APPLICATION FOR NEW COURSE

1. Submitted by College of ___________________________ Date April 4, 2005
   Department/Division offering course Mechanical Engineering

2. Proposed designation and Bulletin description of this course
   a. Prefix and Number ME 565
   b. Title* Scale Modeling in Engineering
      *NOTE: If the title is longer than 24 characters (including spaces), write
      A sensible title (not exceeding 24 characters) for use on transcripts
      Scale Modeling in Engr.
   c. Lecture/Discussion hours per week 3
   d. Laboratory hours per week 0
   e. Studio hours per week 0
   f. Credits 3
   g. Course description
      A study of the concepts of scale modeling in engineering applications. The course will include dimensionless
      numbers, scaling laws, and their application in engineering design and research.
   h. Prerequisites (if any)
      ME 310, 321, 325
   i. May be repeated to a maximum of 0 (if applicable)

4. To be cross-listed as n/a
   Prefix and Number ___________________________
   Signature, Chairman, cross-listing department ___________________________

5. Effective Date Fall 2005
   (semester and year)

6. Course to be offered Fall
   [ ] Fall [ ] Spring [ ] Summer

7. Will the course be offered each year? Yes [ ] No [ ]
   (Explain if not annually)

8. Why is this course needed?
   The scale modeling technique offers at least two unique benefits: (1) It can be used to validate computational model
   predictions and (2) scale models can be used as a preliminary experimental tool to quickly test a new design.

9. a. By whom will the course be taught? Kozo Saito, or other departmental faculty
   b. Are facilities for teaching the course now available? Yes [ ] No [ ]
      If not, what plans have been made for providing them?
**APPLICATION FOR NEW COURSE**

10. What enrollment may be reasonably anticipated? __15__

11. Will this course serve students in the Department primarily?  
   Will it be of service to a significant number of students outside the Department?  
   If so, explain. 
   ☐ Yes ☐ No  
   ☐ Yes ☐ No

Will the course serve as a University Studies Program course? 
☐ Yes ☐ No
If yes, under what Area?

12. Check the category most applicable to this course
   ☐ traditional, offered in corresponding departments elsewhere;  
   ☐ relatively new, now being widely established  
   ☑ not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky?  
   ☑ Yes ☐ No

14. Is this course part of a proposed new program?  
   If yes, which?  
   ☐ Yes ☒ No

15. Will adding this course change the degree requirements in one or more programs?*  
   If yes, explain the change(s) below  
   ☐ Yes ☐ No

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted. ☐

18. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales. ☐

19. Within the Department, who should be contacted for further information about the proposed course?  
   Name: Kozo Saito  
   Phone Extension 257-6336, ext. 80639

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.
APPLICATION FOR NEW COURSE

Signatures of Approval:

Department Chair

Dean of the College

Approved at Department of Mechanical Engineering Faculty Meeting of April 20, 2005. Vote: unanimous.

4/20/05

Date

11/9/05

Date

10/20/05

Date of Notice to the Faculty

*Undergraduate Council

*University Studies

*Graduate Council

*Academic Council for the Medical Center

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Rev 8/02
ME 565 SCALE MODELING IN ENGINEERING  
Department of Mechanical Engineering, U. of Kentucky  
(2005 Fall Semester): Meet RGAN Building Room 202

Instructor: K. Saito, Office: Room 159 RGAN Building, Tel: 7-6336, Ext. 80639  
E-mail: saito@engr.uky.edu, office hours: Monday and Wednesday 3:00 – 4:30PM


Handouts: A copy of representative articles from the Proceedings of International Symposia on Scale Modeling and other sources will be distributed.

Course Contents:

1. Introduction  
2. Similarity, pi-numbers and scaling laws  
3. Derivation of scaling laws (law approach, equation approach, parameter approach)  
4. Characteristic and specific parameters  
5. Design of scale model experiments  
6. Pilot and production tests  
7. Partial scaling and relaxation technique  
8. Plotting results using pi-numbers  
9. Scale modeling vs. numerical modeling  
10. The use of scale models in R&D  
11. Lean principle-based R&D (Waste elimination, R4D and R&D)  
12. The use of scale models in new product developments  
13. Group project (Design of a simple scale model experiment, interpreting results, presenting results, writing report, and discussion).

Course Objectives

Upon completion of this course, UG students should be able to:

(1) Understand principles of scale modeling in comparison to numerical and theoretical methods.

(2) Understand scaling laws, physical meanings of pi-numbers, scale-up and scale down methods.

(3) Understand the concept of partial scaling and apply it to simple engineering problems.

(4) Design simple scale model experiments and analyze the data.

(5) Use scale models in R&D process.

Additional for Graduate students only:

(6) apply CFD calculations to compare scale model experimental results.

Additional Requirements for Graduate Students

(1) CFD calculations using commercial CFD codes

(2) Reading and interpreting published articles on advanced scaling problems

(3) Advanced heat transfer analysis

Grading and Distribution

Exams 30%; Projects 50%; Homework (3 to 4) 20%.  
A > 90; 89>B>80; 79>C>70; 69>D>60, fail <59.
ME565 Scale Modeling  
(TE 2:00PM-3:15PM, Location: RGAN 202)  

A special lecture by Mr. Jim Boyd is planned.  

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