APPLICATION FOR NEW COURSE

1. Submitted by College of ___________________________ Engineering ___________________________ Date 14 May 2004

   Department/Division offering course Mechanical Engineering ___________________________

2. Proposed designation and Bulletin description of this course

   a. Prefix and Number ME 510
   b. Title* Vibro-Acoustic Design in Mechanical Systems

   *NOTE: If the title is longer than 24 characters (including spaces), write
   A sensible title (not exceeding 24 characters) for use on transcripts Vibro-Acoustics

   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

   Application of basic acoustics and vibrations to engineering problems in vibro-acoustic design. The objective is to
   acquaint the student with the tools used in industry for noise and vibration control and to make the student aware of the
   major applications of such tools in the automotive, aerospace, and consumer product industries.

   h. Prerequisites (if any)

   ME 340

   ME 310

   i. May be repeated to a maximum of ___________________________ (if applicable)

4. To be cross-listed as

   Prefix and Number ___________________________ Signature, Chairman, cross-listing department ___________________________

5. Effective Date S05 ___________________________ (semester and year)

6. Course to be offered
   □ Fall  □ Spring  ☒ Summer

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

8. Why is this course needed?

   Course will help students apply other topics in required courses to design of systems.

9. a. By whom will the course be taught? Andrew F. Seybert

   b. Are facilities for teaching the course now available?
   If not, what plans have been made for providing them?
   ☒ Yes  □ No

   ___________________________  ___________________________  ___________________________

   MOV 15 2005
APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated? 10 (on site)

11. Will this course serve students in the Department primarily? ☒ Yes ☐ No
    Will it be of service to a significant number of students outside the Department?
    If so, explain.
    Course was offered to WKU via ITV during S04; likely will be offered again.

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

13. 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

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

15. Is this course part of a proposed new program:
    If yes, which?

16. Will adding this course change the degree requirements in one or more programs?*
    If yes, explain the change(s) below

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

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

19. 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. ☒ Check here if 400G-500.

20. Within the Department, who should be contacted for further information about the proposed course?
    Name  Andrew F. Seybert  Phone Extension  76336 x 80645

*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:

[Signatures]

Department Chair

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

Date

Date

Date of Notice to the Faculty

*Undergraduate Council

*University Studies

*Graduate Council

*Academic Council for the Medical Center

*Senate Council (Chair)

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

ACTION OTHER THAN APPROVAL

Rev 8/02
ME 510

Vibro-Acoustic Design in Mechanical Systems

New Course Application

Teaching Objectives:

1. To bring together theory in other mechanical engineering courses and apply it to the design of mechanical systems having vibro-acoustic requirements
2. To introduce elementary acoustics concepts and terminology to students
3. To provide the student an experience using software tools in vibro-acoustics such as ANSYS and SYSNOISE
4. To give the student an individual vibro-acoustics design experience (project)

Learning Outcomes: After completion of the course, students will be able to:

1. Apply vibration concepts to the solution of problems of isolation and forced response
2. Understand basic acoustic concepts of emission, transmission, and reception
3. Use software tools such as ANSYS and SYSNOISE for modeling vibro-acoustics systems.
4. Select and apply sound absorbing materials
5. Calculate the sound transmission loss of panels and walls
6. Analyze and design a simple acoustical filter (muffler)
7. Make basic vibration measurements, including measurement of modes.
8. Make basic acoustic measurements such as sound pressure, sound intensity, and sound power
9. Know and use proper terminology on the topic of vibro-acoustics

Text: None. Handouts will consist of copies of relevant chapters of reference materials and copies of Power Point slides. The download site for slides and homework is: http://www.engr.uky.edu/vac/ME599/

Differentiation between undergraduate and graduate students:

Graduate students are expected to perform at a level consistent with that of an MS or Ph.D. student. This will include extra problems on each test and a more comprehensive project compared to those students registered as undergraduates.

List of topics and schedule: see attached schedule from Spring 2004

Grading Scale: 90-100, A; 80-89, B; 70-79, C; 60-69, D; <60, E.
Date: Lecture Topic:

Jan. 14 00. Introduction – lab demonstration on structural acoustics
Jan. 16 01. Auditory demonstrations in acoustics
Jan. 19 No class
Jan. 21 02. Review of mechanical vibration
Jan. 23 02. Review of mechanical vibration
Jan. 26 03. Design of vibration isolation systems
Jan. 28 04. Modal and harmonic analysis using ANSYS
Jan. 30 04. Modal and harmonic analysis using ANSYS
Feb. 02 04. Modal and harmonic analysis using ANSYS
Feb. 04 05. Fourier analysis – theory and practice
Feb. 06 05. Fourier analysis - theory and practice
Feb. 19 06. Experimental modal analysis/curve fitting
Feb. 11 Review/Problem Session
Feb. 13 **Test 1**
Feb. 16 07. Vibration measurements
Feb. 18 07. Noise Measurements
Feb. 20 08. Vibration and noise of mechanical components
Feb. 23 08. Vibration and noise of mechanical components
Feb. 25 09. Plane harmonic sound waves
Feb. 27 09. Plane harmonic sound waves
Mar. 01 10. BEM and SYSNOISE
Mar. 03 10. BEM and SYSNOISE
Mar. 05 10. BEM and SYSNOISE
Mar. 08 Project definition
Mar. 10 11. Spherical sound waves
Mar. 12 **Test 2**
Mar. 15 (or 22) (Open)
Mar. 17 (or 24) 12. Sound intensity and power – theory and experiment
Mar. 19 (or 26) 12. Sound intensity and power – theory and experiment
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 29</td>
<td>13. Sound absorbing materials</td>
</tr>
<tr>
<td>Mar. 31</td>
<td>13. Sound absorbing materials</td>
</tr>
<tr>
<td>Apr. 02</td>
<td>14. Sound in enclosures</td>
</tr>
<tr>
<td>Apr. 05</td>
<td>15. Room acoustics</td>
</tr>
<tr>
<td>Apr. 07</td>
<td>15. Room acoustics</td>
</tr>
<tr>
<td>Apr. 09</td>
<td>16. Sound transmission through walls and panels</td>
</tr>
<tr>
<td>Apr. 12</td>
<td>16. Sound transmission through walls and panels</td>
</tr>
<tr>
<td>Apr. 14</td>
<td>17. Design of mufflers and silencers</td>
</tr>
<tr>
<td>Apr. 16</td>
<td>17. Design of mufflers and silencers</td>
</tr>
<tr>
<td>Apr. 19</td>
<td>18. Design of Loudspeakers</td>
</tr>
<tr>
<td>Apr. 21</td>
<td>18. Design of Loudspeakers</td>
</tr>
<tr>
<td>Apr. 23</td>
<td>Test 3</td>
</tr>
<tr>
<td>Apr. 26</td>
<td>Project presentations</td>
</tr>
<tr>
<td>Apr. 28</td>
<td>Project presentations</td>
</tr>
<tr>
<td>May 30</td>
<td>Project presentations</td>
</tr>
</tbody>
</table>

AFS, 23 December 2003