January 19, 2017

PROFESSOR BENSON SHING, Chair  
Department of Structural Engineering

PROFESSOR MICHAEL TODD  
Department of Structural Engineering

SUBJECT: Proposal for Changes to the MS degree in Structural Engineering with a Specialization in Health Monitoring, Prognosis, and Validated Simulations (SHMP&VS)

At its January 9, 2017 meeting, the Graduate Council reviewed the proposed changes to the MS in Structural Engineering with Specialization in Health Monitoring, Prognosis, and Validated Simulations (SHMP&VS). The Council made the following decisions on the requested actions:

1. Changes to the name of the MS degree
   The Council approved changing the name of the MS in SHMP&VS to an MS in Structural Health Monitoring and Non-Destructive Evaluation. The Council determined that the requested change represents a simple name change. The Graduate Council will request that the proposal be placed on the January 31, 2017 Representative Assembly agenda. The proposal must also be forwarded to the Coordinating Committee on Graduate Affairs (CCGA) for Systemwide review. If approved by the end of the 2016-17 academic year, the name change will be effective for cohorts entering the program in Fall Quarter 2017 and after. The Council supports permitting continuing students to choose whether to receive the MS degree in SHMP&VS or the MS degree in Structural Health Monitoring and Non-Destructive Evaluation.

2. Curriculum changes for the MS degree
   The Council approved the proposed changes to the curriculum, which include options to complete the degree with either a thesis or a comprehensive exam. If CCGA completes its review by the end of the 2016-17 academic year, the changes will be effective Fall Quarter 2017.

3. Change in the units required
   The Council approved reducing the number of required units from 48 to 36. If CCGA completes its review by the end of the 2016-17 academic year, the changes will be effective Fall Quarter 2017.

4. Synchronous learning mode
   The Council supports the Department’s plan to offer the program in a synchronous learning mode using the technologies described in the proposal. Prior to offering the Program through this modality, the Department must obtain approval from the Western Association of Schools and Colleges (WASC). WASC considers offering 50% or more of a degree program through a technologically-mediated mode of instruction to be a substantive change that requires its approval. Barbara Sawrey, Associate Vice Chancellor for Academic Affairs and Dean of Undergraduate Education, is UCSD’s Accreditation Liaison Officer to WASC. Please contact AVC/Dean Sawrey to initiate the WASC review process. The effective date for the proposed use of the synchronous learning mode will depend on the actual date of completion of the WASC review process.

Sincerely,

Richard Arneson, Chair  
Graduate Council

cc: F. Ackerman  M. Allen  Y. Bazilevs  S. Cassedy  K. Johnson  A. Pisano  
    R. Rodriguez  K. Roy  B. Sawrey
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La Jolla, CA 92093-0085

November 29, 2016

To: Graduate Council

From: Benson Shing, Professor and Chair, Department of Structural Engineering  
CC: Michael Todd, Professor and SHM Advisor  
Yuri Bazilevs, Professor and Department Vice Chair

Re: Proposal for Curriculum Changes to the MS in Structural Engineering with Specialization in Health Monitoring, Prognosis, and Validated Simulations (SHMP&VS)

Dear Graduate Council Members:

The Department of Structural Engineering (SE) currently offers a MS in SHMP&VS, and we are proposing:

1. Changes to the name of the degree
2. Curriculum changes for the MS in SHMP&VS
3. Change in the units required
4. Retain synchronous learning mode

These proposed changes are a result of: a thorough review of the graduate curriculum by the Graduate Affairs Committee, feedback from our students (during a series of open town hall type meetings), and in response to the Graduate Program Review to request for timely graduation and reduction in the number of units required to graduate. The proposed effective date for implementing these changes is Fall 2017.

We feel these changes will better serve our students in terms of providing a better education.

A. Changes to the name of the degree
The department is requesting to change the name of the MS in SHMP&VS to MS in Structural Health Monitoring and Non-Destructive Evaluation. The current name of the degree does not reflect the degree program. The department feels that changing the name to Structural Health Monitoring and Non-Destructive Evaluation will also attract a broader scope of students.

B. Curriculum changes for the MS
The new proposed curriculum will be a total of 36 units (equivalent to 9 classes) with either a thesis or a non-thesis (comprehensive) option. The two curricular options are described below in this table:
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Thesis option (units)</th>
<th>Comprehensive option (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core course</td>
<td>SE 263 “Nondestructive Evaluation” (4) [1]</td>
<td>SE 263 “Nondestructive Evaluation” (4) [1]</td>
</tr>
<tr>
<td></td>
<td>SE 265 “Structural Health Monitoring Principles” (4)</td>
<td>SE 265 “Structural Health Monitoring Principles” (4)</td>
</tr>
<tr>
<td>Capstone experience</td>
<td>No requirement</td>
<td>SE 296 “Independent Study” or approved equivalent (4)</td>
</tr>
<tr>
<td>Thesis research</td>
<td>SE 299 “Graduate Research” (8)</td>
<td>No requirement</td>
</tr>
<tr>
<td>Focus sequence 1</td>
<td>One from FS 1 (4)</td>
<td>One from FS 1 (4)</td>
</tr>
<tr>
<td>Focus sequence 2</td>
<td>Two from FS 2 (8)</td>
<td>Two from FS 2 (8)</td>
</tr>
<tr>
<td>Focus sequence 3</td>
<td>Two from FS 3 (8)</td>
<td>Two from FS 3 (8)</td>
</tr>
<tr>
<td>Technical elective</td>
<td>No requirement</td>
<td>One from TE (4)</td>
</tr>
<tr>
<td><strong>Total units</strong></td>
<td><strong>36</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

The list of FS classes referred to in the table above are listed below:

<table>
<thead>
<tr>
<th>FS 1 “Sensing”</th>
<th>FS 2 “Data Interrogation”</th>
<th>FS 3 “Modeling and Analysis”</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE 266 “Smart and Multifunctional Materials”</td>
<td>ECE 251A “Digital Signal Processing I”</td>
<td>SE 207 “Validation and Verification of Computational Models” [2]</td>
</tr>
<tr>
<td>SE 268 “Structural System Testing and Model Correlation”</td>
<td>ECE 251C “Filter Banks and Wavelets”</td>
<td>SE 203 “Structural Dynamics”</td>
</tr>
<tr>
<td>ECE 257B “Principles of Wireless Networks”</td>
<td>ECE 254 “Detection Theory”</td>
<td>SE 206 “Random Vibrations”</td>
</tr>
<tr>
<td></td>
<td>SE 268 “Structural System Testing and Model Correlation”</td>
<td>SE 224 “Structural Reliability and Risk Analysis”</td>
</tr>
<tr>
<td></td>
<td>CSE 254 “Statistical Learning”</td>
<td>SE 235 “Wave Propagation in Elastic Media” or MAE 238 “Stress Waves in Elastic Media”</td>
</tr>
</tbody>
</table>
Probabilistic Reasoning and Learning”  
CSE 250B “Principles of Artificial Intelligence: Learning Algorithms”  
ECE 271A Statistical Learning I  
ECE 271B Statistical Learning II  

Solids”  
SE 236 “Wave Propagation in Continuous Structural Elements”  
SE 253A “Mechanics of Laminated Composite Structures I”  
SE 262 “Aerospace Structures Repair”  
SE 254 “FRPs in Civil Structures”  
SE 268 “Structural System Testing and Model Correlation”  

For the technical elective (TE) course, it may be chosen from any of the FS lists above (provided it’s not being counted as an FS requirement) or from this additional pre-approved TE list:

SE 200 “Applied Mathematics in Structural Engineering”  
SE 253B “Mechanics of Laminated Composite Structures II”  
MAE 273A “Dynamic Behavior of Materials”  
SE 201A “Advanced Structural Analysis”  
SE 260 “Aerospace Structural Mechanics I”  
ECE 250 “Random Processes”  
SE 204 “Advanced Structural Dynamics”  
SE 276B “Finite Elements in Solid Mechanics II”  
ECE 241D “Array Processing”  
SE 234 “Plates and Shells”  
MAE 208 “Mathematics for Engineers”  
ECE 255AN “Information Theory”  
MAE 272 “Imperfections in Solids”  
ECE 272A “Stochastic Processes in Dynamic Systems”  
ECE 275A “Parameter Estimation I”  
CSE 250C “Machine Learning Theory”

[1] Course approval submitted and in review  
[2] An SE 207 that needs a permanent number

Prerequisite Training
Students seeking to pursue the M.S. program in Structural Health Monitoring and Nondestructive Evaluation should have an undergraduate degree in Mechanical, Aerospace, Civil, or Structural Engineering. As part of those undergraduate degrees, or through equivalent course completion elsewhere, students must have programming skills in Matlab (e.g., SE 9), SE 101C, SE110A and
SE 125 as prerequisites to admission into the M.S. program. Exceptions to this will only be granted through explicit approval of the M.S. program director.

C. Change in the units required
The department felt that the original units required (48 units) was too long and we would also like to keep up with our competing schools, like Stanford University and UC Berkeley. Most universities offer a one year program, and we would like to recruit top candidates.

D. Retain synchronous learning mode
Historically, lecturers who have participated in teaching courses to LANL employees enrolled in the SHM degree program have relied on the Polycom videoconferencing system or Skype, once the CLICS system was discontinued at UCSD. Polycom has been unreliable, with inconsistent audio or video streams in one or both directions; and upgrades to the now-outdated hardware being used are expensive. Skype has worked well, but has limited capabilities.

Beginning in Fall 2016, the SHM program launched real-time synchronous broadcasts to LANL via VSee, a technology that was originally developed for telemedicine/telehealth applications, so it's encrypted and is also HIPAA-compliant. It has several advantages over Skype, including:
- Higher quality video
- Free group video chat (Skype no longer charges a fee, but has a limit to hours of use)
- Ability to share a specific application or window, and not an entire desktop. The people participating in the video call are always visible, because VSee allows a user to send up to 4 simultaneous video streams from a single device. With a single click, a lecturer can share their presentation slides or other images/video relevant to the lecture.
- VSee uses 256 bit FIPS 140-2 AES encryption for all traffic (everything is always encrypted)
- Annotation: this is especially useful in a distance-learning environment. A lecturer can share a PowerPoint presentation, with remotely located students, and the annotation feature allows these students to draw or write text on the shared presentation, to highlight (for example) information related to a specific question.

Below is a screen shot of what a user may see on a VSee video call. The document with the orange border is the only part of the desktop that the LANL colleague sees.
Sincerely yours,

Benson Shing
Professor and Chair