoncik, D. Turgut, and L. Bölöni. Grid coordination with marketmaker agents. *International Journal of Computational Intelligence*, 3(2):153–160, 2006.
- L. Bölöni, D. Turgut, and D. C. Marinescu. Task distribution with a random overlay network. *Future Generation Computer Systems (Elsevier)*, 22(6):676–687, Elsevier, 2006.
- L. Bölöni, D. Turgut, G. Wang, and D.C. Marinescu. Challenges and Benefits of Time-Parallel Simulation of Wireless Ad Hoc Networks. In *Proceedings of First International Conference on Performance Evaluation Methodologies and Tools (Valuetools-2006)*, October 2006.
- L. Bölöni, M.A. Khan, and D. Turgut. Agent-based coalition formation in disaster response applications. *submitted to International Journal of Intelligent Control and Systems*, 2006.
- A. Chalak, V. Sivaraman, N. Aydin, and D. Turgut. A Comparative Study of Routing Protocols in Wireless Sensor Networks. In *Proceedings of IEEE Thirteenth International Conference on Telecommunications (ICT)*, May 2006.
- Q. Chen, R. Palaniappan, and D. Turgut. UltraWideBand Indoor Location and Tracking System. *Submitted to IEE Electronic Letters*, 2006.
- S. Jin, G. Schiavone, and D. Turgut. A Performance Study of Algorithms for Multiprocessor Task Scheduling with Communication Delay. *Submitted to Parallel Computing Journal, Elsevier*, 2006.
- L. Bölöni, M.A. Khan and D. Turgut. Agent-based coalition formation in disaster response applications. In *IEEE Workshop on Distributed Intelligent Systems (DIS)*, pp. 259–264, June 2006.
- K. Robinson, D. Turgut, and M. Chatterjee. Entropy based Clustering in Mobile Ad Hoc Networks. In *Proceedings of IEEE International Conference on Networking, Sensing and Control (ICNSC)*, pp. 1–5, April 2006.
- D. Turgut, O. Ozyer, K. Hua, and L. Bölöni. Energy-Efficient Dissemination in Sensor Networks: Reactive Event Flow Shaping. In *Proceedings of the International Conference on Wireless Networks (ICWN'06)*, June 2006.
- D. Turgut, K. Robinson, and M. Chatterjee. Entropy based Clustering in Mobile Ad Hoc Networks. *Accepted for publication in Journal of Ubiquitous Computing and Intelligence (JUCI)*, 2006.

- D. Turgut, G. Wang, L. Bölöni, and D.C. Marinescu. Speedup-Precision Tradeoffs in Time-Parallel Simulation of Wireless Ad hoc Networks. In *Proceedings of Tenth IEEE International Symposium on Distributed Simulation and Real Time Applications (DS-RT)*, pp. 265–268, October 2006.
- G. Wang, Y. Ji, D.C. Marinescu, D. Turgut, and L. Bölöni. Location- and Power-Aware Protocols for Wireless Networks with Asymmetric Links. In E. Gelenbe, editors, *Computer System Performance Modeling in Perspective: A Tribute to the Work of Prof. Kenneth C. Sevcik (Advances in Computer Science and Engineering: Texts)*, Imperial College Press, 2006.
- G. Wang, D. Turgut, L. Bölöni, Y. Ji, and D.C. Marinescu. A simulation study of a MAC layer protocol for wireless networks with asymmetric links. In *Proceedings of the IEEE International Wireless Communications and Mobile Computing Conference (IWCMC'06)*, pp. 929–936, July 2006.
- G. Wang, D. Turgut, L. Bölöni, Y. Ji, and D. Marinescu. Improving Routing Performance Through m-Limited Forwarding in Power-Constrained Wireless Networks. *Submitted to International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC)* , 2006.
- G. Wang, D. Turgut, L. Bölöni, Y. Ji, and D. Marinescu. A MAC layer protocol for wireless networks with asymmetric links. *Submitted to Ad hoc Networks Journal*, 2006.
- G. Wang, D. Turgut, L. Bölöni, and D.C. Marinescu. Accuracy-Speedup Tradeoffs for a Time-Parallel Simulation of Wireless Ad hoc Networks. In *Accepted for publication in Proceedings of Second IEEE International Workshop on Performance and Management of Wireless and Mobile Networks (P2MNet)*, November 2006.
- G. Wang, D. Turgut, L. Bölöni, and D. Marinescu. Time-Parallel Simulation of Wireless Ad Hoc Networks. *Submitted to ACM/Springer Journal of Wireless Networks (WINET)*, 2006.

2005

- J. Ai, D. Turgut, and L. Bölöni. A Cluster-based Energy Balancing Scheme in Heterogeneous Wireless Sensor Networks. In *Proceedings of the 4th International Conference on Networking (ICN'05)*, pp. 467–474, April 2005.
- N. Aydin, S. H. You, B. Turgut, and D. Turgut. Scenario-Based Performance Analysis of MAC Protocols for Wireless Sensor Networks. In *The 2005 International Conference on Wireless Networks (ICWN'05)*, pp. 105–111, June 2005.
- L. Bölöni and D. Turgut. YAES - a modular simulator for mobile networks. In *Proceedings of the 8-th ACM/IEEE International Symposium on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM'05)*, pp. 169–173, October 2005.
- L. Bölöni, D. Turgut, T. Kocak, Y. Ji, and D. C.Marinescu. Rapid distribution of tasks on a commodity grid. In *Lecture Notes in Computer Science, LNCS 3470, Advances in GridComputing - EGC 2005*, pp. 721–730, Springer, February 2005.
- L. Bölöni, D. Turgut, and D. C. Marinescu. n-Cycle: a set of algorithms for task distribution on a commodity grid. In *IEEE International Symposium on Cluster Computing and the GridCCGrid'05*, May 2005.

2004

- J. Ai, J. Kong, and D.Turgut. An Adaptive Coordinated Medium Access Control for Wireless Sensor Networks. In *The 9th IEEE Symposium on Computers and Communications (ISCC 2004)*, June 2004.
- L. Bölöni, P. DeJung, and D. Turgut. Agents with Non-Anthropomorphic Lifecycles. In *Proceedings of the Workshop on Intelligent Agent Architectures at AAAI-2004*, pp. 34–38, August 2004.
- L. Bölöni and D. Turgut. Partial Merging of Semi-structured Knowledge bases. In *Proceedings of the 8th International Conference on Knowledge-Based Intelligent Information and Engineering Systems KES 2004, Part II*, pp. 1121–1127, Springer, September 2004.
- M.A. Khan, D. Turgut, and L. Bölöni. Computer Persona: a user interaction architecture for mobileenvironments. In *Proceedings of the Vehicular Technology Conference (VTC Spring'04)*, April 2004.
- G. Wang, Y. Ji, D. C. Marinescu, and D. Turgut. A Routing Protocol for Power Constrained Networks with Asymmetric Links. In *Proceedings of ACM Workshop on Performance Evaluation of Wireless Ad Hoc, Sensor, and Ubiquitous Networks (PE-WASUN'04)*, IEEE Press, October 2004.
- C. Yin and D. Turgut. Adaptive Ethernet Backoff Algorithm. In *Proceedings of International Conference on Networking (ICN'04)*, February 2004.
- M. Zipparo, D. Turgut, and L. Bölöni. A Survey of Merging Techniques and Tools for Ontologies. In *Proceedings of the International Conference on Information and Knowledge Engineering (IKE'04)*, pp. 322–326, June 2004.

2003

- D. Turgut, B. Turgut, S.K. Das, and R. Elmasri. Balancing Loads in Mobile Ad hoc Networks. In *Proceedings of ICT'03*, February 2003.
- D. Turgut, B. Turgut, R. Elmasri, and Than V. Le. Optimizing Clustering Algorithm in Mobile Ad hoc Networks Using Simulated Annealing. In *Proceedings of WCNC'03*, pp. 1492–1497, March 2003.
- C. Yin and D. Turgut. A Performance Comparison of Ethernet Backoff Algorithms. In *Proceedings of SoftCOM'03*, October 2003.

2002

- M. Chatterjee, S.K. Das and D. Turgut. WCA: A Weighted Clustering Algorithm for Mobile Ad hoc Networks. *Journal of Cluster Computing (Special Issue on Mobile Ad hocNetworks)*, 5(2):193–204, April 2002.
- B. Turgut, N. Aydin, and D. Turgut. Design and Development of E-Commerce Businesses. In *International Conference on Information and Knowledge Engineering (IKE'02)*, pp. 585–591, June 2002.
- B. Turgut, N. Aydin, R. Elmasri, and D. Turgut. An Evaluation of Distributed Database Tools. In *Proceedings of 6th World Multiconference on Systemics, Cybernetics and Informatics (SCI)*, July 2002.

- D. Turgut, S.K. Das, R. Elmasri, and B. Turgut. Optimizing Clustering Algorithm in Mobile Ad hoc Networks Using Genetic Algorithmic Approach. In *Proceedings of GLOBECOM'02*, pp. 62–66, November 2002.

2001

- S. Basagni, D. Turgut, and S.K. Das. Mobility-Adaptive Protocols for Managing Large Ad hoc Networks. In *Proceedings of IEEE International Conference on Communications (ICC)*, pp. 1539–1543, June 2001.
- D. Turgut, L. Barasch, Nevin Aydin, and Lynn Peterson. *Introduction to Computers and Programming with C*, McGraw-Hill, 2001.
- D. Turgut and E. Summerlin. Evaluation of the Computer-based Training Module for the Marine Medic. *Journal of BioCommunication (JBC)*, 28(4):18–20, 2001.
- D. Turgut, S.K. Das, and M. Chatterjee. Longevity of Routes in Mobile Ad hoc Networks. In *Proceedings of IEEE VTC (Spring)*, May 2001.
- D. Turgut, N. Aydin, and R. Elmasri. A Comparative Evaluation of Mobile Computing Systems. In *Proceedings of IEEE Eight International Conference on Telecommunications (ICT)*, pp. 364–369, June 2001.
- D. Turgut, N. Aydin, R. Elmasri, and B. Turgut. A CASE Tool for Object-Oriented Database Design. In *Proceedings of Seventh International Conference on Object-Oriented Information Systems (OOIS)*, August 2001.
- D. Turgut, N. Aydin, R. Elmasri, and B. Turgut. Integration of Object-Oriented Databases with VRML in Virtual Environments. In *Proceedings of Seventh International Conference on Object-Oriented Information Systems (OOIS)*, August 2001.
- D. Turgut, N. Aydin, R. Elmasri, and B. Turgut. Utilizing Object-Oriented Databases for Concurrency Control in Virtual Environments. In *Proceedings of 25th Annual International Computer Software and Applications Conference (COMPSAC)*, October 2001.
- B. Turgut, N. Aydin, and D. Turgut. Sphere System. In *Proceedings of Seventh International Conference on Information Networks and Systems, Technologies (ICINASTe)*, October 2001.
- B. Turgut, N. Aydin, and D. Turgut. User Interface Builders: Are They a Good Idea?. In *Proceedings of Seventh International Conference on Information Networks and Systems, Technologies (ICINASTe)*, October 2001.

2000

- M. Chatterjee, S.K. Das, and D. Turgut. An On-Demand Weighted Clustering Algorithm (WCA) for Ad hoc Networks. In *Proceedings of the IEEE GLOBECOM'00*, pp. 1697–1701, November 2000.
- M. Chatterjee, S.K. Das, and D. Turgut. A Weight-Based Distributed Clustering Algorithm for Mobile Ad hoc Networks. In *Proceedings of Seventh International Conference on High Performance Computing (HiPC)*, pp. 511–521, December 2000.
- D. Turgut, R. Elmasri, and N. Aydin. An Overview of Three Mobile Computing Systems. In *Proceedings of Fifth Symposium on Computer Networks (BAS)*, pp. 49–58, June 2000.

1998

- E. Summerlin, D. Turgut, and C. Gates. How a Computer-based Training Module for the Marine Medic was Developed. *Journal of BioCommunication (JBC)*, 25(4):6–9, 1998.

Advising

Ph.D. students

- **Mohammad Zubair Ahmad**
  Qualifier scheduled Fall 2006
- **Rawad Al-Haddad**
  Qualifier scheduled Spring 2007
- **Brent Horine**
  Candidacy scheduled Fall 2006
- **Shiyuan Jin**
  Candidacy scheduled Fall 2006
- **Guoqiang Wang** - Coadvised with Prof. Marinescu
  Candidacy scheduled Fall 2006

MS students

- **Nikolaos Peppas**
  Thesis defense scheduled Spring 2007
- **Brian K. Neiman**
  Thesis defense scheduled Summer 2007

Alumni

- **Hong Nguyen**, MS in Spring 2006
- **Qing Chen**, MS in Summer 2006
- **Chun Sum Yeung**, MS in Summer 2006

Curriculum Vitae

Joohan Lee, Ph.D.

Assistant Professor

School of Electrical Engineering and Computer Science

University of Central Florida

Research Interest

- Fault Tolerant Distributed System
- High Performance Parallel Distributed Computing : Cluster Computing
- Computer/Network Security : Intrusion Detection, Malicious Code Detection
- Parallel and Distributed Data Mining

Past Research Projects

- Computational Resiliency (Sponsor: Air Force Rome Laboratory, Information Warfare Group, IFGB)
- Distributed Sonar/Radar Processing (Sponsor: DARPA, ITO)
- Distributed Real-Time Sensors (Sponsor: DARPA, ITO)
- SCP (Scalable Concurrent Programming) Library (Sponsor: Defense Advanced Research Projects Agency (DARPA)

Refereed Papers

"A Java-based Portable Virtual Cluster Computing Library", Joohan Lee, Hua Zhang, Ratan Guha, submitted to the Journal of Software Practice and Experience, 2006

"Detecting Computer Viruses Mining Instruction Sequences", Jianyong Dai, Joohan Lee, Muazzam Siddiqui, Morgan C. Wang, submitted to the IEEE International Conference on Data Mining, 2006

"Extensions to Session-Based Modeling for Intrusion Detection Systems", Bruce D. Caulkins, Joohan Lee, Morgan C. Wang, International Journal of Modeling and Simulation, 2006. (Under revision)

"Resilient Image Fusion", Tiranee Achalakul and Joohan Lee, International Journal of Information, Vol.9, No.3, 2006.

"Active Event Correlation in Bro IDS to Detect Multi-stage Attacks", Bing Chen, Joohan Lee, Annie Wu, The 4th IEEE/ACM International Information Assurance Workshop, April 13 - 14, 2006, Royal Holloway, UK

"Bootstrapping Methodology for the Session-Based Anomaly Notification Detector (SAND)", Bruce D. Caulkins, Joohan Lee, Morgan Wang, ACM SE Conference, Melbourne, FL, March 2006.

"A Rule Based System to Detect Malicious Programs", Muazzan Siddiqui, Joohan Lee, Morgan C. Wang, UCF CS Technical Report CS-TR-05-06, 2005

"An IV Collision Avoidance Algorithm - Strengthening The Wired Equivalent Privacy (WEP)", Darshan Purandare, Ratan Guha, Joohan Lee, The International Conference on Wireless Networks (ICWN), 2005

"Efficient Parallel Data Mining for Massive Datasets: Parallel Random Forests", Jianyong Dai, Joohan Lee, Morgan C. Wang, The International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA), June 2005

"Analytical Modeling of Data Mining Process Based on Distributed Tuple Space", Jianyong Dai, Joohan Lee, Morgan C. Wang, The International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA), June 2005

"Portable and Scalable Parallel Applications with VCluster", Joohan Lee, Hua Zhang, Ratan Guha, 19th European Simulation Multiconference, High Performance Computing & Simulation (HPC&S) Conference, Riga, Latvia, 2005

"Evaluating Performance of Distributed Computing Technologies: HLA and TSpaces", Ratan Guha, Joohan Lee, and Oleg Kachirask, 19th European Simulation Multiconference, Performance Computing & Simulation (HPC&S) Conference, Riga, Latvia, 2005

"Virtual Cluster Computing Architecture", Joohan Lee, Hua Zhang, Ratan Guha, The International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA), Las Vegas 2005

"Distributed Tuple Space Approach for Parallel and Distributed Knowledge Discovery in Databases (KDD) and Data Mining", Jianyong Dai, Joohan Lee,

Hua Zhang, the 13th High Performance Computing Symposium, San Diego, April 2005

"Packet- Vs. Session-Based Modeling for Intrusion Detection Systems", Bruce D. Caulkins, Joohan Lee, Morgan Wang, IEEE International Conference on Information Technology, Las Vegas, April 2005

"A Dynamic Data Mining Technique for Intrusion Detection Systems", Bruce D. Caulkins, Joohan Lee, Morgan Wang, ACM SouthEast Conference, 2005

"VCluster: Virtual Cluster Computing Library", Joohan Lee, UCF CS Technical Report CS-TR-04-10, 2004

"Experience with MPI/RT and Its Application to Distributed Real-time Application", Joohan Lee, UCF CS Technical Report, CS-TR-04-09, 2004

(Invited Paper) "Overview on High Performance Data Mining", Joohan Lee, Jianyong Dai, Business Intelligence Symposium, Orlando, November 2004

"High Performance Data Mining for Network Intrusion Detection Using Cluster Computing", Joohan Lee, Muazzam Siddiqui, International Conference on Parallel and Distributed Computing and Systems (PDCS 2004), MIT Cambridge, November 2004

"Programming Environment for High Performance Data Mining on the Heterogeneous Parallel Computing Platforms", Joohan Lee, 7th SIAM International Workshop on High Performance and Distributed Mining, Orlando, April 2004

"Intrusion Detection using Multivariate Profiling", Brian Young, Joohan Lee, UCF CS Technical Report, CS-TR-04-02, 2004

"Assuring Consistency and Increasing Reliability in Group Communication Mechanisms in Computational Resiliency" , N. Lucena, Joohan Lee, S. Chapin, IEEE Information Assurance Workshop, West Point, NY, May 2003

"Reliable Heterogeneous Applications", Joohan Lee, S. J. Chapin, S. Taylor, IEEE Transactions on Reliability, Vol 52, No 3, pp. 330-339, 2003

"Computational Resiliency", Joohan Lee, S. J. Chapin, S. Taylor, Journal of Quality and reliability Engineering International, Vol 18, No 3, pp185-199, 2002

"Agreement Protocol and Computational Resiliency", Joohan Lee, N. Lucena, S. Chapin, Critical Infrastructure & Information Assurance Symposium, Syracuse, NY, 2002.

"Advances in Computational Resiliency", Joohan Lee, S. Taylor, IEEE Aerospace Conference, March, 2001

"Resilient Image Fusion", T. Achalakul, Joohan Lee, S. Taylor, IEEE ICPP Workshop on High Performance Scientific and Engineering Computing with Applications (HPSECA), August, 2000

"Resilient Remote Sensing: Fusing Remote Sensing with Information Resiliency", S. Taylor, T. Achalakul, Joohan Lee, K. Lhee, S. Robila, National Symposium on Sensor and Data Fusion, June, 2000

"Performance Evaluation of ATM and Gigabit Networks", S. Park, Joohan Lee, S. Hariri, IEEE Information Technology Workshop, August, 1998

"A Multithreaded Message-Passing System for High Performance Distributed Computing Applications", S. Park, Joohan Lee, S. Hariri, IEEE 18th International Conference on Distributed Computing Systems(ICDCS),1998

"An Efficient Group Communication Architecture over ATM Networks", S. Park, Joohan Lee, S. Hariri, IEEE IPPS/SPDP 7th Heterogeneous Computing Workshop, 1998

"Motion Analysis Using Competitive Learning Neural Network and Fuzzy Reasoning", Joohan Lee, K. Oh, Journal of Fuzzy Logic and Intelligent Systems, vol.5, No.3, pp117-127, Sept. 1995

Magazines and Misc.

Joohan Lee, Improving Information Security Curriculum, UCF Faculty Focus, 2005.

Thesis

"Computational Resiliency", Joohan Lee, Syracuse University, Ph.D. Thesis, 2001 (Awarded All-University Doctoral Prize)

"Motion Analysis Using Competetive Neural Network and Fuzzy Reasoning", Joohan Lee, Sogang University, Master's Thesis, 1995

Technical Report

"A Search Query Categorization Model for KDD Cup 2005", Jianyong Dai, Joohan Lee, Morgan C. Wang, UCF CS Technical Report, 2005

"A Rule Based System to Detect Malicious Programs", Muazzan Siddiqui, Joohan Lee, Morgan C. Wang, UCF CS Technical Report CS-TR-05-06, 2005

"VCluster: Virtual Cluster Computing Library", Joohan Lee, UCF CS Technical Report CS-TR-04-10, 2004

"Experience with MPI/RT and its application to distributed real-time application", UCF CS Technical Report, CS-TR-04-09, 2004

"Intrusion Detection using Multivariate Profiling", Brian Young, Joohan Lee, UCF CS Technical Report, CS-TR-04-02, 2004

"Fuzzy Expert System for Autonomous Vehicle", Technical Report, KOSEF, Sogang University, 1994

Thesis Advised

"SARP NET: A Secure, Anonymous, Reputation-Based, Peer-To-Peer Network", Sean Mondesire, School of Computer Science, UCF, Summer 2006

"High Performance Data Mining for Intrusion Detection", Muazzam Siddiqui, School of Computer Science, UCF, Spring 2004

F. **Sample email inquiries about the MSDF program:**

Tue, 24 Jul 2007 08:47:43 -0400

Good morning. Just wanted to touch base w/ you regarding my recent application for the Certificate Program. I received an e-mail yesterday from the Graduate Studies office stating that my application has been processed and will be forwarded to the Department for which I applied. I'm assuming that they will now notify you of my application (my transcripts from my BS at FSU are still en route)??

I'm not sure what information you need from me to determine my eligibility into the program. I've been through IACIS in 2003, and have been working computer forensic cases since then. I've also been through the EnCase Intermediate course and am currently working on the practical portion of the EnCE certification (already took the written test portion). I am one of the two active computer forensic examiners here at Orlando PD (along with Charlie Troell), hoping to become a full-time examiner if a full-time position is ever approved by the Department.

I've worked on dozens of cases in the last four years, conducting search warrants on structures to seize the systems and media and later examining them in the lab.

I'm very much looking forward to entering the Certificate Program at UCF and would like to pursue a Master's Degree in the field once it's approved there (Charlie advised it's in the works???) Thanks for your time, and please let me know if there's anything else I should do in order to begin classes this upcoming semester. Thanks, and take care....William Long

William Long
Orlando Police Department

Tuesday - July 10, 2007 1:06 PM:
and I have been involved in the computer
> forensics field for about two years now, I originally graduated from
> college with a Bachelor's in Accounting. I have attended several
> courses put on by Guidance Software and received my EnCase Certified
> Examiner certification just last year. I was told by a current student
> of your computer forensics program that it is available for out of state
> students via online courses.
>
> He also told me that next year it will be converted into a full Master's
> program. Would you recommend I wait until next year to begin looking
> into the program? Is there some informational brochures you could send
> me possibly?

>
> I would love to hear more about the program and I look forward to
> hearing from you.
>

Friday - July 6, 2007 10:55 PM:
I'm emailing in regards to your Masters in Digital Forensics. I have been in communications (emailing) with Dr. Philip Craiger, and he provided my with your name and email address. I graduated from Sam Houston State University with my BS in Criminal Justice. I also have a AS in Information Technology from ITT Tech. I was interested in if you offered online courses, and who may I speak to in regards to the process/requirements of your graduate program, because I'm very interested in getting my masters degree in digital forensics. I would like to start the process as soon as possible. Some questions I have are will the GRE be required for your program admission, Do you accept credits from ITT Tech if need be, and how do I go about getting a graduate catalog from UCF. I was asked by some co-workers who I had told what I wanted my masters degree in "what is the job market like for this degree, what can you do with this degree" and I didn't really
have a good answer for the question but it can be used in the law enforcement field. I just know that I want to be involved with the CJ field and I enjoy forensics either digital or science. Could you elaborate on the use of a Digital Forensic masters degree.

Wednesday - June 13, 2007 3:43 PM:
> I am interested in working on the as-yet unannounced Masters Degree
> program in Digital Forensics. I know that there are no official answers,
> however, I noticed that CHS 5596 will be offered in Spring 2008, do you
> know if this will count towards the degree program? If so, please
> consider this my request for a permit to enter the class. As I am
> finished with the GCCF, I am currently not able to enroll in classes,
> please let me know if there is a further application process I must go
> through.

> United States Probation Office
> Middle District of Florida

Tuesday - June 5, 2007 8:42 PM:
> Hello. I am writing to ask you a few questions about Computer Forensics
> programs.
>
> I have a Bachelor of Science in Business Administration from the University
> of Florida (2004), but I am now interested in the Criminology field,
> specifically Computer Forensics.
>
> Do you have a Masters program available in this field? Do you have any
> online programs available? Would I need to have more of a background in
> criminology or computers to enter any program that you offer? Do I need to have

work
> experience?

Tuesday - June 5, 2007 8:24 PM:
and I am currently a Senior here at Washington
> State University. I will hopefully receive my B.A. in Digital Technology
> and Culture with minors in Management Information Systems and Technical
> and Professional Writing. About a year ago I started looking at what my
> options and enjoyments would be for graduate programs. My parents
> attended a seminar here at Washington State University on the growing
> market for qualified professionals. It immediately spark my interest (a
> huge CSI fan). I am also the type of person that doesn't like to do the
> same thing day in and day out, hence the reason why I love golf (no two
> rounds are ever the same even though I might shoot the same score). I
> then started to Google the topic and found three universities that
> offered some sort of program at the graduate level - University of North
> Texas, University of Rhode Island, and University of Central Florida. I
> looked deep into all three possibilities and when I was finished I would
> be convinced that it was the right choice for me. Central Florida would
> offer me an experience that none of the others could, the opportunity to
> work or do research in the National Forensics Lab. But today I saw that
> the program offers a Graduate Certificate. Is this all your department
> offers, or could I actually get my masters and doctorate in Computer
> Forensics from your institution? If not, where would you recommend me
> going for schooling?

Monday - May 7, 2007 3:37 PM:
Hello,
> I read the documents posted online regarding the proposal by the University
> of Central Florida to create a Masters in Digital Forensics. I currently
> work in computer forensics as a Detective for the Milwaukee Police
> Department in Wisconsin. I have a Bachelor of Science from the University of
> Wisconsin, Oshkosh, in Criminal Justice.
> I am extremely interested in pursuing the certificate offered by your
> College, but only if the end result will be the a Master's Degree. I read
> that the goal was to offer the Master's Degree online, which would be
> perfect for me. Have you succeeded in creating a full Master's program in
> Digital Forensics, and if so, will it be offered online, and will it be an
> accredited Degree?
> Thank you for your time.

Wednesday - April 11, 2007 1:53 PM:
Just following up on our conversation yesterday. Can you add me to your list of folks for the mailing list should the new master's program be approved. Is there a proposal out in the public space that details the possible classes toward the degree, or a set of guidelines as to what kinds of classes might be included?

Monday - April 9, 2007 8:58 PM:
> I am interested in the graduate certificate in computer forensics. My
> questions: Is the MS program on go status? If so, when will it come online
> and will the graduate certificate work be applied for credit to the MS
> program?

> North Carolina Department of the Secretary of State

Thursday - March 8, 2007 12:12 PM:
> It's great to hear that their will be a science/computing track for the
> MSDF program, this is exactly what I'm looking for as a developer. I'll
> attempt to stop by your office after spring break. I serve in the
> reserves as a communications officer and have to leave this afternoon
> for this weekends drill, due to an extended communications exercise.

> > I received a BS in CS from UCF in 2004. As an undergrad I studied
> > Computer Forensics I and had a related independent study with Dr.
> > Leeson. As a software engineer, I'm currently working in the field of
> > handset (cell phone / PDA) and SIM forensics; which has re-vitalized
> my
> > interest in the Computer Forensics program at UCF. I'm currently
> > contemplating the direction I would like to go in with respect to
> > graduate studies? I came across a proposal for a Masters in Digital
> > Forensics at UCF:
> >
> http://csdl2.computer.org/comp/proceedings/hicss/2007/2755/00/27550264b.
> > pdf Would it be possible to sit down and talk to you about the
> Masters
> > program? What are your current office hours?

Wednesday - March 7, 2007 10:54 AM:
You were helpful with information about the Computer Forensics program
> at
> > > UCF when we spoke December, '06.
> > > I and a few colleagues are still very interested in the program. Since
> > our
> > > location is Broward County we would have to take the classes online.
> > > I would like to start the fall session so I can began the program with
> the
> > > classes offered in the order as perceived by UCF as a succession of
> > classes
> > > to build upon.
> > > I currently have a Masters in Information and Network Security, so my
> > > interest right now would be to pursue the graduate certificate program
> but
> > > if I should change my mind, can I get the Masters? In doing so, would

> > there
> > > need to be an application filed and what are the fees to follow, if any?
> > > Outside of the classes that are offered in the Computer Forensic
> program,
> > > what classes would I need to take to earn the Masters degree?

> > > Broward Sheriff Office

Friday - March 2, 2007 11:27 AM:
I recently read an article online regarding a masters degree program for digital forensics from the University of Central Florida. The article mentioned the timing of the program was tentatively scheduled to start in the fall of 2007. I have been searching for a program that accomplishes the goals described by your article for a long time. There are programs sprouting up across the United States regarding digital forensics. However, with my career, I need a flexible program that does not require me to relocate in order to attend classes. I am pleased to see your attempt to creating an online program.

Recently, I became involved with the Minnesota Financial Crimes Task Force. During my first tour of the facility, I was led into a room where nearly 10 computers were stored. I inquired about the computers, and the commander of the task force stated that they ware awaiting examination for various computer based offenses. There are only two non federal examiners in the Twin Cities area. They are in desperate need of additional examiners like so many area across the nation. I am a civilian, but work with law enforcement everyday. I believe that I can be a great asset for law enforcement in the area. I am writing because I have several questions about the upcoming program.

1.) Is it likely that the program will began in the fall?
2.) What will be the cap for the amount of students attending the first year?
3.) Will the program be accredited? By Whom?
4.) What will the application process look like?
4.) When can I start?

Minnesota*Wisconsin*North Dakota*South Dakota
Macy's North

Monday - January 29, 2007 8:46 PM:
and I am interested in becoming a graduate
> student in MS in Digital/Computer Forensics program but there are still a few
> questions I have about this program.
>
> I was instructed to send you an email to find out about the different
> options or choices I have to register and become part of this exciting
> graduate program.

>
> I am a Certified Ethical Hacker (CEH) and Certified Hacking Forensic
> Investigator (CHFI) with a vast experience in Forensic Computing. I
> have been teaching several Computing Forensic courses for institutions
> such as Chubbs and Devry. I have attended several boot camps and
> training seminars dictated by Ec-Council and (ISC)2 as I am planning
> to become a Certified Information System Security Professional (CISSP)
> in the months to come. I also hold the CCNP certification.

---

from "Kevin.Stenger@ocfl.net" <Kevin.Stenger@ocfl.net>
date Jul 13, 2007 7:31 AM
subject RE: Master's Degree
mailed-by ocfl.net

My application is filled out and standing by one click from being submitted and has been for some time. If you tell me that the MS will start taking apps at 0300 on such and such date my application will be in at 0301.

Thanks for the link. The proposal looks great. The only thing that worries me is the news lately. I keep hearing about freezes and cuts and the universities and I am hoping the MS does not get caught up in that.

Kevin
Sgt. Kevin Stenger
Orange County Sheriffs Office
Computer Crimes Squad
kevin.stenger@ocfl.net

-----Original Message-----
From: admin@craiger.net [mailto:admin@craiger.net] On Behalf Of Philip Craiger
Sent: Thursday, July 12, 2007 7:52 PM
Purcell, Dan" <DPurcell@seminolesheriff.org>
to philip@craiger.net
date Jul 14, 2007 1:29 PM
subject RE: Master's Degree
mailed-by seminolesheriff.org

Thanks, Dr. Craiger… Yes, I am very interested in the MSDF. I have been for quite some time. Do you think this will get off the ground in the Spring of 2008 (January, right)? I have 6 credit hours remaining for the GCCF program, and I plan to finish up in the fall semester. Therefore, I should be done by December of 2007 with the GCCF.

The proposal is great, and I think this will be a very fun and interesting program. Dr. Lang asked me to be a part of the advisory board for the MSDF, and gladly, I accepted. Obviously, I will be taking the Professional track as outlined in the proposal.

How will the intern hours work for someone like me in the field already? I see that I can take up to 6 hours, which would work out great for me! Is that doable? Could I have my supervisor oversee my intern hours here in the office? Just curious as it looks like a good option for me based on how busy I am with work, teaching, and family…

Thanks for the document! I will not release it to anyone!

Dan

Dan Purcell, Sergeant, CFCE/EnCE
IACIS CFCE Chairman
Seminole County Sheriff's Office
Economic & Computer Crimes Unit/Computer Forensics
100 Bush Blvd.
Sanford, FL 32773
(407) 665-6948
dpurcell@seminolesheriff.org
cfce.se@gmail.com (IACIS CFCE Email)

On 11/29/06, Reese, Richard Stephen < rsreese@ufl.edu> wrote:

Dr. Craiger,

Ok sorry to bug you with this again but here's where I'm at.

I need to take a class in the Spring at UCF and since I would like to do the Digital Forensics degree I might as well take one of the classes for it. Please look at the attached email from Dr. Lang. I don't understand why I can't be in a class that's solely for the graduate certificate guys but listed as a requirement for the MSDF (I understand I'm not technically a graduate student). Has the layout for the http://www.ncfs.org/MSdigital_evd.html changed greatly as Dr. Lang has mentioned, is there an official degree description?

Thanks.

Carlos Marchante <cmarchante@gmail.com> 12:56 pm (13 minutes ago)
to Philip Craiger <philip.craiger@gmail.com>
date Sep 5, 2007 12:56 PM

subject Master's of Science in Digital Forensics
mailed-by gmail.com
I am very interested in Master's of Science degree in Digital Forensics. If you could let me know where and when I can apply to the program I would appreciate it. I look forward to this program's existence.

Thanks,

Carlos Marchante

From: Jim Schoenherr < jim.schoenherr@gmail.com>
Date: Sep 10, 2007 10:10 AM
Subject: Masters in Digital Forensics
To: Philip Craiger <philip@craiger.net >

Dr. Craiger,

I am interested in the UCF Masters in Digital Forensics. I was wondering if there was any progress with this degree as I am soon to complete the Certificate in Computer Forensics.

Any information is appreciated.

Thanks,
Jim Schoenherr

---------- Forwarded message ----------
From: **Jonathan Medefind** <jmedefind@gmail.com>
Date: Sep 10, 2007 12:21 PM
Subject: Computer Forensic Masters Program
To: philip.craiger@gmail.com

Dr. Craiger,

I was wondering if there were any updates on UCF's Computer Forensic Masters program.

I am currently researching available programs and would prefer to attend at UCF.

Thanks,
Jonathan Medefind

G. Support Letters for the MSDF Degree

An email dated August 24, 2007, for possible internship at Microsoft:

From: Mike Duffield <Mike.Duffield@microsoft.com>
To: "gccf@cs.ucf.edu" <gccf@cs.ucf.edu>
Date: Fri, 24 Aug 2007 11:12:16 -0700
Subject: Inquiry

Hi-

My name is Mike Duffield, I am the Director of Forensic Investigations at Microsoft. My team handles internal forensic investigations for the company worldwide. In April, I was through your facility as part of the ITSG tour that you provided. At the time, I spoke briefly with someone from the faculty but that name escapes me and I'm having trouble locating that business card.

At any rate, I'd love to talk to someone about a the possibility of coordinating an internship within my team here at Microsoft headquarters in Redmond, Washington.

If someone could put me in touch with the right person there to discuss this, I'd appreciate it. Email is probably the best way to get me as I'll be out of town most of next week but will get back with you at my first opportunity.

Thanks,
Mike

Mike Duffield
Director, Forensic Investigations
Trustworthy Computing Network Security
Microsoft Corporation
(425) 703-7021
mike.duffield@microsoft.com<mailto:mike.duffield@microsoft.com>

University of Central Florida

Department of Criminal Justice & Legal Studies

From: Dr. Robert Langworthy, Chair, Department of Criminal Justice and Legal Studies
Subject: Memorandum of Understanding on proposed Master of Science in Digital Forensics (MSDF) degree
Date: August 30, 2007

To Whom It May Concern:

The Department of Criminal Justice and Legal Studies will play active roles in contributing to the Master of Science in Digital Forensics (MSDF) degree, an interdisciplinary program proposed by the School of Electrical Engineering and Computer Science, and the Department of Engineering Technology. Specifically, the curriculum of the proposed degree calls for using existing courses of the CJ/LS Department as electives; these courses and their offerings are described below:

- CCJ 6074, Investigative and Intelligence Analysis, Theory and Methods, is offered once annually;
- CCJ 6706, Quantitative Methods and Computer Utilization in Criminal Justice, is offered once every semester;
- CJE 5688, Cybercrime and Criminal Justice, is offered once every year; and,
- PLA 5587, Current Issues in Cyberlaw, is offered every other year.

Therefore, there are an adequate number of classes to accommodate students of the proposed MSDF degree using the Criminal Justice and Legal Studies courses as electives. Further, the Department of Criminal Justice and Legal Studies welcomes the opportunities to collaborate with other units on campus for research work in digital forensics once the proposed Master's degree is in place.

College of Health and Public Affairs
P.O. Box 161600 • Orlando, FL 32816-1600 • Phone: 407-823-2603 • Fax: 407-823-5360

FTI Consulting
1201 Fye Street, N.W
Suite 400
Washington, DC 20005
202.312.9100 telephone
202 312 9101 facsimile
www.fticonsulting.com

September 24, 2007

John C. Hitt, President
University of Central Florida
P.O. Box 160000
Orlando, FL 32816

Re: Proposed Masters in Digital Forensics Program at UCF

Dear Mr. Hitt:

FTI Consulting is one of leading consulting firms in the world and we work on many of the high-profile situations, litigations, investigations, and matters published on the front page of the world's business newspapers.

FTI's technology segment is the fastest growing area within FTI, and includes consulting services for electronic evidence, digital forensics, data analytics, and litigation technology consulting. This segment is responsible for almost $300M in annual revenue, nearly a third of FTI's nearly $1B of annual sales. We have hiring plans to increase the headcount in our technology segment by several hundred over the next two to three years as the industry is expected to continue explosive growth in the coming years.

Our workforce is our greatest asset, as we generate the bulk of our fees from hourly consulting assignments from our consulting professionals, who are specialists in data analytics, litigation consulting, and forensic examinations. Our consultants require a high degree of training, education, certification, and experience to qualify as testifying experts in open court.

Until recently, most college programs included computer and digital forensics in a larger information security context, mostly to satisfy national security requirements and defense against hacking and cyber terrorism. Computer and digital forensics, though, is a specialty by itself, and is a skill set in high demand by the public and private sector, law enforcement, and the criminal and civil justice system.

My role at FTI includes identifying and recruiting candidates who have a desire to enter the field of computer and digital forensics consulting as their lifelong career. As such, having an

undergraduate and a graduate program focusing on this area is of great interest to me as a future employer of these graduates.

I am a strong supporter of your initiative to create a Master's program in Digital Forensics and look forward to helping in any way I can to make it a reality at UCF.

Sincerely,

Joe Bartling
Director, Electronic Evidence/Technology
FTI Consulting

F T I

Sheriff Donald F. Eslinger
Member, Florida Sheriffs Association
Member, National Sheriffs' Association

An Internationally Accredited Agency

Seminole County

February 7, 2007

To whom it may concern:

I have been informed that the University of Central Florida is establishing a Masters of Science in Digital Forensics program. Digital forensics is an essential service required of law enforcement agencies in the 21st Century. The Seminole County Sheriff's Office is committed to supporting and enhancing this discipline to remain on the cutting edge of technology.

The evolution of digital technology in our society, coupled with new generations of criminals, demands our collective attention in addressing the needs of criminal justice organizations and private enterprise. Seven years ago, our organization began to develop and implement this critical component of law enforcement services. Today, our organization is a strong leader in the field of digital forensics throughout the nation.

The Seminole County Sheriff's Office has a well-established partnership with the University of Central Florida in several academic areas. We are committed to furthering this relationship in an effort to improve education in this emerging discipline by providing opportunities for practical application. This program will benefit law enforcement organizations and security professionals throughout the world, and I applaud the University's commitment to this discipline and growing field.

Sincerely,

DONALD F. ESLINGER

Sheriff

100 Bush Blvd., Sanford, Florida 32773 **http://www.seminolesheriff.org**
Office: (407) 665-6600 / Corrections: (407) 323-6512 / Orlando Exchange: (407) 830-8111

Sheriff Kevin Beary

ORANGE COUNTY SHERIFF'S OFFICE

1/26/2007

To Whom It May Concern:

I would like to express my support for the collaborative effort between the University of Central Florida and Florida A & M University on the creation of an undergraduate program in computer forensics. I believe that this project can only help to strengthen the efforts Florida's Universities have demonstrated toward making Florida a world leader in computer forensics. The undergraduate program at Florida A & M University will help create a pool of qualified candidates for the Masters degree program in Computer Forensics under development at the University of Central Florida.

I will be happy to provide assistance to this effort via correspondence and the attendance at a workshop to develop the program.

Thank you for allowing me to assist in the development of this worthwhile project.

Sincerely,

KEVIN BEARY
Sheriff of Orange County

Sergeant Kevin Stenger DPC, CFCE, EnCE
Computer Crimes Squad
(407) 254-7229

Post Office Box 1440 • Orlando, Florida 32802-1440
Telephone (407) 836-3700

Walt Disney Parks and Resorts

January 25, 2007

To Whom It May Concern:

I would like to express my support and commitment to the collaborative project for enhancing Digital Forensics in North and Central Florida currently being proposed by the University of Central Florida and Florida A&M University.

The field of information technology continues to grow and emerge at an astounding rate. New technologies are extending the reach of computers into every aspect of our lives. From personal computers to cell phones and wireless networks, these new technologies present increasing challenges to the field of digital forensics.

Digital evidence has become commonplace in our courtrooms and boardrooms. The proposed enhancement and expansion of the existing digital forensics program at UCF builds on the solid foundation already established at UCF through its partnership with the National Center for Forensic Sciences.

This expansion will be tremendously beneficial to law enforcement, government agencies and commercial sector entities engaged in digital forensics and information protection activities. Having a strong center of academic excellence in our community will encourage continued collaboration between government, industry, and academia in identifying and solving common digital forensics problems and issues related to the preservation, handling, and examination of digital evidence. At the same time, this program will attract eager, technology-savvy students into a growing field of practitioners who are constantly fighting to stay ahead of the latest criminal enterprises.

The coupling of leading edge academic research in the areas of information systems, forensic sciences, and legal studies with the practical experiences shared by practitioners in the field will result in a better understanding of the impact of technology emergence on future digital forensics challenges. It will also enable the development of academic curricula that will have immediate impact in the real world for graduates and practitioners alike.

I strongly support this effort and I look forward to contributing to its success.

Sincerely,

Tim Gruber, CPP, CFE, CHPA, CISSP, EnCE, GCCF
Walt Disney World
Information Technology Security