MEMORANDUM

Date: February 8, 2008

For: Undergraduate Curriculum Committee

Thru: Thomas Waite, COE Dean

From: George A. Maul

Subj: Adding a new course in Environmental Flow Modeling

Attached please find a request to add OCE 4601 / QCN 4601 (dual-listed) "Introduction to Environmental Flow Modeling" to the ocean engineering and the oceanography course offerings.

Computer modeling of flows in the ocean, atmosphere, groundwater, etc. is common in many businesses and government agencies. Undergraduates need to have basic skills in modeling in order to compete for the best jobs and to set the stage for life-long learning as computer models become more ubiquitous. This course will provide that basic skill-set for our students as they matriculate to graduate school or to post-baccalaurean employment, and will cement the use of their earlier programming courses.

We propose the course as a dual offering to attract more students to the topic as well as to emphasize the commonality of skills needed in both science and engineering.

cc: J. Windsor
Florida Institute of Technology

ADDING A NEW COURSE TO THE CURRICULUM

This course is available for student registration only after the approval process has been completed.

SUBJECT OCE COURSE NO. 4601 CREDIT HOURS 3 TERM TO BE ADDED TO THE FILE Fall 2008

CLASS HOURS 3 LECTURE HOURS 3 LAB HOURS CONTACT HOURS (CEU ONLY)

DEPARTMENT Marine and Environmental Systems SCHEDULE TYPE Lecture

☐ COLLEGE OF AERONAUTICS-23 ☐ COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS-25
☐ COLLEGE OF BUSINESS-24 ☐ COLLEGE OF SCIENCE-26
☒ COLLEGE OF ENGINEERING-01 ☐ UNIVERSITY COLLEGE EXTENDED STUDIES-27

COMPUTER TITLE Restricted to 25 characters, including spaces Intro Env Flow Model

CATALOG TITLE Introduction to Environmental Flow Modeling

CATALOG DESCRIPTION OF COURSE Limited to 350 characters, including spaces
Introduces turbulence models, basic numerical simulation and computer modeling of turbulent flows. Includes models of discretization schemes for finite-difference, time marching, stability, Hirt analysis and advection schemes and applies to the ocean and atmosphere. Addresses the effects of stratification. Requires student project and presentation.

In addition, you may attach a course syllabus and/or more detailed description.

RESTRICTIONS ☒ Prerequisite MTH 2201 Course Number
☐ Corequisite Course Number
☐ Prerequisite Course Number
☐ Corequisite Course Number
☐ Prerequisite Course Number
☐ Corequisite Course Number

GRADES TO BE ISSUED ☒ A,B,C,D,F
☐ A,B,C,D,F,CEU
☐ CEU
☐ S,U
☐ P,F
☐ Other

ADDITIONAL RESTRICTION (e.g., Major, Class Level, Department Head Approval)

If this course replaces a course currently offered in BANNER, please indicate old course information

SUBJECT Alpha Prefix (e.g., CSE) COURSE NO. (e.g., 1301)

APPROVALS: Upon completion of appropriate department approvals, submit form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for approval below and forward to Catalog Director.

_____ Originator/Date 2-10-08

_____ Chair, Graduate Council/Date

_____ Originator/Date 2-20-08

OR

_____ Chair, Undergraduate Curriculum Committee/Date

_____ Dean or Associate Dean/Date

CATALOG DIRECTOR

These changes/additions have been made for the University/Extended Studies Catalog and entered into the BANNER term named above.

Catalog Director/Date

REGISTRAR'S USE ONLY

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Florida Institute of Technology - Office of the Registrar
150 West University Boulevard, Melbourne, FL 32901-6975 • (321) 674-8114 • Fax (321) 674-7549
OCE4601 Introduction to Environmental Flow Modeling
Tuesday & Thursday 12:30-1:45 PM, Fall 2008 in XXXX

Instructors: Sen Chiao, Ph.D. & Steven Jachec, Ph.D., P.E.

Chiao Contact: office: Link 205, phone: 321-674-8008, email: schiao@fit.edu

Jachec Contact: office: Link 215, phone: 321-674-7522, email: sjachec@fit.edu

Office Hours: xxxxxxxx and by appointment

Website: http://my.fit.edu/~sjachec/OCE4601_2008.html

Textbook: None. Course notes will be used.

Prerequisites: MTH2201 (Ordinary Differential Equations). Computer programming will be part of homework assignments; acceptable software include: MATLAB, C, C++, and FORTRAN.

Description: Introduction to turbulence models and to basic concepts of numerical simulation and computer modeling of turbulent flows in the environment. Development of models including discretization schemes for finite-difference, time marching, stability, Hirt analysis, advection schemes. Application of models to the ocean and atmosphere. The effects of stratification will be addressed.

Target Audience: Ocean engineers, physical oceanographers, meteorologists, mathematicians, mechanical engineers, and chemical engineers.

Course Outline:

Introduction—models, methods, grids, and properties ........ Week 1
Basic equations .................................................. Week 2
Algorithm development, Introduction to MATLAB ............. Week 3
Taylor series, discretization schemes, and errors/accuracy ..... Week 4
von Neumann stability analysis and Hirt analysis .......... Week 5
Time Marching—explicit and implicit methods ................. Week 6
Solution of linear equation systems (direct) .................. Week 7
Solution of linear equation systems (iterative) ............. Week 8
Advection schemes for nonlinear terms ......................... Week 9
Shallow water wave equations ................................ Week 10
Introduction to turbulent flows ................................ Week 11
Essence of turbulence modeling ................................ Week 12
1D turbulence models .......................................... Week 13
TBD ................................................................. Week 14
Student presentations ............................................ Week 15
Final Grading:

- Homework 60%
- Final Project 40%

Homework and Learning: Homework problems are given throughout the week with a specified due date. Since the class focuses on theory, numerical methods, and coding, the assignments will take some time; so do not wait until the last minute. Late homework will be accepted only one (1) day after the due day beginning with a 50% penalty; it will not be accepted after that. Late homework resulting from extenuating circumstances (e.g., hospitalization, etc.) are handled case by case.

Neatness... Anything you turn in is a reflection on you. Homeworks should be clear and logical. Code should be well-documented. You are expected to turn in hard-copies of you code and graphical results. Code should be logical, and it should have comments such that it can be easily read. Graphical results should have appropriate axes, axis labels, and titles. Legends should be used when applicable.

Fish survive by schooling. I encourage you to do the same by grouping together to help each other... explain concepts, trouble-shoot math errors, debug code, etc. However, you are expected to turn in individual homework assignments.

Final Project: The final project is a substantial part of the course. The topic of the project is determined by the student with the approval of the instructor; it should be related to numerical methods and/or application to the ocean or the atmosphere. Deliverables include a final report with code attached in the appendix and a class presentation.

Class Environment: This course will consist of an energetic, non-threatening environment where student participation is expected. Questions and discussion are encouraged; this is partly how you learn. Disruptive talking in class will not be tolerated; other students are trying to listen and learn.

Attendance: You are responsible for the material presented in class, homework assigned, and your individual final project. In my experience, there is a strong correlation between attending class and doing well in the course.

Important Dates: Late day to drop without receiving a W is xxxxxxxx. Last day to drop with a W is xxxxxx. Final Exam is on xxxxxx.

Students with Disabilities: Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact me as soon as possible to make necessary arrangements (See FIT Student Handbook).

Cheating and Plagiarism: Cheating will not be tolerated and may result in severe academic sanctions (See FIT Student Handbook).