Wilkes University Curriculum Committee

PROPOSAL SUBMITTAL FORM

Directions:
- Use this set of forms for all proposals sent to the Curriculum Committee.
- Pages 1-3 of this document are required. Any unnecessary forms should be deleted from the packet before submissions. If multiple forms are needed (course addition, course deletion, etc), simply copy and paste additional forms into this packet.
- Note that all new programs (majors and minors), program eliminations, significant program revisions and all general education core revisions must be reviewed and approved by the Provost and Academic Planning Committee (APC) prior to submission to the Curriculum Committee. The Provost will make the decision if a program revision requires APC review.
- Completed and signed forms are due no later than the second Tuesday of every month. Submit one signed original hard copy and a scanned electronic copy with all signatures to the Chair of the Curriculum Committee.

1. Originator: Edward T. Bednarz III, Ph.D.
   Department of Mechanical Engineering and Engineering Management
   (570)408-7913 / Edward.Bednarz@Wilkes.edu

2. Proposal Title: Inverse Problems in Mechanics

3. Check only one type of proposal: (double click on the appropriate check box and change default value to “checked”).

☐ New Program. (Major or Minor Degree Programs). This requires prior review and approval by the Provost and APC.
☐ Elimination of Program. (Major or Minor Degree Programs). This requires prior review and approval by the Provost and APC.
☐ Program Revision. Significant revisions to a program require review and approval by the Provost. The Provost determines if review and approval by APC is necessary.
☐ General Education Revision. Submissions only accepted from the General Education Committee (GEC). Must be reviewed and approved by the Provost.
☐ Creation of new departments, elimination of existing department. This requires prior review and approval by the Provost and APC.
☒ Course additions or deletions not affecting programs (such as elective courses, transition of “topics” courses to permanent courses).
☐ Change in course credit or classroom hours.
☐ Incidental Changes. Includes changes in course/program title, course descriptions, and course prerequisites. (Although these changes do require approval by the Curriculum Committee, they do not go before the full faculty for approval).
☐ Other (Specify)
4. Indicate the number of course modification forms that apply to this proposal:

   _____1___  Course Addition Form (plus syllabi)
   _______    Course Deletion Form
   _______    Course Change Form

5. Executive Summary of Proposal.
   Briefly summarize this proposal. The breadth and depth of this executive summary should
   reflect the complexity and significance of the proposal. Include an overview of the
   proposal, background and reasoning behind the proposal and a description of how the
   proposal relates to the mission and strategic long-range plan of the unit and/or university.
   For incidental changes a one or two sentence explanation is adequate.

Inverse Problems in Mechanics is intended to serve as a technical elective for undergraduate and
graduate Mechanical Engineering students. The course has successfully run three times under ME
498 Special Topics and is looking to transition to a permanent course number of ME 314.

6. Other specific information. (Not applicable for incidental changes.)

   What other programs, if any, will be affected by this proposal? Describe what resources
   are available for this proposal. Are they adequate? What would be the effect on the
   curriculum of all potentially affected programs if this proposal were adopted? Include any
   potential effects to the curriculum of current programs, departments and courses.

   The proposed course would be taken by ME seniors as an advanced technical elective or by
   MSME students. The course has successfully run three times with enrollments up to 30 students.
   The engineering curriculum requires technical electives and this course provides depth to the
   subject of solid mechanics and measurement techniques.

7. Program Outline. (Not applicable for incidental changes).
   A semester-by-semester program outline as it would appear in the bulletin for a new
   program or any modified program with all changes clearly indicated.

Not applicable
8. Signatures and Recommendations. (please date)
   - Signatures of involved Department chair(s) and Dean(s) indicate agreement with the proposal and that adequate resources (library, faculty, technology) are available to support proposal.
   - If a potential signatory disagrees with a proposal he/she should write "I disagree with this proposal" and a signed statement should be attached to this submission.

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<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Henry Castejon / Chair, Mechanical Eng. and Eng. Mgt. Department chair(s) of all potentially affected programs</td>
<td></td>
<td>July 28, 2015</td>
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<tr>
<td>William Hudson / Dean, College of Science and Eng. Dean (s) of any potentially affected College/School</td>
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<td>July 28, 2015</td>
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<tr>
<td>Susan Hritzak</td>
<td>Signature</td>
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<td>Registrar</td>
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Wilkes University Curriculum Committee
1. Course Title: Inverse Problems in Mechanics

2. Course Number: ME 314 (undergraduate) and ME 414 (graduate)
   Coordinate with Registrar to insure course number is available

3. Course Credit Hours:
   Classroom Hours ___3___  Lab Hours _______  Other _______

4. Course Prerequisites: ME 333

5. Course Description (as proposed for the Bulletin): Course descriptions provide an overview of the topics covered. If the course is offered on a scheduled basis, i.e. every other year, or only during a set semester, note this in the description. Course descriptions should be no more than two to three sentences in length.

   Inverse problems are very common in engineering where the outputs are known but the inputs are unknown. This course will show how to properly setup a well-posed inverse problem, how to solve matrix inverses, and conduct hands on experiments by creating strain gage based force transducers.

6. Required Documentation:
   Proposed Syllabus  Attach proposed syllabus immediately after this document. In some situations the official syllabus may contain information which is beyond the review needs of the Curriculum Committee (such as extensive rubrics, etc). It is permissible to attach an abbreviated syllabus. In general, syllabi (whether full or abbreviated) should contain the following information: Course Title, Course Number, Credit hours, Faculty Information (name contact information, office hours), Course Description, Course Outcomes or Objectives, Assessment (grading) informations, required texts (or other things such as tools, software, etc), pertinent policies and a proposed schedule of topics.
Wilkes University - Department of Mechanical Engineering and Engineering Management

Syllabus – Inverse Problems in Mechanics – ME498

A. GENERAL INFORMATION:  Technical Elective
Instructor: Dr. Edward T. Bednarz III, Assistant Professor of Mechanical Engineering
Contact Info: SLC 145, Office Hrs: MW 2:30-3:30 PM and TR 1:00-2:30 PM
Phone: 570-408-7913
E-Mail: Edward.Bednarz@wilkes.edu
Reference Texts: Scientific Data Analysis: An Introduction to Overdetermined Systems - Branham
Parameter Estimation and Inverse Problems - Aster, Borchers, and Thurber

B. CATALOG DESCRIPTION:
ME 498 – Inverse Problems in Mechanics Three credits
Inverse problems are very common in engineering where the outputs are known but the inputs are unknown. This course will show how to properly setup a well-posed inverse problem, how to solve matrix inverses, and conduct hands on experiments by creating strain gage based force transducers.
Prerequisite: ME 333

C. LEARNING OBJECTIVES:
1. Solve matrix inverse problems (a, e, k)*
2. Analyze shear force and bending moment diagrams (a, e, k)
3. Use measured strain to calculate input forces (a, e, k)
4. Effect of boundary conditions (a, e, k)
5. Design beams with constantly changing cross sections that have constant stress distributions (a, b, c, d, e, f, g, k)
   * The letters in parenthesis refers to ABET outcomes

D. RELATIONSHIP OF THE COURSE OUTCOMES TO ABET (Criterion 3) OUTCOMES:
The Accreditation Board for Engineering and Technology (ABET) Criteria 2000 define a number of program outcomes that all graduates of ABET accredited Engineering programs must have. How this course is related to ABET outcomes (a-k) is listed below:
Outcomes a, e, and k are central to the course. These outcomes are attained by learning principles of inverse problems. By solving homework problems and exam problems, the student applies theories of mathematics, physics and engineering as well as gaining problem solving skills.
Outcomes a, b, c, d, e, f, g and k are implemented for the group design project which emphasizes teamwork and the ability to communicate effectively via a written paper and in class presentation.

E. TOPICS COVERED:
Inverse problems in linear algebra, shear force and bending moment diagrams, stress and strain relationship, design of force transducers using strain gage based methods, and strain gage application.

F. PREREQUISITES BY TOPIC:
- Calculus
- Microsoft Word, PowerPoint, and Excel
- Knowledge of determining normal, bending, shear, and torsional stress.
G. HOMEWORK, QUIZ, AND EXAM, PROJECT SCHEDULE:
   1. Homework, lab report and attendance will consist of 25% of the final grade.
   2. Late HW will receive partial credit.
   3. If working with other people on a homework assignment, be sure to list their names.
   4. Homework must be handed in individually.
   5. Attendance is mandatory! Two sessions absentee will receive a zero final grade for the course.
   6. There will be one midterm exam (25%) and one non-cumulative final exam (25%).
   7. No makeup will be given on exams.
   8. There will be a group design project (25%).

H. GRADING:
The final course grade will be determined as follows: ≥ 90% = 4.0; 85-89.9% = 3.5; 80-84.9% = 3.0;
75-79.9% = 2.5; 70-74.9% = 2.0; 65-69.9% = 1.5; 60-64.9% = 1.0; < 60% = 0.0

I. Methods of Assessment:
   Graded HW                  Graded Exams                        Design and Research Projects
   Instructor Judgment        Course Evaluations by students      Faculty Course Assessment
   Program skills surveys (performance criteria)