Graduate Council Curriculum Committee
July 12, 2012
10:00 a.m., TA 420B

Agenda

1. Welcome and call to order
2. Addition of a graduate certificate in Modeling & Simulation of Technical Systems, CGS
3. Articulation agreement with Beijing University – transfer of credits, CECS
4. Revisions to the Biotechnology MS program & PSM track, COM
5. Adjournment

Members of the Graduate Council Curriculum Committee:

Tosha Dupras, COS
Cristina Fernandez-Valle, COM
Charles Kelliher, CBA
Kerry Purmensky, CAH
Art Weeks, CECS
Deborah Breiter, RCHM
Naim Kapucu, COHPA
Joyce Nutta, CED
Terrie Sypolt, LIB
Julee Waldrop, CON
Boris Zeldovich, COP
Jay Jay Stroup, GSA
Ross Hinkle, EX Officio
Max Poole, CGS Liaison

UNIVERSITY OF CENTRAL FLORIDA
COLLEGE OF GRADUATE STUDIES

Program Recommendation Form

This form is to be used to revise, add, suspend, or delete degree programs, tracks, or certificate programs. If there are changes to a program and the changes will affect the program tracks also, one form may be used for this type of change.

PLEASE NOTE: The deadline for new tracks or certificates is **February 1 of each year**. Any proposal for new tracks or certificates received after this date will not be included in the next year's catalog. Revisions to existing programs, tracks, or certificates are **due by March 15**. Any proposals for revisions received after that date will not be included in the next year's catalog. Please include catalog copy (description, curriculum, contact information, application requirements, and application deadlines). For revisions – attach the catalog copy **showing changes (use Track Changes in Word)**.

College/Unit(s) Submitting Proposal: College of Graduate Studies

Proposed Effective Term/Year: Fall 2012

Unit(s) Housing Program: Modeling & Simulation Graduate Program

Name of program, track and/or certificate: Graduate Certificate in Modeling & Simulation of Technical Systems

Brief description of program (this description will show up in the graduate catalog copy)**:** *Do not add complete catalog copy here.*

The Graduate Certificate in Modeling & Simulation of Technical Systems provides students with the necessary knowledge in modeling and simulation fundamentals, including modeling techniques and applications, with emphasis in test and evaluation.

DELIVERY - Will program be delivered: ☐ **Face to face** ■ **Completely online** ☐ **Mixed delivery**

Admissions deadlines: (Please specify if you have a different deadline for the track than for the program?)

Fall: July 15

Application requirements: (Please specify if you have different application requirements for the track than for the program? Will you admit directly to the track?)

General UCF graduate certificate requirements, i.e., academic transcripts and an earned Bachelor's degree

Program Director(s) and contact information: (name, email, phone, campus address, program website address)

Christopher D. Geiger, Ph.D., Associate Professor

J. Peter Kincaid, Ph.D., Graduate Research Professor

modsim@ucf.edu; 407-882-1407; Partnership II Building, Suite 131

Please check one: this action affects a: ☐ Program ☐ Track ■ Certificate

Please check one: this action is a(n):

■ Addition. Please proceed to Part A.

☐ Revision. If a revision applies to multiple tracks, please list them here and then proceed to Part A:

☐ Inactivation

☐ Temporary Suspension of Admissions. Give Length of Suspension:

Temporary suspension of admissions: The program will be removed from the online application. A notation will be entered in the graduate catalog indicating the length of the suspension of admissions. Currently enrolled students will not experience any issues with continued enrollment.

Inactivation: Admissions will be suspended for new students and the program will be removed from the online application. Students active in the program are eligible to complete the program under the appropriate criteria and an appropriate teach-out plan is required. The program will be removed from the catalog as of the approved term.

If you checked inactivation or you are temporarily suspending admissions, please go to Part B and complete it.

Signature Page

RECOMMENDATIONS

■ Yes	☐ No	**Department Chair:**		**Date:**	6/29/2012
☐ Yes	☐ No	**College Curriculum Committee Chair:**		**Date:**	
☐ Yes	☐ No	**College Dean:**		**Date:**	
☐ Yes	☐ No	**Chair or GSC:**		**Date:**	
☐ Yes	☐ No	**Dean, College of Graduate Studies:**		**Date:**	

APPROVAL

Provost and Vice President for Academic Affairs: _____ **Date:** _____

Distribution: After approval is received from the Provost, distribution will be to:

Department(s); College; Registrar; Associate Registrar; Institutional Research; Academic Services; Faculty Senate; University Analysis and Planning Support; College of Graduate Studies

Part A – For additions or revisions of programs, tracks or certificates

Brief statement of rationale: (Please indicate the rationale, how it affects the unit and faculty teaching in and students enrolled in the program, track or certificate.)

There is an urgent need in the M&S community of practice, particularly in the various government and Department of Defense agencies, to create a sequence of graduate-level courses to benefit working M&S professionals, where these courses emphasize modeling and simulation for test and evaluation, especially for scenarios that are either unsafe or cost-prohibitive to test empirically. Conversations with Navy representatives from the NSWC Port Hueneme Division confirm that the U.S. Navy spends a considerable amount of money on test and evaluation and modeling and simulation. According to the PEO IWS Project Manager, the Navy now desires to foster best practices of using M&S in T&E with its Naval personnel, in particular the U.S. Naval personnel involved with simulation. Furthermore, the Navy and many other organizations and agencies with interest in using M&S in T&E need only a certificate program, as opposed to a full graduate degree program. The proposed graduate certificate program seeks to address this need initially of the U.S. Navy and subsequently for other government, military agencies, defense contractors and private sector companies. (See the attached proposal for additional explanation of the rationale for the proposed certificate program.)

For Revisions:

Brief listing of Program Changes: (Please indicate the changes in bullet format. If there are changes to the credit hours of the program, required courses or other requirements, please state those changes. **Remember to attach the catalog copy showing changes, using Track Changes in Word.**)

Will students be moved from an existing program, track, or certificate into this new program, track, or certificate?

☐ **Yes** ■ **No**

If yes, state the name of the program or track where students are currently enrolled and provide a list of students if possible:

_____

Will students have the option to stay in their existing program, track, or certificate? ☐ **Yes** ☐ **No**

Name Change

Are you changing the name of an existing program, track, or certificate? ☐ **Yes** ☐ **No**

If yes, provide the new name of the program, track, or certificate:

Provide the name of the current program, track, or certificate:

When is the name change effective? Please note: A name change will apply to the record of all students who are currently enrolled, readmitted or newly admitted into this program as of the effective date of this change.

Will students have the option to stay in their existing program, track, or certificate? ☐ **Yes** ☐ **No**

If you are requesting a CIP Code change for an existing program, track, or certificate, please provide:

old CIP:

new CIP:

If a name change is your only revision, stop here. Otherwise, complete the rest of Part A.

Part A - Continued

Specify the faculty who will participate in the program, track or certificate and their credentials to do so: (List faculty and a brief paragraph of their credentials.)

Christopher D. Geiger, Ph.D.; Associate Professor, Industrial Engineering & Management Systems
J. Peter Kincaid, Ph.D.; Graduate Research Professor, Institute for Simulation & Training
Susan McGill, Ph.D.; Adjunct Professor, Institute for Simulation & Training

Impact of changes on students: Will current students be impacted by the addition or revision of a program, track or certificate? If so, how?

There will be no direct impact of the new certificate program on current UCF students. In fact, this will be another certificate option for those whose interests lie in the interdisciplinary field of modeling and simulation.

If applicable, provide a written agreement (email is fine) from all involved units that they are in support of, will provide courses to, or will participate in the program, track, or certificate. Please attach the correspondence and also list the units here.

The proposed certificate program does not compete or conflict with or duplicate other certificate or degree programs. Attached to this Program Recommendation form is e-mail correspondence from Dr. Ahmad Elshennawy, the Graduate Program Director of Industrial Engineering & Management Systems in the College of Engineering & Computer Science from where the two most closely-related existing graduate certificates, i.e., Systems Simulation for Engineers and Training Simulation, are offered. Also, attached is a Letter of Intent from the Naval Surface Warfare Center, Port Hueneme Division, which details their expressed need and intent to participate in the proposed certificate program.

If an addition, provide a statement of who is likely to enroll and why. Please state if there is licensure or certification that depends upon this education, etc. Also, complete the following table.

This certificate will likely attract individuals who already work full-time, and wish to enroll part-time. Specifically, we expect to attract individuals who have interest in or are involved with simulation and are government and DoD employees based on the rationale explained in Part A above. We also expect professionals from defense contractors and private sector companies to enroll in the proposed certificate program based on the same rationale.

Many of the certificate students will further develop their knowledge and professional skills to prepare them as future technical leaders for testing and evaluation and many other aspects of their work. Many working professionals would probably pursue this graduate certificate in order to become eligible for a promotion in the workplace. (See the attached proposal for additional explanation of the target audience for the proposed certificate program.)

	Year 1	Year 2	Year 3
Headcount	FA2012+SP2013+SU2013 = 36	FA2013+SP2014+SU2014 = 69	FA2014+SP2015+SU2015 = 90
SCHs	36 x 3 cr hrs x 3 courses = 324	69 x 3 cr hrs x 3 courses = 621	90 x 3 cr hrs x 3 courses = 810

If an addition, indicate likely career or student outcomes upon completion: (What will students do? What will their job titles be?)

This certificate will add to desired positional certification criteria with new knowledge and skill levels to be certified for M&S-related activities and more in-depth knowledge of testing and evaluation skillsets and practices. Those who complete the certificate program typically become Team Leaders (Leads) in the areas of testing and evaluation, modeling and simulation, and special project-funded teams. The completion of this certificate may result in a promotion for professionals who are pursuing it to further develop their careers.

Part A - Continued

If an addition or there are substantial REVISIONS to existing tracks or certificates, please complete the following table on financial support: (Specify all forms of support – assistantships, fellowships, and tuition remission.)

	No. assistantship students	Source of funds	No. fellowship students (specify fellowship)	No. tuition remissions	Source of funds
Year 1	N/A	N/A	N/A	N/A	N/A
Year 2	N/A	N/A	N/A	N/A	N/A
Year 3	N/A	N/A	N/A	N/A	N/A

Checklist of items to be provided:

☑ **Electronic graduate catalog copy for additions; track changes included if there are revisions. (required)**

☑ **Attach all appropriate course action requests that will be necessary to implement the changes. (required)**

☑ **Emails showing consultation with other units. (if applicable)**

☐ **If an addition, list of 1-3 students and 1-3 faculty for profiles in the graduate catalog (provide email address so Graduate Studies can contact them to write profiles and take photos). You may provide draft copy of profiles if you wish.**

☐ **If an addition, what disciplines does this program, track or certificate belong to? What other UCF graduate programs, tracks, or certificates are related to it? This information will be used to provide additional links for prospective students to search in the online graduate catalog.**

Part B – For inactivations or suspensions of programs, tracks, or certificates

Are students currently enrolled in the program? ☐ **Yes** ☑ **No**

If yes, number of current students:

Please specify the intended time period of inactivation or suspension:

If program, track, or certificate is being inactivated or suspended, then attach a "teach out" plan for all current students specifying how they can finish the program or where students will be placed if moving to another program. The "teach out" plan should specify when courses will be offered to enable students to finish. Specify whether students will remain in the existing program to finish, and if so, when the completion date will be, whether students will be moved to another program, etc. Please provide a list of students where applicable.

Sample teach out plan: Enter the terms and courses that will be taught for each term throughout the last semester. **Please delete course prefixes and numbers in this section if no teach out plan is required.**

Fall 2010	Spring 2011	Summer 2011	Fall 2011	Spring 2012

Checklist of items to be provided:

☐ **Attach all appropriate course action requests that will be necessary to implement the changes. (required)**

☐ **E-mails showing consultation with other units. (if applicable)**

Proposal for a Graduate Certificate in "Modeling & Simulation of Technical Systems" by the UCF Modeling & Simulation Graduate Program

July 2012

1. Purpose

The Modeling & Simulation Graduate Program at the University of Central Florida (UCF) is proposing a Graduate Certificate in Modeling & Simulation of Technical Systems. This certificate is proposed based on a specific need by the U.S. Navy in which there is a strong desire for the Navy to understand and foster best practices of using modeling and simulation (M&S) in test and evaluation (T&E). The certificate program focuses on modeling and simulation fundamentals, including modeling techniques and applications and will emphasize modeling and simulation in test and evaluation.

2. Need and Rationale

Many private industrial organizations and various government and Department of Defense agencies, particularly the military, are placing a greater emphasis on modeling and simulation. These organizations and agencies are developing personnel internally so that they have a more knowledgeable workforce to better perform research, development and engineering for both internally-conducted projects and externally-contracted projects. As systems and processes become more complex and cover larger mission areas, the utilization of modeling and simulation to support the test and evaluation in a continuum of live, virtual, and constructive operational environments becomes essential.

According to U.S. Department of Defense (DoD) Directive 5000.01 Section E1.1.11:

> "Test and evaluation shall be integrated throughout the defense acquisition process. Test and evaluation shall be structured to provide essential information to decision-makers, assess attainment of technical performance parameters, and determine whether systems are operationally effective, suitable, survivable, and safe for intended use. The conduct of test and evaluation, integrated with modeling and simulation, shall facilitate learning, assess technology maturity and interoperability, facilitate integration into fielded forces, and confirm performance against documented capability needs and adversary capabilities as described in the system threat assessment." (DoD, 2003)

The Department of the U.S. Navy, in particular, uses M&S because it is less expensive than testing in a real environment and reduces risk by allowing the introduction of various environments and conditions that cannot be experienced safely in live testing. The future of modeling and simulation in the test and evaluation of naval surface ship integrated warfare weapon systems was the subject of a national forum sponsored by the Program Executive Office for Integrated Warfare Systems (PEO IWS) at the Naval Surface Warfare Center (NSWC) Port Hueneme Division in January 2012 (see the attached article summarizing the technical forum). The general consensus from this national discussion is that there is a need to develop and use modeling and simulation capability to support T&E; however, the integration of complementary computer simulation models with test and evaluation is presented with major performance evaluation challenges. To effectively complement testing, it is necessary that the methodology for employing M&S with testing be clearly understood throughout the lifecycle of the weapon system. As such, there is an urgent need in the M&S community to create a sequence of graduate-level courses to benefit working M&S

professionals, where these courses emphasize modeling and simulation for test and evaluation, especially for scenarios that are either unsafe or cost-prohibitive to test empirically.

Conversations with Navy representatives from NSWC Port Hueneme confirm that the U.S. Navy spends a considerable amount of money on test and evaluation and modeling and simulation. According to the PEO IWS Project Manager, the Navy now desires to foster best practices of using M&S in T&E with its naval personnel, in particular the U.S. naval personnel involved with simulation. Furthermore, the Navy and many other organizations and agencies with interest in using M&S in T&E need only a certificate program, as opposed to a full graduate degree program. The proposed graduate certificate program seeks to address this need initially of the U.S. Navy and subsequently for other government, military agencies and defense contractors.

3. Target Audience

The target audience of this proposed certificate program is professionals who have earned a Bachelor's degree and wish to enhance their education and professional opportunities through advanced study in modeling and simulation with emphasis in test and evaluation.

The M&S Graduate Program at UCF envisions that the certificate program will appeal to those organizations and agencies that design, develop, engineer and manufacture systems that are simply too large, complex or costly to be field tested. Government, military agencies and defense contractors are the likely customers of this certificate program. In fact, the NSWC Port Hueneme Division has committed to enroll its personnel with a need to expand their knowledge of M&S in T&E starting Fall 2012 (see the attached Letter of Intent). Second, other customers of this program include acquisition managers, designers and engineers and end users at private sector organizations who have a need for M&S capability to support T&E.

4. Curriculum and Program Delivery Information

The Modeling & Simulation of Technical System's Graduate Certificate is a 15-credit-hour lockstep, cohort certificate program that will be offered electronically through distance education.

Upon review of the UCF M&S Graduate Program curricula and M&S-related course offerings, representatives from the NWSC Port Hueneme Division indicate that their personnel require a course plan that focuses on the competency areas of M&S fundamentals, modeling techniques and applications, and test and evaluation. The desired curriculum of the proposed certificate program consists of courses that are currently approved as part of the existing UCF M&S M.S. and Ph.D. degree programs. Table 1 summarizes the progression through the proposed certificate program. NWSC Port Hueneme confirms that the course topics and progression sufficiently addresses their strong and growing need. The IDS 6XXX Modeling and Simulation for Test and Evaluation course does not, yet, exist; however, a Course Action Request to establish this key course of the certificate program is included with this proposal.

Table 1. Course progression of the proposed graduate certificate curriculum.

Term	Course Number and Title (credit hours)	Instructional Mode
Fall	IDS 6147 Perspectives on Modeling and Simulation (3 credit hours)	Web Only
Spring	ESI 5531 Discrete Systems Simulation (3 credit hours)	Videostreaming
Summer	IDS 6146 Modeling and Simulation Systems (3 credit hours)	Web Only
Fall	IDS 6XXX Modeling and Simulation for Test and Evaluation (3 credit hours)	Web Only
Spring	IDS 6916 Simulation Research Methods and Practicum (3 credit hours)	Web Only

Students who complete the certificate program may apply their coursework toward an M.S. in Modeling & Simulation; however, successful completion of the Modeling & Simulation of Technical Systems Certificate does not guarantee admission to the UCF M&S M.S. and Ph.D. degree programs.

5. Program Administration

The proposed graduate certificate program will be administered by the Director of the UCF M&S Graduate Program. The Director and the M&S Graduate Program Office will have the responsibility of admitting and tracking the progress of students in the certificate program. The M&S Graduate Program Office includes the following individuals:

- Program Director: Christopher D. Geiger, Ph.D., Associate Professor, Industrial Engineering & Management Systems
- Associate Program Director: J. Peter Kincaid, Ph.D., Graduate Research Professor, Institute for Simulation & Training
- Program Coordinator: Sabrina Kalish, M.A.

5.1. Application and Admission Requirements

Applications for the certificate program will be accepted only for the Fall semester, and the M&S Program Director will admit program applicants according to the admission criteria. Each cohort will begin in the Fall term, with the initial cohort enrolling Fall 2012.

Admission is open to those with a Bachelor's degree from a regionally-accredited institution. An application to the graduate certificate program and official transcripts must be submitted. Applicants must apply online, and the application form is available at the Graduate Certificate Programs site (www.admissions.graduate.ucf.edu/nondegree_applicants/graduate_certificate_programs). All requested materials must be submitted by the established deadline, as shown in Table 2.

Table 2. Application deadline for the graduate certificate program.

Applicants	Fall Priority	Fall	Spring	Summer
Domestic	-	Jul 15		
International	-	-	-	-
International Transfer	-	-	-	-

All cohort members will be enrolled in a special section of each course and will take their courses at the same pace (one course per term as shown in Table 1) until completion.

5.2. Role of and Support from UCF Continuing Education

The special section of each course will be managed through the Corporate Education Division of the Continuing Education (CE) unit within the UCF Regional Campuses. The primary role of CE will be to provide full registration and general support to all admitted students throughout the program.

CE registration support includes accepting tuition and fee payments from students and assisting the students with registering for courses. CE will also build and populate the special section of each course each term. Finally, CE will serve as the fiscal agents for the certificate program, performing services such as transferring tuition and fee payments, purchasing instructional materials such as books and software licenses, etc. All services performed by Continuing Education are covered by a 15% Administrative Fee, which is included in the budget of the proposed program.

6. Budget

There are no certificate programs similar to that which is proposed herein in order to establish a market-based tuition rate. Therefore, the proposed certificate program will be offered through Continuing Education as a self-supporting, cost recovery program in order to recover the administrative and instructional costs associated with offering and managing the credit-earning program. The total cost per credit hour will be $800 per credit hour (i.e., $722.21 Program Fee per credit hour + $77.79 University Fees per credit hour). However, this cost per credit hour is subject to change.

The primary administrative and instructional costs include the purchase of books and specialized software licenses for the program students. In addition, a portion of the total expenses include salary and fringes of the faculty instructors and Program Coordinator for their additional efforts of enhanced instruction and support of the students enrolled in the special sections of the courses. Additionally, expenses are planned to support a focused print and electronic marketing campaign to promote the certificate program to the other nine NSWC sites as well as to other government and military agencies and private sector organizations. Using the UCF M&S Graduate Program website will provide no-cost option for informing potential students about the cohort certificate program. Any surplus revenue will be reinvested for the benefit of the certificate program.

7. Projected Program Headcount

Table 3 summarizes the anticipated headcount for the graduate certificate program over the next five years. The initial cohort is estimated to be 12 students, which is the minimum number of students that will ensure fiscal viability of the program assuming $800 cost per credit hour.

Table 3. 5-Year projected student enrollment and headcount.

Term	New Cohort	Program Headcount	Graduates
Fall 2012	12	12	
Spring 2013	-	12	
Summer 2013	-	12	
Fall 2013	15	27	
Spring 2014	-	27	12
Summer 2014	-	15	
Fall 2014	20	35	
Spring 2015	-	35	15
Summer 2015	-	20	
Fall 2015	20	40	
Spring 2016	-	40	20
Summer 2016	-	20	
Fall 2016	20	40	
Spring 2017	-	40	20
Summer 2017	-	20	
Fall 2017	20	40	
Spring 2018	-	40	20
Summer 2018	-	20	

8. Accountability

Success of the graduate certificate program will be measured using several performance metrics, including:

- number of students enrolled per cohort;
- student satisfaction with the program;
- employer satisfaction with the program; and
- number of certificates conferred.

9. Participating Faculty Members and Qualifications

UCF faculty who will teach in the Modeling and Simulation of Technical Systems Graduate Certificate Program include the following individuals. Full curricula vitae are available upon request.

- Dr. Christopher D. Geiger (Associate Professor of Industrial Engineering & Management Systems). Dr. Geiger's areas of expertise include discrete event simulation modeling and simulation multiobjective optimization. He will teach ESI 5531.
- Dr. J. Peter Kincaid (Graduate Research Professor in the Institute for Simulation & Training). Dr. Kincaid will teach IDS 6146 and IDS 6916. Dr. Kincaid will serve as the primary contact for the IDS 6XXX M&S for Test and Evaluation course, which will be taught by an M&S specialist with interest and experience using M&S for T&E.
- Dr. Susan McGill (Adjunct Professor for the Modeling & Simulation Graduate Program). Dr. McGill specializes in several modeling and simulation software tools and will teach IDS 6147.

Attachments Included with This Proposal

- Copy of the Naval Surface Warfare Center Port Hueneme Division NEWSWIRE article entitled "Modeling and simulation for Navy test and evaluation technical forum"
- Draft of the catalog description of the proposed graduate certificate program

2/9/2012 # NEWSWIRE: Modeling and simulation for Navy test and evaluation technical forum

from : NSWC Port Hueneme Command Communications

PORT HUENEME, Calif. - The future of modeling and simulation in test and evaluation of surface ship integrated warfare systems was the subject of a national technical forum sponsored by the Program Executive Office for Integrated Warfare Systems (PEO IWS) at Naval Surface Warfare Center (NSWC) Port Hueneme, Jan. 30 - Feb. 2.

"This event was an important collaboration across the Integrated Warfare Systems Test and Evaluation Enterprise," said Tim Troske, NSWC Port Hueneme technical director. "We had distinguished speakers who shared their perspectives on a common test and evaluation roadmap, leading to reduced risk, while leveraging assets, resources and data."

Modeling and simulation (M&S) is used throughout the warfare systems acquisition lifecycle as a tool for both developmental and operational testing phases. The Navy uses M&S because it is less expensive than testing in a real environment, it provides analytical system performance data, reduces risk, allows introduction of various environments and conditions (such as high sea states) that can't be executed safely in live testing. M&S also helps validate test scenarios; provides pre-test predictions; post-test analysis and is particularly effective at providing insight into system-of-systems end-to-end performance for scenarios that are either unsafe or cost prohibitive to test empirically.

The forum provided a venue for attendees to share ideas, challenges, and lessons learned; identify best practices; generate innovative concepts; and offer technical solutions with experts throughout the integrated warfare systems modeling and simulation and test and evaluation communities.

On the agenda were six influential keynote speakers, 22 technical presentations, and numerous workshops, panel discussions, and tutorials with perspectives on the theme provided by sponsors, users, and practitioners.

Most M&S presented at the technical forum for integrated testing were computer based. However, the important role of physical models and system surrogates, such as aerial targets, were also discussed. The broad spectrum of models discussed ranged from large integrated infrastructures encompassing many systems to individual models of warhead kinematics.

"The Navy spends a sizeable amount of money on test and evaluation and modeling and simulation," said Terry Johnson, PEO IWS project manager, "So, it's in our best interest to foster best practices with everyone throughout the enterprise."

The biggest lesson shared during the forum was that efficiencies in M&S, as well as test and evaluation, can be achieved through a shared knowledge of methodologies, assets, resources and data. These efficiencies can make systems cheaper to procure, reduce risks in development and execution, and speed capabilities to the warfighter.

NSWC Port Hueneme is a field activity of the Naval Sea Systems Command providing the Fleet with weapon system in-service engineering, logistics, and test and evaluation. PEO IWS is responsible for all Navy surface ship combat systems, surface to air missile systems, radars, launchers, electronic warfare systems, anti-submarine warfare systems, and gun systems. PEO IWS is also responsible for the integration of these combat systems and the warfare elements into the Fleet.

This is an official U.S. Navy Web site. Please read our Privacy Policy notice | U.S. Navy Recruiting | Freedom of Information Act | No Fear Act
Commander Naval Sea Systems Command | 1333 Isaac Hull Avenue, SE | Washington Navy Yard, DC 20376 | 202-781-0000 | Webmaster | Site Map

- Letter of Intent from the Naval Surface Warfare Center Port Hueneme Division
- E-mail correspondence from the UCF Department of Industrial Engineering & Management Systems
- Completed Course Action Request Form for “IDS 6XXX Modeling and Simulation for Test and Evaluation” and the course syllabus

UNIVERSITY OF CENTRAL FLORIDA
Modeling and Simulation Graduate Program

Modeling and Simulation of Technical Systems Graduate Certificate

- **Program Description**
  The Graduate Certificate in Modeling & Simulation of Technical Systems provides students with the necessary knowledge in modeling and simulation fundamentals, including modeling techniques and applications, with special emphasis on M&S in testing and evaluation. This graduate certificate is beneficial to technical professionals involved with constructing and using simulation models of dynamic systems. All courses of the certificate program will be delivered electronically via distance education.

- **Curriculum**
  Students must complete a total of 15 credit hours minimum of courses in the required competency areas of Modeling and Simulation Fundamentals, Testing and Evaluation, and Modeling Techniques and Applications.

Fall	IDS 6147 Perspectives on Modeling and Simulation (3 credit hours)
Spring	ESI 5531 Discrete Systems Simulation (3 credit hours)
Summer	IDS 6146 Modeling and Simulation Systems (3 credit hours)
Fall	IDS 6XXX Modeling and Simulation for Test and Evaluation (3 credit hours)
Spring	IDS 6916 Simulation Research Methods and Practicum (3 credit hours)

- **Admissions Requirements**
  Admission is open to those with a bachelor's degree from a regionally accredited institution. An application to the graduate certificate program and official transcripts must be submitted. Applicants must apply online. All requested materials must be submitted by the established deadline.

- **Application Deadlines**

	Fall Priority	Fall	Spring	Summer
Domestic Applicants	-	Jul 15		
International Applicants	-	-	-	-
International Transfer Applicants	-	-	-	-

- **Contact Info**
  - Graduate Program Director
    - Christopher D. Geiger, Ph.D.
    - Associate Professor
    - modsim@ucf.edu
    - Telephone: 407-882-1407
    - P2 – 131
  - Associate Graduate Program Director
    - J. Peter Kincaid, Ph.D.
    - Graduate Research Professor
    - modsim@ucf.edu
    - Telephone: 407-882-1407
    - P2 – 131

DEPARTMENT OF THE NAVY
PORT HUENEME DIVISION
NAVAL SURFACE WARFARE CENTER
4363 MISSILE WAY
PORT HUENEME, CALIFORNIA 93043-4307

IN REPLY REFER TO:

June 24, 2012

Sabrina Kalish, M.A.
Coordinator, Modeling & Simulation Graduate Program
University of Central Florida
Orlando, FL 32816-0112

Dear Ms. Kalish:

I would like to express the Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD), intends to support the Modeling and Simulation Certificate Program (M&S) offered by University of Central Florida (UCF). NSWC PHD's expectation would be to support a maximum of 15 students in the M&S Certificate Program.

We are looking forward to this opportunity to develop a partnership with UCF, leaders in M&S education. Our partnership will help PHD workforce to develop knowledge and skill sets in (M&S). These areas will help fill a need to improve test and evaluation capabilities and position PHD to be better able to apply expertise in the area of modeling and simulation.

Gary Farber
Training Director

Sabrina Kalish

From: Christopher Geiger
Sent: Thursday, June 14, 2012 4:06 PM
To: Sabrina Kalish
Subject: FW: Proposed M&S Graduate Certificate

Sabrina,

FYI…Please include this e-mail conversation with the Modeling and Simulation of Technical Systems graduate certificate program proposal.

Thanks,
Chris

From: Ahmad Elshennawy
Sent: Thursday, June 07, 2012 9:33 AM
To: Christopher Geiger
Cc: Timothy Kotnour; Jennifer Pazour; Petros Xanthopoulos; Mansooreh Mollaghasemi; Ahmad Elshennawy
Subject: RE: Proposed M&S Graduate Certificate

Hi Chris:

I don't think there is a cause for concern for the department that will affect the two existing graduate certificates currently offered through IEMS.

I am copying the IEMS graduate committee for their information and input.

Regards,
Ahmad

From: Christopher Geiger
Sent: Thursday, June 07, 2012 9:06 AM
To: Ahmad Elshennawy
Subject: Proposed M&S Graduate Certificate

Good Morning, Ahmad.

The Modeling & Simulation Graduate Program is proposing a fully-online 15-credit hour co-hort graduate certificate program entitled: "Modeling and Simulation of Technical Systems"

The course sequence of the proposed certificate program will be the following:

- Fall: IDS 6147 Perspectives on Modeling and Simulation (3 credit hours)
- Spring: IDS 6XXX Testing and Evaluation for M&S (3 credit hours)
- Summer: ESI 5531 Discrete Systems Simulation (3 credit hours)
- Fall: IDS 6146 Modeling and Simulation Systems (3 credit hours)
- Spring: IDS 6916 Simulation Research Methods and Practicum (3 credit hours) (This is a Capstone Course.)

Attached is a draft of the catalog description for your reference.

The rationale for this new certificate program is the following:
There is a strong need in the Modeling & Simulation (M&S) community to create a sequence of graduate-level courses to benefit working M&S professionals. Various government agencies, particularly in the military, are placing a greater emphasis on modeling and simulation and many of these agencies need only a certificate program, instead of a full graduate degree program. The government agencies now have a desired technical competency for M&S technical experts to be within (no longer outside) their command units. They are developing personnel internally so that they have more knowledgeable government workers to better perform research development and engineering for both internally conducted projects and contracted projects. This certificate is valuable because it is designed with a logical progression of skill enhancement.

This certificate will likely attract individuals who already work full-time, and wish to enroll part-time. Specifically, we expect to attract U.S. Naval personnel involved with simulation, and some existing M&S graduate students. Many of these certificate students will further develop their knowledge and professional skills to prepare them as future technical leaders for testing and evaluation and many other aspects of their work. Many working professionals would probably pursue this certificate in order to become eligible for a promotion in the workplace.

I am writing you to inquire if this proposed graduate certificate program is a cause for concern for you and the two existing graduate certificates currently offered through IEMS, i.e., Systems Simulation for Engineers and Training Simulation. We feel that the proposed program does not compete with the two existing IEMS graduate certificate programs.

If you would like to discuss the proposed graduate certificate program in detail, I am available at any time. We would like to present this proposed graduate certificate program to Graduate Studies as soon as possible this week.

I look forward to hearing from you.

Thanks,
Chris

==========

Christopher D. Geiger, Ph.D.
Associate Graduate Program Director, Modeling and Simulation
Associate Professor, Department of Industrial Engineering and Management Systems
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University of Central Florida

Course Action Request Form

■ Course Addition ☐ Course Revision ☐ Course Deletion

Forward to your college office

Course Information NOTE: *Course additions and course revisions must be accompanied by a course syllabus and rationale.*
Note: Departments must also submit an electronic syllabus to the college curriculum person.

College: College of Graduate Studies **Department:** Interdisciplinary

Department Chair: Christopher D. Geiger **Phone:** 2-2115

Academic Affairs Approved Instructor: J. Peter Kincaid

	Course Prefix	Number	Title	Credit Hours Ex.: 3(3,0)
Course Prefix	IDS	6XXX	Modeling and Simulation for Test and Evaluation	3(3,0)
New or Proposed Revision				

30 Char. Abbreviation: M&S for Test and Evaluation

Course Description (25 word limit) (If course revision, underscore changes.):

Modeling and simulation for test planning, execution, and evaluation will be described, characterized, and illustrated with real-world examples and case studies.

Will lab fees be charged? ☐ Yes ■ No

Repeat for credit? ☐ Yes ■ No If yes, indicate the total times this course may be used in the degree program. _____

Repeat within same semester? ☐ Yes ■ No

NOTE: For a repeatable course, indicate in the syllabus what will remain the same and what will change when the course is repeated. Also indicate who approves content before a course is repeated.

Prerequisite(s) and/or Corequisite(s): Graduate Standing and C.I. **Graded S/U?** ☐ Yes ■ No

Split-Level Class: ☐ Yes ■ No

If offering a split-level class, complete this section even if it had been approved earlier for individual delivery.

List undergraduate split-level course: _____

NOTE: *Both the graduate and the undergraduate split-level syllabi must be approved through the established university process for approving courses so that there are two separate and complete syllabi for each course. The graduate syllabus should clearly demonstrate more advanced subject matter, expectations, and rigor. Attach both undergraduate and graduate syllabi to this form.*

Term of Offering
When will course be offered?

■ Odd Fall ☐ Odd Spring ☐ Odd Summer ☐ Every Semester

■ Even Fall ☐ Even Spring ☐ Even Summer ☐ Occasional

Intended Utilization of Course
The course will be used primarily as:

■ Required Courses ☐ Elective Courses

Justification for Course Addition or Course Revision

What is the rationale for adding/changing this course?

There is an urgent need in the M&S community of practice to create a sequence of graduate-level courses to benefit working M&S professionals, where these courses emphasize modeling and simulation for test and evaluation, especially for scenarios that are either unsafe or cost-prohibitive to test empirically. M&S is less expensive than testing in a real environment as it provides analytical system performance data, reduces risk and allows introduction of various environments and conditions in simulated form with the opportunity to augment with live testing. The Modeling and Simulation Graduate Program does not, yet, have such a course.

What majors require or recommend this course for graduation? Modeling and Simulation of Technical Systems Graduate Certificate

If not a major requirement, what will be the source of students? Not applicable

What is the estimated annual enrollment? 10-20

Possible duplications and conflicts with other departments or colleges should be discussed with appropriate parties. Please detail discussion you have had.

There are no duplications or conflicts with other departments or colleges.

Justification for Course Deletion

Is this course a required course for graduation in a major or prerequisite? ☐ Yes ☐ No

If yes, have the involved major departments been informed, in writing, of proposed deletion? ☐ Yes ☐ No

If not, explain:Course Description (25 word limit) (If course revision, underscore changes.):

Notes:

Approval Signatures

Department Chair _____ **Date** 6/29/2012

College Academic Standards _____ **Date** _____

College Dean _____ **Date** _____

Graduate Council _____ **Date** _____

Graduate Dean _____ **Date** _____

Modeling & Simulation Graduate Program
University of Central Florida

IDS 6XXX: Modeling and Simulation for Test and Evaluation

COURSE SYLLABUS

Instructor: Dr. J. Peter Kincaid
Office:
Partnership II Bldg, Room 131E
3100 Technology Parkway, Orlando, FL 32826
Phone: 407-882-1330
E-Mail: pkincaid@ist.ucf.edu
Office Hours:
Tuesdays 10am – 12noon EDT,
and by appointment
In the instructor's office, and virtually via Adobe Connect Pro (connection instructions on posted on Webcourses)

Term: Fall 2013
Class Meeting Days: TBD

Class Meeting Hours: TBD

I. University Course Catalog Description

Modeling and simulation is discussed as a complement to physical testing in support of systems evaluation. Forms of use of modeling and simulation in support of test planning, test execution, and systems analysis are described, characterized, and illustrated with real-world examples.

II. Course Overview

M&S is less expensive than testing in a real environment; it provides analytical system performance data, reduces risk and allows introduction of various environments and conditions in simulated form with the opportunity to augment with live testing. M&S also helps validate test scenarios; provides pre-test predictions; post-test analysis and is particularly effective at providing insight into performance of scenarios that are either unsafe or cost prohibitive to test empirically.

Use of simulation in support of test planning, test execution, and systems analysis will be described, characterized, and illustrated with real-world examples. Issues and opportunities relevant to the integrated use of simulation and testing will be identified; and strategies to optimize the use of scarce resources in executing test and evaluation programs will be provided. Other course topics include: a brief review of pertinent probabilistic and statistical models, concepts and practices; an overview of Verification, Validation and Accreditation; and development and use of distributed simulation (including High Level Architecture);.

IDS XXXX is a course that can be taken fully-online.

III. Course Goals

The primary goals of this course are to provide students with an in-depth understanding of:

1. the role of Modeling and Simulation (M&S) in the Test and Evaluation (T&E) process, and
2. robust T&E approaches incorporating M&S techniques for the T&E of a system or subsystem.

IV. Course Prerequisite

Graduate Standing and Consent of the Instructor

V. Credit Hours

3 (3-0)

VI. Course Texts

Required: *Principles of Modeling and Simulation: A Multidisciplinary Approach*
J.A. Sokolowski and C.M. Banks (editors)
Wiley, New York, NY, 2009
ISBN-13: 978-0-470-28943-3

Modeling and Simulation in Manufacturing and Defense Systems Acquisition – Pathways to Success
National Research Council Committee on Modeling and Simulation Enhancements for 21st Century Manufacturing and Defense Acquisition
National Academies Press, Washington, DC, 2002
ISBN-13: 978-0-309-08666-0

VII. Course Topics

Topic
• Introduction to Simulation Modeling
• Role and Theoretical Underpinnings of M&S
• Methods of Verification, Validation and Accreditation of M&S Models
• Systems-of-Systems, Distributed Simulations, and Enterprise Systems
• Overview of Test and Evaluation
• Modeling Approaches for Test and Evaluation
• M&S for Pre-Test, Test Execution, and Post-Test Analysis
• Simulation and Test Integration and Coordination
• Other related topics as time permits

VIII. Course Requirements

Homework Assignments: During the semester, periodic assignments will be assigned and must be submitted on their associated due date. Homework assignments can be completed in teams of ≤ 2 students. Late assignments will be accepted only with permission from the instructor.

Discussion Forum Postings: Class participation is an important expectation of this course. As such, students are expected to actively participate in online discussions throughout the semester. Students must offer comments, questions, and replies to EACH discussion question/topic that is presented by the instructor. Students will submit original postings as well as replies to classmate postings. Posting quality will be weighed heavier than posting length.

The instructor's role is as an observer and facilitator. The instructor will read ALL messages and will participate in the discussions as appropriate.

Examinations: Each student will be responsible for completing a take-home final examination.

Course Project: Each student as part of a team will be required to complete a semester-long course project. The course project can be completed in teams of 1 to 4 students. Each student-team will be responsible for completing a presentation and written report summarizing the project.

IX. Course Grading

Course Item		Percent of Final Grade
Homework Assignments (approx. 6)		30%
Online Discussion Participation		25%
Course Project		25%
Presentation	10%	
Report	15%	
Final Examination (Take-Home)		20%
	Total	100%

IMPORTANT NOTE: In addition to the instructor's own assessment of the Course Project, **the instructor will also use peer evaluations** to assign individual grades to each member of a team for each deliverable of the Course Project (*i.e.*, Presentation and Final Report).

When submitting the each project deliverable, **each team member will complete and submit directly and confidentially to the instructor a separate peer evaluation of the performance of each member (including a self-evaluation) over the duration of the project**. Students that complete the project individually do not complete a peer evaluation.

Grading Scale (%)					Interpretation
90	≤	A	≤	100	: Excellent, exceeds average understanding as evidenced in course work and goes well beyond the basics.
80	≤	B	<	90	: Far above average, fully meets average understanding as evidenced in course work and fully understands the basics and can deal with concepts somewhat beyond that level.
70	≤	C	<	80	: Average, meets minimum expectations and satisfies course requirements
60	≤	D	<	70	: Below average, meets many minimum expectations and satisfies all or most course requirements.
0	≤	F	<	60	: Fails to meet minimum expectations in understanding and course work as evidenced by performance and submission of graded elements

Individual assignment and project grades will be posted on Webcourses. Students are responsible for making sure that Webcourses grades are correct.

X. Grading Objections

All objections to grades should be made IN WRITING WITHIN ONE WEEK of the work in question. Objections made after this period has elapsed will NOT be considered – NO EXCEPTIONS.

XI. Important Dates to Remember

First Day of Classes:	August 19
Labor Day Nationally-Observed Holiday:	September 2
Veteran's Day Nationally-Observed Holiday:	November 11
Thanksgiving University-Observed Holiday:	November 27-December 1

Modeling & Simulation Graduate Program
University of Central Florida

IDS 6XXX: Modeling and Simulation for Test and Evaluation

COURSE PROTOCOLS AND ADDITIONAL EXPECTATIONS

XII. Computer Skills/Usage

- Students are expected to have access to and be familiar with:
  - a Microsoft Windows word processing application (*e.g.*, Microsoft Word) as all assignments will require its use;
  - a Microsoft Windows spreadsheet application (*e.g.*, Microsoft Excel) as some assignments may require its use; and
  - Adobe Acrobat Reader to view some course documents.
- UCF Webcourses and e-mail will be used to communicate with students and disseminate materials and assignments throughout the course. So, students should check Webcourses and their e-mail at least once per day.

XIII. Course Assignments

- All assignments are due on or BEFORE the scheduled due date and time. Make-ups are allowed with permission of instructor.
- All assignments must be submitted via Webcourses, unless specified otherwise. All assignments must be submitted in a high-quality and professional manner. They should be well-written and understandable.
- Students are encouraged to collaborate outside of class to discuss and debate course concepts. However, all assignments MUST be completed and written up individually by team. Each student team is required to turn in their own solutions and only one copy of the assignment solutions containing the names of all team members is required.
- If an emergency arises and a student cannot submit the assignment or project deliverable on or before the due date, the student MUST give notification to the instructor NO LESS THAN 24 HOURS BEFORE the due date and NO MORE THAN 48 HOURS AFTER the due date.
- Please make sure that you communicate with the instructor regularly regarding your work schedule, work-related trips, *etc*.

XIV. Attendance Policy and Expectation

This course can be successfully completed fully-online. As such, ALL students that are enrolled in this course are expected to complete and participate in all online activities and assignments.

At best, unavoidable circumstances sometimes occur that throw timing off (e.g., weather emergencies including hurricanes and tornadoes). In the event of an emergency that causes internet service and power outages and evacuations, do not panic about your online assignments. As soon as the internet is restored, contact your instructor, who will then work with affected students on a case-by-case basis to determine the best course of action. Remember, your instructor could be experiencing the same or similar problems.

Other circumstances, which may be considered “unavoidable”, include medical or legal emergencies. Pertinent documentation, deemed acceptable by the instructor, will be required for any excused absence.

XV. Professionalism and Ethics

Academic dishonesty in any form will not be tolerated. If you are uncertain as to what constitutes academic dishonesty, please consult The Golden Rule, the University of Central Florida's Student Handbook (http://www.goldenrule.sdes.ucf.edu/) for further details.

As in all University courses, The Golden Rule Rules of Conduct will be applied. Violations of these rules will result in a record of the infraction being placed in your file and the student receiving a zero on the work in question AT A MINIMUM. At the instructor's discretion, you may also receive a failing grade for the course. Confirmation of such incidents can also result in expulsion from the University.

XVI. Students with Special Testing/Learning Needs

Students with special needs and require special accommodations must be registered with UCF Student Disability Services prior to receiving those accommodations. Students must have documented disabilities requiring the special accommodations and must meet with the instructor to discuss the special needs as early as possible in the first week of classes. UCF Student Disability Services can be contacted at http://www.sds.sdes.ucf.edu/, or at (407)823-2371.

Note: The instructor reserves the right to modify the information contained in this document at his discretion.

Modeling & Simulation Graduate Program
University of Central Florida

IDS 6XXX: Modeling and Simulation for Test and Evaluation

COURSE SCHEDULE

Week	Topic(s)
1	• Instructor and Course Introduction • Introduction to Simulation Modeling
2	• The Role of and Theoretical Underpinnings of Simulation Modeling
3	• Systems-of-Systems, Distributed Simulations, and Enterprise Systems
4	• Systems-of-Systems, Distributed Simulations, and Enterprise Systems (cont'd)
5	• Methods of Verification, Validation and Accreditation of Simulation Models
6	• Methods of Verification, Validation and Accreditation of Simulation Models (cont'd)
7	• Overview of Test and Evaluation
8	• Modeling Approaches for Test and Evaluation
9	• Modeling Approaches for Test and Evaluation (cont'd)
10	• M&S for Pre-Test, Test Execution, and Post-Test Analysis
11	• M&S for Pre-Test, Test Execution, and Post-Test Analysis (cont'd)
12	• Simulation and Test Integration and Coordination
13	• Simulation and Test Integration and Coordination (cont'd)
14	*Thanksgiving Holiday (No Classes)*
15	• Course Summary and Final Project Submission
16	• Final Examination

Note: The instructor reserves the right to modify the course content, sequence of topics, course assignments during the progress of the course.

ARTICULATION AGREEMENT

between the

UNIVERSITY OF CENTRAL FLORIDA
Orlando, Florida, U.S.A.

and the
BEIJING JIAOTONG UNIVERSITY
Beijing, China

The University of Central Florida, Orlando, Florida (hereafter referred to as "UCF"), on behalf of its Board of Trustees, and Beijing Jiaotong University, Beijing, China (hereafter referred to as "**BJTU"**), agree to establish an academic agreement program known as the BJTU-UCF Articulation Program. The purpose of this agreement is to provide graduate students at BJTU the opportunity to pursue graduate education at UCF. Students under this agreement will be able to receive at UCF a Master of Science (M.S.) by completing the academic requirements for the master's degree in the Transportation Systems Engineering Track at UCF as specified in the UCF Graduate Catalog.

The agreement is based on the following stipulations:

A. General

1. A student will be awarded the degree of Master of Science (M.S.) from UCF after successful completion of all the for the Transportation Systems Engineering Track requirements stipulated by UCF as outlined in the Appendix.

2. English will be the language of instruction in all courses offered by UCF. BJTU students must demonstrate proficiency in English by submitting record of a minimum score of 220 on the computer-based Test of English as a Foreign Language (TOEFL), or a minimum score of 80 on TOEFL iBT (Internet Based Test).

3. Both UCF and BJTU are free to make reference to the arrangements for this program, and to use the other university's name in conjunction therewith. However, any other use of a university's name, trademark or logo by the other party to this agreement must be approved or denied by the university that owns such name, logo or trademark within thirty (30) working days of such request. If disclosure is required by applicable law or valid court order, nothing shall prevent compliance with such law or court order. Any material or copy intended for publication by one university, which refers in any way to the other university, must be reviewed and approved in writing by the other university in advance of publication. The university officers authorized to approve any such material for publication at each university are listed in Schedule 2, as are those university officials authorized to approve the use of the university's trademarks/logos by the other university. Neither UCF nor BJTU may use the SACSCOC logo.

B. Program Admission

1. BJTU will select candidates for participation in the BJTU-UCF Articulation Program based on the following criteria:

a. A score of 220 or better on the computer-based TOEFL, or a minimum score of 80 on TOEFL iBT (Internet Based Test). The selection committee for the particular program at UCF may allow a student with a score below 220 on the TOEFL to participate in the program if the student is considered a strong candidate, but the admission would be conditioned on the student's placement at the Advanced Level in the Intensive English program at UCF.

b. A 3.0 GPA or better on a 4.0 scale. More restrictive requirements for a particular program may apply. The complete academic record must be received by Graduate Studies when the application is submitted.

2. The Transportation Systems Engineering Selection Committee of the Civil, Environmental and Construction Engineering (CECE) Department at UCF will admit students from the group of candidates selected by BJTU based on the following criteria:

   a. Student has proof of a Bachelor's degree from an accredited four year institution compatible with the requirements of the particular degree and program being sought in CECE.

   b. Student has shown proficiency in English by presenting a score of 220 on the TOEFL exam (or a minimum score of 80 on TOEFL iBT) or by taking and passing an Intensive English course at UCF; and

   c. A GPA of 3.0 or better is recommended for admission to graduate work. BJTU's grade scale is from 1 to 100. For the purposes of this Agreement, a 75 grade at BJTU will be considered equivalent to a B (or 3.0 on a 4.0 scale) grade at UCF. Applicants must provide a course-by-course credential evaluation with GPA calculation. Credential evaluations are accepted only from World Education Services (WES) or Josef Silny and Associates, Inc.

3. Program participants who will be coming to UCF must abide by the application deadlines that can be found at (http://www.graduate.ucf.edu/currentGradCatalog/content/AppDeadlines/) and the international student immigration requirements listed at www.intl.ucf.edu.

C. Credit Transfer

Students participating in the BJTU-UCF Articulation Program will be able to transfer up to 12 credits from graduate courses taken by the students at BJTU before starting at UCF from the specific list of classes designated in the Addendum –-listing of approved BJTU courses.

1. In all instances, a majority of the coursework towards the UCF degree will be taken at UCF to comply with accreditation standards.

2. Only courses with grades of B (75/100) or better can be transferred to the UCF program of study.

3. UCF reserves the right to reject graduate course transfer credits not meeting its academic requirements.

D. Program coursework

1. Students participating in the BJTU-UCF Articulation Program must enroll in a specific

graduate engineering program and meet all the requirements for graduation listed in the current Graduate Catalog (http://www.graduate.ucf.edu/currentGradCatalog/) for that program.

2. Students selecting the thesis option must perform the investigation work at UCF, unless the research itself requires the student to work elsewhere and it is approved by the student's research advisor. Regardless of where the research is conducted, students will be required to enroll continuously in thesis hours at UCF throughout the research, until completion of the degree. The thesis defense must be conducted in English and physically at UCF.

3. UCF will provide each graduate program participant with a computer account that allows electronic mail and access to the Internet, WebCourses and/or subsequently enables the use of course management system software and the UCF Library's online facilities.

E. Program administration

1. BJTU will provide UCF with all the appropriate documents related to the student selection process and a transcript with the courses that have been approved for possible transfer to the student's program of study at UCF.

2. A faculty member in the academic program at UCF and a faculty member from BJTU will serve as Program Coordinators and will oversee the execution of the programs at UCF and BJTU, respectively.

3. The responsibilities of the Coordinators at UCF are to:

   a. Interact with the Coordinator at BJTU for the admission of students into the programs.
   b. Serve as UCF's Graduate Advisor of all students under the programs.
   c. Verify that BJTU courses presented for transfer into a student's program of study correspond to equivalent UCF courses and can be accepted into the student's selected program of study (see Addendum for list of approved courses).

4. The responsibilities of the Coordinator at BJTU are to:

   a. Interact with the Coordinators at UCF for all aspects of the program.

   b. Provide documentation on all BJTU courses presented for transfer into a student's program of study.

5. Participants of the program who will be taking courses at the UCF campus will be responsible for all of their expenses including, but not limited to, payment of out of state tuition and living expenses, as well as the cost associated with necessary immigration arrangements.

F. Faculty

1. Faculty participation in the program:

   At BJTU's request and with previous approval by the CECE Department, faculty members at BJTU may be visiting scholars at UCF and may participate in collaborative research hereunder. However, prior to the commencement of any such collaborative research, UCF and BJTU shall enter into a collaborative

research agreement. UCF shall not be responsible for any assistance, financial or otherwise, pertaining to the visits of any BJTU faculty members in the USA and/or at UCF, or for any assistance, financial or otherwise, pertaining to the payment of any living or other expenses in the USA and/or at UCF. The BJTU visiting scholar may participate in the thesis committee of BJTU students in this program, consistent with UCF policies. BJTU shall pay for any and all expenses of the visiting BJTU scholar. UCF shall not be responsible or obligated in any way to compensate the BJTU visiting scholar or to pay any expenses of the BJTU visiting scholar. Participation of the visiting scholar in research will provide an opportunity to develop a collaborative research program between the two universities, subject to the approval of the appropriate departments or units at UCF and BJTU, including, but not limited to, UCF's Office of Research and Commercialization and subject to the establishment and execution of any and all required documents and agreements.

a. Implementation of any UCF-BJTU program, whether the program covered by this agreement or any possible collaborative research program or any other program between UCF and BJTU, will comply with the export control restrictions, as listed in the US Department of State's International Traffic in Arms Regulations (ITAR) and the US Department of Commerce's Export Administration Regulations (EAR), as well as other laws and regulations, all to the extent applicable.

This agreement will come into effect with the appropriate signatures below, at the date of last signature and shall remain in effect for the period of three years. It may be renewed or amended at any time before the actual expiration date by a written agreement signed by authorized representatives of both parties. This agreement may be terminated by the appropriate authority of either party given twelve months' prior written notice to the other party.

Institutional Representatives

Signature:_____	Signature:_____
Date:_____	Date:_____
XXXXXXXXX,	Prof. Jun Liu,
Vice President of UCF	Vice President of BJTU
UCF	BJTU

Addendum – list of approved courses from Beijing

(syllabi are provided in attachment)

A. Transportation Systems Engineering: up to 12 Hours taken at BJTU may be counted for MS program at UCF

- TTE 5204 Traffic Engineering* (3 credit hours)
- TTE 6205 Highway Capacity and Traffic Flow Analysis (3 credit hours)
- TTE 5805 Geometric Design of Transportation Systems* (3 credit hours)
- TTE 5835 Pavement Design (3 credit hours)
- TTE 6256 Traffic Operations* (3 credit hours)
- TTE 6270 Intelligent Transportation Systems (3 credit hours)
- TTE 6315 Traffic Safety Analysis* (3 credit hours)
- TTE 6526 Planning and Design of Airports* (3 credit hours)
- CGN 6655 Regional Planning, Design and Development (3 credit hours)
- ENV 5071 Environmental Analysis of Transportation Systems (3 credit hours)
- ESI 5219 Engineering Statistics or STA 5206 Statistical Analysis (3 credit hours)

BJTU Code	BJTU Courses (3 Hours)	Course Description	UCF Code	UCF Equivalent (3 Hours)
21008304	Mathematical statistics	A graduate level course of statistical inference. The topic includes probability, statistical estimation, hypothesis testing, ANOVA inference as well as its application in the area of engineering.	STA 5206	Statistical Analysis
22004307	Models and methods of transportation systems	It is a multi-disciplinary which includes fundamental concepts of transportation-related planning, engineering, operations research, management and so on. This course also provides several mathematical and economic models for transportation system.	CGN 6655	Regional Planning, Design and Development
22004318	Traffic flow theory	This course focuses on the concepts and theories of traffic flow characteristics. By mathematical models, topics include dynamic properties of traffic, microscopic and macroscopic traffic parameters, queue analysis, shockwave and so on are presented.	TTE 6205	Highway Capacity and Traffic Flow Analysis
22004309	Traffic simulation technology	This course contains three major parts. First, the mathematical models of traffic simulation based on different scenarios are introduced. Second, the platform of several state-of –the –art software of traffic simulation is provided for course project. Finally, the design of simulation routine for a simple scenario is required for each student.		??
22004306	Theories and methods of transportation planning	This course provides the basic concepts and theories of transportation planning. It includes the trip-based four step method of planning, which is trip generation model, trip distribution model; mode split model and traffic assignment model. The concepts of activity based transportation planning are also presented.	CGN 6655	Regional Planning, Design and Development
22004320	Traffic management and control	This course provides student with the basic knowledge of traffic management and control as well as traffic engineering which emphasis on traffic operations. Topics include capacity analysis, traffic control devices, management strategies, and so on.	TTE 5204	Traffic Engineering
24004310	Transportation demand management and policy analysis	This course introduces the concepts, methods and application of transportation demand management as well as the relative policy analysis. In addition, the relevant knowledge of planning and travel behavior is provided.		??

22004324	Analysis and design of urban transportation	This course systematically explores the basic methods and technologies of urban transportation design which includes topics of urban road design, public transit design, sidewalk design and transportation design analysis and evaluations.		??
22004325	Urban public transportation systems	A course focuses on the urban public transportation systems which include bus and subway as well as the connection facilities. The content covers the demand forecasting, design and operation of public transportation systems.		Mass Transit
22004329	Systems engineering of transportation Safety	This course introduces the fundamental principle and analysis methods of traffic safety systems engineering. It covers the area of factor analysis of accident, incident prevention methods, safety analysis and assessment of transportation systems as well as the application of statistical models.	TTE 6315	Traffic Safety Analysis
24004305	Economic theory of transportation	This course deals with the allocation of transportation resources. As a branch of economics, this course provides the topics of fundamental supply and demand theory, the economic characteristics of transportation systems, transportation market equilibrium and so on.		??
22004326	Information systems of transportation safety	This course provide the concept and design and of information systems and its application on transportation safety. The content includes the application of GIS on transportation safety, principle of database, traffic data process and so on.	TTE 6315	Traffic Safety Analysis
22004328	Principles of transportation safety	This course focuses on the concepts and methods of safety design of road infrastructure. It summarizes current technologies and theories of safe road design and includes the topics of safety design of urban road network, segment safety design, sidewalk safety design and the evaluation of safety design.	TTE 6315	Traffic Safety Analysis
24004320	Transportation safety and emergency rescue technologies	The main topic of this course is based on the area of transportation with the emphasis of emergency rescue technologies. The contents cover the topics of principle of transportation safety, introduction of rescue technologies for traffic accidents.	TTE 6315	Traffic Safety Analysis
22004310	Intelligent Transportation Systems	This course introduces concepts, technologies and application of ITS. Topics include the intelligent vehicle road coordination systems, wireless communication, sensing technologies and so on.	TTE 6270	Intelligent Transportation Systems
22004327	Theory and methods of safety management	This course presents the basic theory and methods for safety management with emphasis in transportation area. It includes the knowledge of risk analysis, strategies of safety management, policy as well as case studies.	TTE 6315	Traffic Safety Analysis

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Appendix
Schedule I
Requirements for the UCF Degree

All UCF degrees awarded must have the majority of credit hours taken at UCF, consistent with accreditation standards.

A. The requirements for a Master's degree at UCF are listed in the current Graduate Catalog at http://www.graduate.ucf.edu/currentGradCatalog/. Particular programs may have their own

individual requirements, which may be more restrictive than university requirements.

B. Approved Plan of Study (List courses leading to the degree and indicate whether credits are transferred or earned at UCF.)

C. International Participating Faculty Roster Form--Qualifications of Participating Faculty

1	2	3	4
Name	**Courses Taught**	**Relevant Academic Degrees and Course Credits Earned**	**Other Qualifications**
To be completed by BJTU			

Schedule 2
Authorized Persons/Officers

The following persons/officers will be responsible for the arrangements with respect to publications:

1. Vice-Provost and Dean of Graduate Studies
2. Program Coordinator at BJTU
3. University Liason Coordinator at UCF

The following persons/officers will be responsible for the arrangements regarding the use of UCF's name and trademarks/logos: UCF Associate Vice President of Marketing or his/her delegate.

Schedule 3
Cost Estimates

1. At UCF, a full time graduate student must take at least nine (9) credit hours per semester in the fall and spring terms and at least six (6) credit hours in the summer. A student may require more time for completing the Intensive English Language course or thesis requirements. BJTU students participating in the program will be charged and required to pay out-of-state tuition.

2. UCF's current tuition and fees and other pertinent financial information can be found at http://pegasus.cc.ucf.edu/~irps/character/current_tuition.html.

3. The estimated living expenses for UCF can be found at http://finaid.ucf.edu/wwwtext/budget01.htm

Schedule 4

SACS Accreditation Disclaimer

UCF is accredited by the Southern Association of Colleges and Schools' Commission on Colleges (SACS) to award degrees at the associate, baccalaureate, master's, doctoral, and professional levels. BJTU is not accredited by the Commission on Colleges and the accreditation of UCF does not extend to or include BJTU or its students. Although UCF accepts certain course work in transfer toward a credential from BJTU or collaborates in other ways for the generation of course credits or program credentials, other colleges and universities may or may not accept this work in transfer, even if it appears on a transcript from BJTU. This decision is made by the institution subsequent to considering the possibility of accepting such credits.

Schedule 5

UCF Degree Requirements for the Transportation Systems Engineering Track

(http://www.graduatecatalog.ucf.edu/programs/program.aspx?id=1116&tid=322&track=Transportation Systems Engineering)

PROGRAM DESCRIPTION

TRACK DESCRIPTION

The Transportation Systems Engineering track in the Civil Engineering MS program reflects the very broad nature of the field, which encompasses the design, construction, and enhancement of the infrastructure of society. The program's course work includes structural analysis and design, geotechnical engineering and foundations, transportation planning and operations, traffic engineering and water resources engineering.

Faculty research interests include geotechnical studies of subsurface conditions, soil testing "superpave" mix design, intelligent transportation systems, traffic safety, structural dynamics, nonlinear structural analysis and software development, reinforced concrete, hydraulic modeling, coastal ocean modeling, stormwater management, and watershed management. Students completing the program find positions in consulting firms, construction and construction-related industries, in city, county, state, and federal government agencies, and academic institutions.

International students (F or J visa) are required to enroll in a full-time course load of 9 credit hours during the fall and spring semesters. Only 3 of the 9 credit hours may be taken in a completely online format. For a detailed listing of enrollment requirements for international students, please visit www.intl.ucf.edu. If you have any questions, please consult the International Services Center at 407-823-2337.

CURRICULUM

Total Credit Hours Required:

30 Credit Hours Minimum beyond the Bachelor's Degree – Thesis Option

The Transportation Systems Engineering track in the Civil Engineering MS program is for students with appropriate science or engineering baccalaureate backgrounds. Both a thesis option and a nonthesis option are available with each requiring 30 credit hours of graduate courses. The thesis option requires 15 credit hours of required courses, 9 credit hours of elective courses, exclusive of thesis and research, and a thesis (6 credit hours). The nonthesis option requires 15 credit hours of required courses and 15 credit hours of elective graduate course work exclusive of thesis and research. The nonthesis option also requires a comprehensive oral and/or written final examination. The student must develop an individual program of study with a faculty adviser and must have background or articulation course work as described below. At least one-half of the required credits must be taken at the 6000 level.

Research studies are required in one or more courses. The research study and report will focus on reviewing and analyzing contemporary research in a student's particular specialization within the profession in order to help students acquire knowledge and skills pertaining to research-based best practices in that specialization area. In addition, students may engage in directed independent studies, research, or a research report during their studies.

Prerequisites

- STA 3032 Probability and Statistics for Engineers (3 credit hours)
- TTE 3810 Transportation Engineering (3 credit hours)

Required Courses—15 Credit Hours

Both thesis and nonthesis students must choose five of the following courses. Courses with asterisks provide independent learning experiences. These experiences encompass research reports, design projects, and literature studies. Nonthesis students must choose at least one course with an asterisk.

- TTE 5204 Traffic Engineering* (3 credit hours)
- TTE 6205 Highway Capacity and Traffic Flow Analysis (3 credit hours)
- TTE 5805 Geometric Design of Transportation Systems* (3 credit hours)
- TTE 5835 Pavement Design (3 credit hours)
- TTE 6256 Traffic Operations* (3 credit hours)
- TTE 6270 Intelligent Transportation Systems (3 credit hours)
- TTE 6315 Traffic Safety Analysis* (3 credit hours)
- TTE 6526 Planning and Design of Airports* (3 credit hours)
- CGN 6655 Regional Planning, Design and Development (3 credit hours)
- TTE 6625 Mass Transportation Systems (3 credit hours)
- ENV 5071 Environmental Analysis of Transportation Systems (3 credit hours)
- STA 5156 Probability and Statistics for Engineers, ESI 5219 Engineering Statistics or STA 5206 Statistical Analysis (3 credit hours)

Elective Courses—9 Credit Hours

All students, both thesis and nonthesis, must complete at least 9 credit hours of approved electives from the list above or other courses as approved by the student's adviser. Directed Research (XXX 6918) is not permitted in the MS program of study.

- Electives (9 credit hours)

Thesis Option—6 Credit Hours

- TTE 6971 Thesis (6 credit hours)

A final defense of the thesis is required. In addition, the College of Engineering and Computer Science requires that all thesis defense announcements be approved by the student's advisor and posted on the college's website and on the university-wide Events Calendar at the College of Graduate Studies website at least two weeks before the defense date.

Nonthesis Option—6 Credit Hours

For those pursuing the nonthesis option, two additional electives are required, which should preferably come from the above list, although other courses may be chosen with adviser’s consent. In addition, students must successfully complete a comprehensive final exam.

- Electives (6 credit hours)

Equipment Fee

Students in the Civil Engineering MS program pay a $90 equipment fee each semester that they are enrolled.

INDEPENDENT LEARNING

A research or design project serves as the independent learning experience for thesis students. Nonthesis students are required to take at least one of the courses marked with an asterisk (*), denoting an independent learning experience, and a comprehensive exam.

Application Requirements

For information on general UCF graduate admissions requirements that apply to all prospective students, please visit the Admissions section of the Graduate Catalog. Applicants must apply online. All requested materials must be submitted by the established deadline.

The College of Engineering and Computer Science strongly encourages prospective applicants to request a free pre-screening (www.cecs.ucf.edu/prescreen) of their qualifications prior to submitting an online application for graduate admission. However, a pre-screening is not required; rather, it is offered as a courtesy to all prospective applicants before they commit to submitting a complete online application and paying an application processing fee.

Admissions decisions are made on the basis of a complete online application only, and not on the basis of any pre-screening. Prospective applicants who are encouraged to apply to their intended graduate program based on the information provided for their pre-screening are not assured of admission or financial assistance when they submit a complete online application. Although it is possible, it is not likely, that prospective applicants who are discouraged from formally applying to a graduate program at the pre-screening stage will be admitted if they elect to submit a complete online application anyway.

In addition to the general UCF graduate application requirements, applicants to this program must provide:

- One official transcript (in a sealed envelope) from each college/university attended.
- A Bachelor of Science degree in civil engineering or another closely related engineering degree.
- Résumé.
- Statement of educational, research, and professional career objectives.
- Three letters of recommendation.
- Applicants applying to this program who have attended a college/university outside the United States must provide a course-by-course credential evaluation with GPA calculation. Credential evaluations are accepted from World Education Services (WES) or Josef Silny and Associates, Inc. only.

Faculty members may choose to conduct face-to-face or telephone interviews with applicants before

accepting them into their research program.

The GRE is not required, however, taking the GRE is highly recommended for students wishing to pursue a thesis. In order to be considered for any fellowships, a GRE score is required.

The MS degrees in specialized options are designed for students with appropriate baccalaureate backgrounds. Applicants who are applying to the programs without a directly related undergraduate degree should closely check the prerequisites. Additional undergraduate courses may be required.

Revision

UNIVERSITY OF CENTRAL FLORIDA
COLLEGE OF GRADUATE STUDIES

Program Recommendation Form

This form is to be used to revise, add, suspend, or delete degree programs, tracks, or certificate programs. If there are changes to a program and the changes will affect the program tracks also, one form may be used for this type of change.

PLEASE NOTE: The deadline for new tracks or certificates is February 1 of each year. Any proposal for new tracks or certificates received after this date will not be included in the next year's catalog. Revisions to existing programs, tracks, or certificates are due by March 15. Any proposals for revisions received after that date will not be included in the next year's catalog. Please include catalog copy (description, curriculum, contact information, application requirements, and application deadlines). For revisions – attach the catalog copy showing changes (use Track Changes in Word).

College/Unit(s) Submitting Proposal: COM

Proposed Effective Term/Year: FALL 2012

Unit(s) Housing Program: BSBS

Name of program, track and/or certificate: MS BIOTECHNOLOGY

Brief description of program (this description will show up in the graduate catalog copy): *Do not add complete catalog copy here.*

This program is unique and focuses on practical training offered to graduate students through master's thesis research in molecular biotechnology to perform jobs in laboratory environment that require scientific talent.

DELIVERY - Will program be delivered: ■ Face to face ☐ Completely online ☐ Mixed delivery

Admissions deadlines: (Please specify if you have a different deadline for the track than for the program?)

January 15

Application requirements: (Please specify if you have different application requirements for the track than for the program? Will you admit directly to the track?)

Program Director(s) and contact information: (name, email, phone, campus address, program website address)

Saleh A. Naser; saleh.naser@ucf.edu

Please check one: this action affects a: ☐ Program ■ Track ☐ Certificate

Please check one: this action is a(n):

☐ Addition. Please proceed to Part A.

■ Revision. If a revision applies to multiple tracks, please list them here and then proceed to Part A:

Program+PSM track revisions

☐ Inactivation

☒ Temporary Suspension of Admissions. Give Length of Suspension:

Suspend PSM track for Fall 2012

Temporary suspension of admissions: The program will be removed from the online application. A notation will be entered in the graduate catalog indicating the length of the suspension of admissions. Currently enrolled students will not experience any issues with continued enrollment.

Inactivation: Admissions will be suspended for new students and the program will be removed from the online application. Students active in the program are eligible to complete the program under the appropriate criteria and an appropriate teach-out plan is required. The program will be removed from the catalog as of the approved term.

If you checked inactivation or you are temporarily suspending admissions, please go to Part B and complete it.

Signature Page

RECOMMENDATIONS

☒ Yes	☐ No	Department Chair: Assoc.	Date: 4/24/2012
☒ Yes	☐ No	College Curriculum Committee Chair:	Date: 4/24/2012
☒ Yes	☐ No	College Dean:	Date: 4-24-12
☐ Yes	☐ No	Chair or GSC:	Date:
☐ Yes	☐ No	Dean, College of Graduate Studies:	Date:

APPROVAL

Provost and Vice President for Academic Affairs: _____ Date: _____

Distribution: After approval is received from the Provost, distribution will be to:

Department(s); College; Registrar; Associate Registrar; Institutional Research; Academic Services: Faculty Senate; University Analysis and Planning Support; College of Graduate Studies

Program changes:
1. Reduce overall hours from 31 to 30, required from 19 to 21, and electives from 6 to 3 hours. Thesis hours remain at 6.

PSM track changes:
1. Reduce overall hours from 43 to 42, required from 13 to 15, and electives from 12 to 9. Professional and internship hours remain at 12 and 6.
2. Suspend admissions to track for fall 2012 to secure internships. Students in the track will be able to continue their courses.

Part A – For additions or revisions of programs, tracks or certificates

Brief statement of rationale: (Please indicate the rationale, how it affects the unit and faculty teaching in and students enrolled in the program, track or certificate.)

The rationale for the revision is due to the offering of new courses that could provide similar service to the students. The diversity in course offering gives students more course choices to accommodate knowledge need and graduation time line.

For Revisions:

Brief listing of Program Changes: (Please indicate the changes in bullet format. If there are changes to the credit hours of the program, required courses or other requirements, please state those changes. **Remember to attach the catalog copy showing changes, using Track Changes in Word.)**

MS Biotechnology Thesis Track:
-Total 30 credit hour program instead of 31
-Required courses: 21 credit hour minimum with 18 credit hour Core instead of 19 and 17 respectively
-BSC 6431 Practice of Biomedical Science (3 credit hours) was added to core courses.
-BSC 6407C Laboratory Methods in Molecular Biology (3 credit hours) can be used to substitute for - MCB 5722C Methods in Biotechnology (4 credits)
-BSC 5418 Tissue Engineering (3 credit hours). OR MCB 6417C Microbial Metabolism (3 credit hours), OR PCB 5025 Molecular and Cellular Pharmacology (3 credit hours) may be used to substitute for -PCB 5527 Genetic Engineering and Biotechnology (3 credit hours)
-or MCB 6938 (1 credit hour, 1 semester only) may be used to substitute for one credit hour of MCB 5314 Industrial Perspectives Seminar
-Elective courses added BRC5436, MCB5937, PCB5838, PCB5265, PCB5025 PCB5937 PCB5815, Course Title update PCB5566 (where F approved by the Graduate Committee was added
-A total of 3 credit hour elective instead of 6 credit hour
-Dead line for all applications (domestic, international or international transfers is January 15

Professional Science Masters (PSM) track
-Total 42 credit hour program instead of 43

Will students be moved from an existing program, track, or certificate into this new program, track, or certificate?

☐ Yes ■ No

If yes, state the name of the program or track where students are currently enrolled and provide a list of students if possible:

Will students have the option to stay in their existing program, track, or certificate? ☐ Yes ☐ No

Name Change

Are you changing the name of an existing program, track, or certificate? ☐ Yes ■ No

If yes, provide the new name of the program, track, or certificate:

Provide the name of the current program, track, or certificate:

When is the name change effective? Please note: A name change will apply to the record of all students who are currently enrolled, readmitted or newly admitted into this program as of the effective date of this change.

Will students have the option to stay in their existing program, track, or certificate? ☐ Yes ☐ No

If you are requesting a CIP Code change for an existing program, track, or certificate, please provide:

old CIP:

new CIP:

If a name change is your only revision, stop here. Otherwise, complete the rest of Part A.

Part A - Continued

Specify the faculty who will participate in the program, track or certificate and their credentials to do so: (List faculty and a brief paragraph of their credentials.)

no change

Impact of changes on students: Will current students be impacted by the addition or revision of a program, track or certificate? If so, how?

none negative. The change should give the student more choices and better diversity in course offering and collectively the revised curriculum is better fit for current job market.

If applicable, provide a written agreement (email is fine) from all involved units that they are in support of, will provide courses to, or will participate in the program, track, or certificate. Please attach the correspondence and also list the units here.

The agreement and collaboration we have with Business administration had not been affected due to the revision our course-requirement.

If an addition, provide a statement of who is likely to enroll and why. Please state if there is licensure or certification that depends upon this education, etc. Also, complete the following table.

	Year 1	Year 2	Year 3
Headcount			
SCHs			

If an addition, indicate likely career or student outcomes upon completion: (What will students do? What will their job titles be?)

Part A - Continued

If an addition or there are substantial REVISIONS to existing tracks or certificates, please complete the following table on financial support: (Specify all forms of support – assistantships, fellowships, and tuition remission.)

	No. assistantship students	**Source of funds**	**No. fellowship students (specify fellowship)**	**No. tuition remissions**	**Source of funds**
Year 1					
Year 2					
Year 3					

Checklist of items to be provided:

■ Electronic graduate catalog copy for additions; track changes included if there are revisions. (required)

☐ Attach all appropriate course action requests that will be necessary to implement the changes. (required)

☐ Emails showing consultation with other units. (if applicable)

☐ If an addition, list of 1-3 students and 1-3 faculty for profiles in the graduate catalog (provide email address so Graduate Studies can contact them to write profiles and take photos). You may provide draft copy of profiles if you wish.

☐ If an addition, what disciplines does this program, track or certificate belong to? What other UCF graduate programs, tracks, or certificates are related to it? This information will be used to provide additional links for prospective students to search in the online graduate catalog.

Part B – For inactivations or suspensions of programs, tracks, or certificates

Are students currently enrolled in the program? ☐ Yes ☐ No

If yes, number of current students:

_____

Please specify the intended time period of inactivation or suspension:

_____

If program, track, or certificate is being inactivated or suspended, then attach a "teach out" plan for all current students specifying how they can finish the program or where students will be placed if moving to another program. The "teach out" plan should specify when courses will be offered to enable students to finish. Specify whether students will remain in the existing program to finish, and if so, when the completion date will be, whether students will be moved to another program, etc. Please provide a list of students where applicable.

Sample teach out plan: Enter the terms and courses that will be taught for each term throughout the last semester. Please delete course prefixes and numbers in this section if no teach out plan is required.

Fall 2010	Spring 2011	Summer 2011	Fall 2011	Spring 2012
EDF 7041	EDF 7041	EDF 7041	EDF 7041	EDF 7041
EDF 6442	EDF 6442	EDF 6442	EDF 6442	
EDF 6442	EDF 6442	EDF 6442		
EDF 6543	EDF 6543			
EDA 7503				

Checklist of items to be provided:

☐ Attach all appropriate course action requests that will be necessary to implement the changes. (required)

☐ E-mails showing consultation with other units. (if applicable)

PROGRAM DESCRIPTION

The Master of Science in Biotechnology program in the College of Medicine will prepare students to function in the industrial biotechnology environment. This program is designed to give students broad knowledge and training in the scientific and practical aspects of biotechnology.

Read More

CURRICULUM

The Master of Science in Biotechnology program consists of a minimum of 30 semester credit hours of graduate courses offered by the College of Medicine that includes ~~19~~ 21 credit hours minimum of required courses, ~~6~~3 credits of restricted electives, and 6 credit hours of thesis research as detailed below.

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Total Credit Hours Required:

~~31~~ 30 Credit Hours Minimum beyond the Bachelor's Degree

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What makes this program unique is the focus on practical training offered to graduate students through master's thesis research in molecular biotechnology to perform jobs in laboratory environment that require scientific talent. The MBA degree will provide management skills necessary in business administration.

Required Courses—~~19~~ 21 Credit Hours minimum

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Core—~~17~~19 Credit Hours

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Students must take the following 17 credit hours of courses plus at least two credit hours of graduate seminar.

- MCB 5722C Methods in Biotechnology (4 credit hours) or BSC 6407C Labatory Methods in Molecular Biology (3 credit hours)
- BSC 6432 Structure-Function-Relationships of ~~Biomolecular~~ Biomedical Sciences I (5 credit hours)
- BSC 6433 Structure-Function-Relationships of ~~Biomolecular~~ Biomedical Sciences II (5 credit hours)
- BSC6431 Practice of Biomedical Sciences (3 credit hours)
- MCB 5527 Genetic Engineering and Biotechnology (3 credit hours) or one of the following: BSC5418 Tissue Engineering (3 credit hours), MCB6417C Microbial Metabolism (3 credit hours), PCB5025 Molecular & Cellular Pharmacology (3 credit hours)

Graduate Seminars—2 Credit Hours

Students will participate in at least two graduate seminar courses that will prepare them for making professional presentations with emphasis in biotechnology. The courses will involve participation of speakers from the biotechnology industry with emphasis on an industrial perspective on biotechnology applications and product development.

- MCB 5937 Industrial Perspectives Seminar (1 credit hour) or MCB 6938 (1 credit hour, 1 semester only)

Elective Courses—~~6~~ 3 Credit Hours

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Students will select ~~six~~ three credit hours of restricted electives from the list below.

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- BSC 5418 Tissue Engineering (3 credit hours)
- BSC 5436 Biomedical Informatics: Structure Analysis (3 credit hours)
- BSC 6407C Laboratory Methods in Molecular Biology (3 credit hours)
- IDS 5127 Foundation of Bio-Imaging Science (3 credit hours)
- MCB 5205 Infectious Processes (3 credit hours)
- MCB 5208 Cellular Microbiology: Host-Pathogen Interactions (3 credit hours)
- MCB 5225 Molecular Biology of Disease (3 credit hours)
- MCB 5505 Molecular Virology (3 credit hours)
- MCB 5527 Genetic Engineering and Biotechnology (3 credit hours)
- MCB 5654 Applied Microbiology (3 credit hours)
- MCB 5722C Methods in Biotechnology (4 credit hours)
- MCB 5932 Current Topics in Molecular Biology (3 credit hours)
- MCB 6226 Molecular Diagnostics (3 credit hours)
- MCB 6417C Microbial Metabolism (3 credit hours)
- ~~MCB 6938 Seminar (1–2 credit hours)~~
- PCB 5025 Molecular and Cellular Pharm~~o~~acology (3 credit hours)
- PCB 5236 Tumor Biology (3 credit hours)
- PCB 5238 Immunobiology (3 credit hours)
- ~~PCB 5275 Signal Transduction Mechanisms (3 credit hours~~)
- PCB 5596 Bioinformation and Genomics (3 credit hours)
- PCB 5937 Special Topics: Human Endocrinology (3 credit hours)
- PCB 6528 Plant Molecular Biology (3 credit hours)
- PCB 6595 Regulation of Gene Expression (3 credit hours)
- PCB 5838 Cellular & Molecular Basis of Brain Functions (3 credit hours)
- PCB 5265 Stem Cell Biology (3 credit hour)
- PCB 5937 ST: Cellular Metabolism (3 credit hour)
- PCB 5815 ST: Molecular Aspects of Obesity, Diabetes, & Metabolism (3 credit hours)
- ZOO 5745C Essentials of Neuroanatomy (4 credit hours)
- ZOO 5748C Clinical Neuroanatomy (5 credit hours)
- Others: If approved by the Graduate Committee

Thesis—6 Credit Hours

~~Students will take a minimum of six credits of thesis research (MCB 6971) to complete their research and submit their thesis specializing in biotechnology research. During the first semester, students are expected to familiarize themselves with the research programs by direct interaction with faculty members, through attending seminars or by visiting faculty websites, before choosing a laboratory for thesis research. There will be no laboratory rotation. The student and the Thesis Adviser/Major Professor will jointly recommend an advisory committee comprised of at least three members. The committee composition must reflect expertise relevant to the student's thesis research and must be approved by the Graduate Committee. An oral thesis defense is required. The emphasis of thesis research will be on providing practical training to graduate students and research leading to scholarly publications in peer-reviewed journals.~~

Students will take a minimum of six credits of thesis research (MCB 6971) to complete their research and submit their thesis specializing in biotechnology research. Students are expected to have an in-depth discussion with at least three faculty members before choosing a laboratory for thesis research. The student and the Thesis Adviser/Major Professor will jointly recommend an advisory committee comprised of at least three members. The committee composition must reflect expertise relevant to the student's thesis research and must be approved by the Graduate Committee. Students switching to change the composition of the Thesis Advisory Committee must also obtain approval from the Graduate Committee.

Thesis Proposal

The thesis proposal defense requirement should be met and passed successfully no later than the end of the summer of the first year in the program. Students will not be allowed to register for courses for the Fall semester of their second year until this requirement is fulfilled. The Thesis Proposal requirement includes: 1) a written 5-page thesis proposal; 2) a thesis proposal defense in front of the thesis committee;3) questions by the thesis committee to test the student understanding of the basic concepts in the field and relevant applications. The student will be evaluated on performance in all three sections. Should the student fail, a second opportunity will be provided within 2 weeks of the first attempt. A second failure will result in dismissal from the program.

An oral thesis defense is required. The defense will be in the format of:

- A 50-minute presentation of the thesis work, including a 5-minute introduction
- A 10-minute free period for the general audience to ask questions
- A 1-hour closed-door examination by the Thesis Advisory Committee and the program faculty present

The thesis should be of significant scope and depth such that the work has made advances in the area of biotechnology. The MS thesis research must generate sufficient quantity and quality data to support the submission of a minimum of one manuscript. Approval of the final thesis will require consent from the majority of the Program Faculty who choose to review the thesis, inclusive of the Thesis Advisory Committee. Faculty members with dissenting vote on the thesis must provide written justification. Scientific journal review criteria will be used as guidelines by the faculty to evaluate the final thesis for its appropriateness for publication in the target journal.

Students will be evaluated on the progress in thesis research by the thesis advisory committee for fall and spring. Two consecutive unsatisfactory evaluations will result in dismissal from the program.

Comprehensive Examination~~s~~

~~Students must pass a comprehensive exam to qualify for the Master of Science degree. All students must successfully pass a written comprehensive examination to test the understanding of the basic concepts in the field. This comprehensive examination will use questions provided by the Program Faculty and approved by the Graduate Committee. The comprehensive examination will be offered twice in the summer and may be taken a maximum of two tim~~

Students must pass a comprehensive exam to qualify for the Master of Science degree. All students must successfully pass an oral comprehensive examination to test the understanding of the basic concepts in the field and relevant applications. The Comprehensive Examination will be conducted during the thesis proposal defense. The exam will be administered by the thesis committee. Should the student fail this exam, a second opportunity will be provided within 2 weeks of the first attempt. A second failure will result in dismissal from the program.

~~es.~~

Option for One-Year, Full-time Master of Business Administration (MBA)

Biotechnology MS students have the option to complete a one-year, full-time MBA of 39 credit hours. The MBA Foundation courses (12 credit hours) are required for all non-business majors and are offered in spring and summer and must be completed prior to starting the MBA Professional Core classes. The MBA core courses begin in the fall semester. Up to nine semester hours of graduate course work in MS Biotechnology at UCF may be transferred into the graduate MBA program upon approval of the MBA program director.

Prerequisites—12 Credit Hours

Non-business majors must take the following foundation courses prior to beginning the MBA core courses.

- ACG 6065 Accounting Foundations (3 credit hours)
- ECO 6418 Economic Concepts with Math Applications (3 credit hours)
- ECO 6405 Business Statistical Concepts and Methods (3 credit hours)
- FIN 6404 Foundations of Finance (3 credit hours)

Suggested One Year Schedule to Degree—39 Credit Hours

Fall —15 Credit Hours

- ACG 6425 Managerial Accounting Analysis (3 credit hours)
- ECO 6416 Applied Business Research Tools (3 credit hours)
- MAN 6245 Organizational Behavior and Development (3 credit hours)
- ECO 6115 Economic Analysis of the Firm (3 credit hours)
- One elective course or internship (3 credit hours)

Spring—15 Credit Hours

- MAR 6816 Strategic Marketing Management (3 credit hours)
- FIN 6406 Strategic Financial Management (3 credit hours)
- MAN 6721 Applied Strategy and Business Policy (3 credit hours)
- Two elective courses and/or internship (6 credit hours)

Summer—9 Credit Hours

- GEB 6365 International Business Analysis (3 credit hours)
- ISM 6367 Strategic Information Systems (3 credit hours)
- BUL 6444 Law and Ethics (3 credit hours)

For MBA course requirements, see www.ucfmba.ucf.edu. More detailed information about the full-time MBA is available at www.bus.ucf.edu/graduate/cgi-bin/site/sitew.cgi?page=/programs/mba_year.htx.

INDEPENDENT LEARNING

The required thesis allows the student to engage in independent learning.

Application Requirements

For information on general UCF graduate admissions requirements that apply to all prospective students, please visit the Admissions section of the Graduate Catalog. Applicants must apply online. All requested materials must be submitted by the established deadline.

In addition to the general UCF graduate application requirements, applicants to this program must provide:

- One official transcript (in a sealed envelope) from each college/university attended.
- A bachelor's degree in life sciences.
- Official, competitive GRE score taken in the last five years.
- Three letters of recommendation.
- A written statement of research experience, area of interest, and immediate long range goals.

Admission into the MBA program will require a minimum grade point average of 3.3 in the last 60 hours of an undergraduate degree and a competitive GMAT score. However, for the MS Biotechnology students at UCF, GRE scores will be accepted in lieu of the GMAT. For admission criteria, visit www.ucfmba.ucf.edu. The MBA program begins each fall semester.

Application Deadlines

Biotechnology MS	**Fall Priority**	**Fall**	**Spring**	**Summer**

Domestic Applicants	Jan 15	~~May 1~~	-	-
International Applicants	Jan 15	~~Jan 15~~	-	-
International Transfer Applicants	Jan 15	~~Mar 1~~	-	-

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FINANCIALS

Graduate students may receive financial assistance through fellowships, assistantships, tuition support, or loans. For more information, see Funding for Graduate School, which describes the types of financial assistance available at UCF and provides general guidance in planning your graduate finances. The Financial Information section of the Graduate Catalog is another key resource.

Fellowships

Fellowships are awarded based on academic merit to highly qualified students. They are paid to students through the Office of Student Financial Assistance, based on instructions provided by the College of Graduate Studies. Fellowships are given to support a student's graduate study and do not have a work obligation. For more information, see Fellowships, which includes descriptions of UCF fellowships and what you should do to be considered for a fellowship.

~~Program Profile~~

~~Faculty Profile~~

~~Henry Daniell, PhD~~

~~Read Profile +~~

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Contact Info

Graduate Program

Saleh Naser PhD

Professor

saleh.naser@ucf.edu
Telephone: 407-823-0955
BL 221C Map

Graduate Admissions

Admissions Counselor

gradadmissions@ucf.edu
Telephone: 407-823-2766 ext. 255

Millican Hall 230 Map
Online Application
Graduate Admissions

Mailing Address

UCF College of Graduate Studies
Millican Hall 230
PO Box 160112
Orlando, FL 32816-0112

Institution Codes

GRE: 5233
GMAT: RZT-HT-58
TOEFL: 5233
ETS PPI: 5233

Graduate Fellowships

Sharon Preston
Telephone: 407-823-6497
LaVonda Walker
Telephone: 407-823-0127
gradfellowship@ucf.edu
www.graduate.ucf.edu

Graduate Financial Aid

UCF Student Financial Assistance
Millican Hall 120
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TRACK DESCRIPTION

The Professional Science Master's in Biotechnology in the College of Medicine will prepare students with practical training through biotechnology laboratory courses and an internship in a laboratory environment that requires understanding of scientific concepts. A one-year MBA option provides management skills necessary in business administration.

CURRICULUM

Total Credit Hours Required:

~~43~~ 42 Credit Hours Minimum beyond the Bachelor's Degree

The Professional Science Master's (PSM) track in Biotechnology consists of ~~43~~ 42credit hours of graduate courses offered by the Burnett School of Biomedical Sciences in the College of Medicine, including ~~13~~15 credit hours of required courses and graduate seminar, ~~12~~ 9credit hours of restricted electives, 12 credit hours of professional content courses, and 6 credit hours of an internship as detailed below. The duration of this program will be two semesters and two summers.

What makes this program unique is the focus on practical training offered to graduate students through biotechnology laboratory courses and internship in a laboratory environment that requires understanding of scientific concepts. A one-year MBA option provides management skills necessary in business administration.

Required Courses—~~13~~ 15 Credit Hours minimum

Core—~~10~~ 13 Credit Hours

- ~~MCB~~ PCB 5527 Genetic Engineering and Biotechnology (3 credit hours) or one of the following: BSC 5418 Tissue Engineering (3 credit hours), MCB 6417C Microbial Metabolism (3 credit hours), PCB 5025 Molecular & Cellular Pharmacology (3 credit hour)
- BSC 6431 Practice of Biomedical Sciences (3 credit hours)
- MCB 5722C Methods in Biotechnology (4 credit hours)
- IDS 5127 Foundation of Bio-Imaging Science (3 credit hours)

Graduate Seminar—~~3~~ 2 Credit Hours

Students will participate in at least ~~three~~ two graduate seminar courses. These seminar courses will prepare students for making professional presentations with emphasis in biotechnology and will involve participation of speakers from the biotechnology industry, with emphasis on an industrial perspective on biotechnology applications and product development.

- MCB ~~5937~~ 5314 Industrial Perspectives Seminar (1 credit hour minimum) or MCB6938 (1 credit hour, 1 semester only)

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Elective Courses—~~12~~ 9 Credit Hours

Students will select ~~12~~ 9 credit hours of restricted electives from the list below.

- BSC 5418 Tissue Engineering (3 credit hours)
- BSC 5436 Biomedical Informatics: Structure Analysis (3 credit hours)
- CHS 6535 Forenesic Analysis of Bilogical Materials (2 credit hours)
- CHS 6535L Forensic Analysis of Biological Materials (2 credit hours)
- CHS 6536 Forensic Analysis of DNA Data (2 credit hours)
- GEB 5516 Technological Commercialization (3 credit hours)
- MCB 5205 Infectious Processes (3 credit hours)
- MCB 5225 Molecular Biology of Disease (3 credit hours)
- MCB 5505 Molecular Virology (3 credit hours)
- MCB 5654 Applied Microbiology (3 credit hours)
- MCB 5932 Current Topics in Molecular Biology (3 credit hours)
- MCB 5937 ST: Microbial Stress Response (3 credit hours)
- MCB 6226 Molecular Diagnostics (3 credit hours)
- MCB 6417C Microbial Metabolism (3 credit hours)
- MCB 6938 Seminar (1-2 credit hours)
- PCB 5236 Tumor Biology (3 credit hours)
- PCB 5238 Immunobiology (3 credit hours)
- PCB 5275 Signal Transduction Mechanisms (3 credit hours)
- PCB 5596 ~~Bioinformation and Genomics~~ Biomedical Informatics: Sequence Analysis (3 credit hours)
- PCB 5937 Special Topics: Human Endocrinology (3 credit hours)
- PCB 6528 Plant Molecular Biology (3 credit hours)
- PCB 5838 Cellular & Molecular Basis of Brain Functions (3 credit hours)
- PCB 5265 Stem Cell Biology (3 credit hours)
- PCB 5025 Molecular & Cellular Pharmacology (3 credit hours)
- PCB 5937 ST: Cellular Metabolism (3 credit hours)
- PCB 5815 ST: Molecular Aspects of Obesity, Diabetes & Metabolism (3 credit hours)
- ZOO 5745C Essentials of Neuroanatomy (4 credit hours)
- Others: If approved by Graduate Committee

Professional Courses—12 Credit Hours

Students are required to take the following courses to better equip them to administer the business aspects of biotechnology programs and laboratories. These courses form the foundation prerequisites of the MBA program.

- ACG 6065 Accounting Foundations (3 credit hours)
- ECO 6418 Economic Concepts with Math Applications (3 credit hours)
- ECO 6405 Business Statistical Concepts and Methods (3 credit hours)
- FIN 6404 Foundations of Finance (3 credit hours)

Internship—6 Credit Hours

Students will take a minimum of six credits of internship to complete their studies in a biotechnology setting. Current opportunities for internship include more than fifty biotechnology companies in Florida, research institutions such as the Burnham Institute, MD Anderson Cancer Center, Scripps, Torrey Pines, Florida Hospital, Orlando Regional Medical Center, research centers associated with hospitals, etc. ~~Internships are scheduled in the summer so that students can find internship opportunities within or outside Florida.~~ Students are encouraged to seek internship placement as soon as they enter the program.

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MBA Option

If students wish to complete the MBA, they may do so within one year. The 12 credit hours of the professional courses listed above form the foundation prerequisites required to enter the MBA. These foundation courses are offered in spring and summer and must be completed prior to starting the MBA Professional Core classes.

After completing the PSM track, students may then take the 8 professional core courses and 3 elective courses to complete the MBA. Up to 9 credit hours of credit may be transferred from the PSM into the MBA upon approval of the MBA program director. Most MBA courses will be offered in the evening (5-9 p.m.). The MBA program begins each fall semester.

The intellectual merit of the Professional Science Master's in Biotechnology and the MBA is expressed through the rigorous training offered to students in interdisciplinary scientific areas and in finance and business administration. This additional training and expertise will help students increase their marketability in the industry and enable them to compete for both scientific and non-technical jobs.

If students wish to earn an MBA degree after completion of the PSM in Biotechnology, then they will need to complete the following MBA courses.

- MAN 6245 Organizational Behavior and Development (3 credit hours)
- ECO 6416 Applied Business Research Tools (3 credit hours)
- ECO 6115 Economic Analysis of the Firm (3 credit hours)
- ACG 6425 Managerial Accounting Analysis* (3 credit hours)
- BUL 6444 Law and Ethics* (3 credit hours)
- MAR 6816 Strategic Marketing Management (3 credit hours)
- FIN 6406 Strategic Financial Management (3 credit hours)
- MAN 6721 Applied Strategy and Business Policy (3 credit hours)
- Electives (9 credit hours)

* Students planning to sit for the CPA exam must substitute approved CPA courses for ACG 6425 and BUL 6444.

Application Requirements

For information on general UCF graduate admissions requirements that apply to all prospective students, please visit the Admissions section of the Graduate Catalog. Applicants must apply online. All requested materials must be submitted by the established deadline.

In addition to the general UCF graduate application requirements, applicants to this program must provide:

- One official transcript (in a sealed envelope) from each college/university attended.
- A bachelor's degree in life sciences.
- Official, competitive GRE score taken in the last five years.
- Three letters of recommendation.
- A written statement of research experience, area of interest, and immediate long range goals.

Application Deadlines

Professional Science Master's	Fall Priority	Fall	Spring	Summer
Domestic Applicants	Jan 15	May 1	-	-
International Applicants	Jan 15	Jan 15	-	-
International Transfer Applicants	Jan 15	Mar 1	-	-

FINANCIALS

Graduate students may receive financial assistance through fellowships, assistantships, tuition support, or loans. For more information, see Funding for Graduate School, which describes the types of financial assistance available at UCF and provides general guidance in planning your graduate finances. The Financial Information section of the Graduate Catalog is another key resource.

Fellowships

Fellowships are awarded based on academic merit to highly qualified students. They are paid to students through the Office of Student Financial Assistance, based on instructions provided by the College of Graduate Studies. Fellowships are given to support a student's graduate study and do not have a work obligation. For more information, see Fellowships, which includes descriptions of UCF fellowships and what you should do to be considered for a fellowship.

Read Profile +

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~~**Graduate Program**~~

~~**Saleh Naser PhD**~~

~~Professor~~

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