ADDING A NEW COURSE TO THE CURRICULUM

Florida Institute of Technology

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

SUBJECT: OCE (p. CSE)  
COURSE NO: 4570 (p. 1309)  
CREDIT HOURS: 9  
TERM TO BE ADDED TO THE FILE: Fall 2012  

CLASS HOURS: 45  
LECTURE HOURS:  
LAB HOURS:  
CONTACT HOURS (CEU ONLY):  

DEPARTMENT: Marine and Environmental Systems  
SCHEDULE TYPE: Lecture (A)  
(Co. Lecture, Lab or Special Topic/Project)

☐ COLLEGE OF AERONAUTICS - 23  
☐ COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS - 25  
☐ COLLEGE OF SCIENCE - 26  
☐ EXTENDED STUDIES DIVISION / NATHAN M. BISK COLLEGE OF BUSINESS - 90

□ COLLEGE OF BUSINESS - 90

COMPUTER TITLE: Restricted to 25 characters, including spaces  
Hydrodynamics in Ship Design

CATALOG TITLE: Hydrodynamics in Ship Design

CATALOG DESCRIPTION OF COURSE: Restricted to 200 characters, including spaces

Provides an understanding of resistance and powering calculations of different types of vessels. Explains the principles of propeller design and its performance analysis. Introduces the behavior of a vessel in a seaway and determines the significant motions in an irregular seaway.

This description has been approved by the catalog office.  
Date: 9/23/11

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

GRADES TO BE ISSUED:  
☐ A, B, C, D, F  
☐ A, B, C, D, F, CEU/Audit

ADDITIONAL RESTRICTION:  
(Co. Major, Class Level, Department Head Approval)

If this course replaces a course currently offered in BANNER, please indicate old course information and the date term the course may be removed from the system.

SUBJECT: Alpha prefix (p. CSE)  
COURSE NO: 1209  
TERM TO INACTIVATE: Fall 2012

APPROVAL: 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.

Oriignator  
Date: 11/16/10

Registrar's Use Only

SCASCRS  
SCADETN  
SCAPREQ  
SCARBASE

SCARRES  
Operator Info.

Date:  

10-5-11  
10-13-11

OR

Chair, Undergraduate Curriculum Committee  
Date:  

Chair, Graduate Council

Date:  

Dean or Associate Dean  
Date:  

PRESANTA SANTO

Catalog Director  
Date:  

These changes/additions have been made for the University Catalog/policy management system and entered into the BANNER term named above.

Date:  

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Date:  

Date:  

Curriculum Changes in Ocean Engineering

Presently the undergraduate curriculum in OE has namely two courses in senior year, which are:

A: OCE 4575 - Design of High Speed Small Craft and
B: OCE 4573 – Ship Design

Essentially both courses have almost 80% which are common in nature as far as design philosophy is concerned. Students are required to understand the design spiral, design a general arrangement drawing, develop lines plan, undertake weight estimate, perform stability analysis, predict powering performance and generate the final design. The only difference in both courses is the powering and performance prediction and structural analysis.

For Structural Analysis, the course OCE 4572 (Structural Design of Marine Vehicles) is already on offer.

It is hereby suggested that OCE 4575 be retained as it is while the course OCE 4573 (Ship Design) be changed to Hydrodynamics of Ship Design instead of Ship Design. With name change students will gain an insight into a) resistance prediction, b) propeller design and c) dynamics in a seaway. These components are in no way replacement for graduate level courses OCE 5590 (Design of Marine Propulsion System) and OCE 5573 (Dynamics of Marine Vehicles).

With these changes the students would have prior background in resistance, propulsion and seakeeping at an undergraduate level so that they are in a position to undertake Design of High-Speed Small Craft in a more responsible manner.

With this modification it is expected that students would have a better appreciation of overall design of small or large floating bodies. This will also provide a well rounded knowledge of ships and floating structures.

Prasanta K Sahoo
September 2011
2011-12 Catalog Data: OCE 45xx HYDRODYNAMICS IN SHIP DESIGN (3 credits). Provides an understanding and working knowledge on resistance characteristics of different types of vessels and powering estimation. Explains the theoretical principles of propeller operations and performance analysis. Introduction to seakeeping analysis and evaluation of significant motions in an irregular seaway using spectral analysis.

Prerequisites by Topic: Fundamentals of naval Architecture, OCE 4571 and Differential Equations/Linear Algebra MTH 2201

Textbook (T) and References (R):

A comprehensive set of lecture notes will be provided by instructor.


(R) Lewis, E., (1990), *Principles of Naval Architecture*, SNAME publication, New York


(R) Bhattacharyya, R (1978), *Dynamics of Marine Vehicles*,

(R) Technical papers on Resistance, Propulsion and Seakeeping from various Journals and Conference Papers.

Course Learning Outcomes: The student will be able to:

- Explain the influence of vessel parameters on various resistance components.
- Describe the flow phenomenon around a ship’s hull and explain the influence of laminar/turbulent flows around the hull.
- Demonstrate an ability to calculate the total resistance of a vessel using the scaling laws.
- Produce a critical analysis of a recent research paper on resistance of mono or multi-hull vessel.
- Explain the principles of propeller operation.
- Explain the momentum theory and blade element theory of propellers.
- Demonstrate an ability to perform a preliminary design of a propeller based on limited data.
- Investigate the influence of parameters on the thrust, torque and efficiency of a propeller.
- Propose a matrix to develop the propeller and thrust characteristics from model scale.
- Construct a set of $K_T$, $K_Q$, $J$ curves for a propeller.
- Investigate the causes of cavitation, its detrimental effects and how to prevent it occurring on a propeller.
• Explain the theories of calm water motions on a vessel.
• Demonstrate an ability to calculate the motions from principal particulars of a ship.
• Explain the theories behind regular and irregular seaway and spectral density.
• Demonstrate an ability to make statistical analysis and use of Rayleigh distribution of wave data.
• Demonstrate an ability to perform a motion analysis and determine significant motions.

**Topics Covered and Associated Time:**

1. Background Theory, Laminar & Turbulent Flows (2 class)
2. ITTC Methods & Form factor (3 class)
3. Wave Resistance & Trim Effects (3 class)
4. Bulbous bow, Systematic Series. (3 class)
5. Intro to propulsion & geometry (4 class)
6. Propeller interaction (4 class)
7. Propeller Theory (4 class)
8. Propeller Design (4 class)
9. Heave, Pitch and Roll motions (3 class)
10. Wave headings and spectral density (3 class)
11. Statistical Analysis of wave data (2 class)
12. Irregular seaway and various spectrums (4 class)
13. Motion analysis (3 class)
14. Revision of entire course (3 class)

**Class/Laboratory Schedule:** Fall, Tuesday/Thursday, Time to be decided

**Contribution of Course to Meeting the Professional Component:** Engineering Science: 2 credits or 67%. Engineering Design: 1 credit or 33%

**Relationship of Course to Program Outcomes:**

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<th>Course Outcomes</th>
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<th>Program Outcomes</th>
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<tr>
<td>A. Ability to apply knowledge of mathematics, science and engineering</td>
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<td>B. Ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>C. Ability to design a system, component or process to meet desired needs</td>
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<td>D. Ability to function on multi-disciplinary teams</td>
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<td>E. Ability to identify, formulate and solve engineering problems</td>
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<td>F. Understanding of professional and ethical responsibility</td>
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<td>G. Ability to communicate effectively</td>
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<td>H. Broad education to understand the impact of engineering solutions in global and societal context</td>
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<td>I. Recognition of the need for, and an ability to engage in life-long learning</td>
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<td>J. Knowledge of contemporary issues</td>
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<td>K. Ability to use the techniques, skills, and engineering tools necessary for engineering practice</td>
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<td>L. Knowledge and skills to apply principles of probability and statistics</td>
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<td>M. Knowledge and skills to apply the principles of oceanography, waves and acoustics to engineering problems</td>
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<td>N. An ability to integrate multiple technical areas</td>
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<td>O. An understanding of the necessity for design optimization</td>
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Prepared By: Prasanta K Sahoo, Ph.D., Associate Professor of Ocean Engineering, 9/2011