The University Senate of Michigan Technological University

Proposal XX-19

Proposal to Shelve the Nondepartmental PhD in Engineering Structural Engineering (EPD1)

Submitted by: Graduate School
Contact: Pushpa Murthy, Dean of the Graduate School
Faith Morrison, Associate Dean of the Graduate School
Will Cantrell, Associate Dean of the Graduate School
Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved

Nondepartmental PhD in Engineering Structural Engineering (EPD1)

2. Final term program will be open for new admits

Fall 2018

3. Plan to complete all enrolled and returning students

No one has enrolled since at least Spring 2011.

4. Reason for shelving

The current degree offerings are meeting the demand for engineering PhDs and there is no evidence of demand for this degree.

5. Financial impact (if any) to the department and university

None. The program is not active.

Approved by Graduate Faculty Council: 06 November 2018 (proposed)
Introduced to Senate: xx December 2018
Approved by Senate: xx December 2018
Approved by Administration: xx December 2018
The University Senate of Michigan Technological University

Proposal XX-19

Proposal to Shelve the Nondepartmental PhD in Engineering Geotechnical Engineering (EPD3)

Submitted by: Graduate School
Contact: Pushpa Murthy, Dean of the Graduate School
          Faith Morrison, Associate Dean of the Graduate School
          Will Cantrell, Associate Dean of the Graduate School
          Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved
   Nondepartmental PhD in Engineering Geotechnical Engineering (EPD3)

2. Final term program will be open for new admits
   Fall 2018

3. Plan to complete all enrolled and returning students
   No one has enrolled since at least Spring 2011.

4. Reason for shelving
   The current degree offerings are meeting the demand for engineering PhDs and there is no evidence of demand for this degree.

5. Financial impact (if any) to the department and university
   None. The program is not active.

Approved by Graduate Faculty Council: 06 November 2018 (proposed)
Introduced to Senate: xx December 2018
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The University Senate of Michigan Technological University

Proposal XX-19

Proposal to Shelve the Nondepartmental PhD in Engineering Sensing and Signal Processing (EPD4)

Submitted by: Graduate School
Contact: Pushpa Murthy, Dean of the Graduate School
         Faith Morrison, Associate Dean of the Graduate School
         Will Cantrell, Associate Dean of the Graduate School
         Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved

   Nondepartmental PhD in Engineering Sensing and Signal Processing (EPD4)

2. Final term program will be open for new admits

   Fall 2018

3. Plan to complete all enrolled and returning students

   No one has enrolled since at least Spring 2011.

4. Reason for shelving

   The current degree offerings are meeting the demand for engineering PhDs and there is no evidence of demand for this degree.

5. Financial impact (if any) to the department and university

   None. The program is not active.

Approved by Graduate Faculty Council: 06 November 2018 (proposed)
Introduced to Senate: xx December 2018
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Proposal XX-19

Proposal to Shelve the Nondepartmental PhD in Propulsion Systems Engineering (EPD6)

Submitted by:  Graduate School
Contact:      Pushpa Murthy, Dean of the Graduate School
              Faith Morrison, Associate Dean of the Graduate School
              Will Cantrell, Associate Dean of the Graduate School
              Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved

   Nondepartmental PhD in Propulsion Systems Engineering (EPD6)

2. Final term program will be open for new admits

   Fall 2018

3. Plan to complete all enrolled and returning students

   No one has enrolled since at least Spring 2011.

4. Reason for shelving

   The current degree offerings are meeting the demand for engineering PhDs and there is no evidence of demand for this degree.

5. Financial impact (if any) to the department and university

   None. The program is not active.

Approved by Graduate Faculty Council:  06 November 2018 (proposed)
Introduced to Senate:  xx December 2018
Approved by Senate:  xx December 2018
Approved by Administration:  xx December 2018
Proposal XX-19

Proposal to Shelve the Nondepartmental Master of Engineering Civil Engineering (EGR3)

Submitted by: Graduate School
Contact: Pushpa Murthy, Dean of the Graduate School
         Faith Morrison, Associate Dean of the Graduate School
         Will Cantrell, Associate Dean of the Graduate School
         Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved

   Nondepartmental Master of Engineering Civil Engineering (EGR3)

2. Final term program will be open for new admits

   Fall 2018

3. Plan to complete all enrolled and returning students

   No one has enrolled since at least spring 2012.

4. Reason for shelving

   The current degree offerings are meeting the demand for engineering masters and there is no evidence of demand for this degree.

5. Financial impact (if any) to the department and university

   None. The program is not active.

Approved by Graduate Faculty Council: 06 November 2018 (proposed)
Introduced to Senate: xx December 2018
Approved by Senate: xx December 2018
Approved by Administration: xx December 2018
The University Senate of Michigan Technological University

Proposal XX-19

Proposal to Shelve the Nondepartmental Master of Engineering Environmental Engineering (EGR5)

Submitted by: Graduate School
Contact: Pushpa Murthy, Dean of the Graduate School
          Faith Morrison, Associate Dean of the Graduate School
          Will Cantrell, Associate Dean of the Graduate School
          Debra Charlesworth, Assistant Dean of the Graduate School

1. Full name of program to be shelved
   Nondepartmental Master of Engineering Environmental Engineering (EGR5)

2. Final term program will be open for new admits
   Fall 2018

3. Plan to complete all enrolled and returning students
   No one has enrolled since at least spring 2012.

4. Reason for shelving
   The current degree offerings are meeting the demand for engineering masters and there is
   no evidence of demand for this degree.

5. Financial impact (if any) to the department and university
   None. The program is not active.

Approved by Graduate Faculty Council: 06 November 2018 (proposed)
Introduced to Senate: xx December 2018
Approved by Senate: xx December 2018
Approved by Administration: xx December 2018
The University Senate of Michigan Technological University

Proposal XX-18
(Voting Units: Academic)

Proposal for New Graduate Degree

“Masters in Engineering Management (MEM)”

Introduction The School of Business and Economics currently offers a Master’s in Business Administration graduate degree that does not include an opportunity for students to specialize in a technical domain. The School of Business and Economics proposes a new graduate degree program: Masters in Engineering Management (MEM). We propose a technical/business (hybrid) degree program that focuses on the managerial knowledge, skills, and abilities critical for operations management success within technical industries.

1. October 23, 2018

2. Contact

Soonkwan Hong
Associate Professor of Marketing
School of Business and Economics
shong2@mtu.edu

3. Approval

(Not applicable)

4. General description and Characteristics

This program will be reviewed and accredited by AACSB (Association to Advance Collegiate Schools of Business). Additionally, the program director will work with the Graduate School to perform annual program reporting of quality characteristics.

The recent success of the B.S. in Engineering Management (undergraduate enrollment growth to 80 students from its introduction in 2013) and the support from various departments at the College of Engineering and College of Sciences and Arts encourages the school to offer this degree program at the master’s level. Given the large engineering and science population at Michigan Tech, the program would be of great necessity and appeal to the University community. The intent of this degree is to build on the technical foundation provided in the
The university strategic plan also underscores the significance of developing interdisciplinary degrees as well as research endeavors. Stakeholders, including but not limited to alumni, members of various boards, and industry leaders, also echo that such a program will add value to the University as well as the School of Business and Economics (SBE). The program will provide opportunities for our engineering graduates to learn how to evaluate and manage innovation and technology in harmony with current business practices.

Student performance will be assessed using accepted learning objectives (AACSB approved) and rubrics developed by the SBE faculty. Each business core course will be assessed on a regular schedule. The current learning objectives are:

Goal 1: Decision Making

Objective 1a: Identify key problems, risks and opportunities in complex business scenarios.

Criterion
1) Students can identify key problems in complex business scenarios.
2) Students can identify key risks in complex business scenarios.
3) Students can identify key opportunities in complex business scenarios.

Objective 1b: Evaluate multiple alternatives to make appropriate executive-level recommendations.

Criterion
1) Students consider multiple alternatives when making recommendations.
2) Students make appropriate recommendations.
3) Students’ recommendations are executive-level.

Goal 2: Managerial Competences

Objective 2a: Generate unique and differentiated alternatives to offer business solutions under uncertainty.

Criterion
1) Students suggest alternatives that are unique.
2) Students suggest alternatives that are differentiated from competitors.
Objective 2b: Recommend appropriate technologies in business solutions.

Criterion
1) Students suggest technologies that are appropriate.
2) Students suggest technologies that integrate with business solutions.

Objective 2c: Demonstrate ethical leadership by influencing globally aware, socially and environmentally responsible behaviors.

Criterion
1) Students demonstrate globally aware leadership behaviors.
2) Students demonstrate socially responsible leadership behaviors.
3) Students demonstrate environmentally responsible leadership behaviors.

Goal 3: Professional Communication

Objective 3a: Written communication is logical, concise, and comprehensive.

Criterion
1) Written communication has a logically flow from premises to conclusions.
2) Written communications are concise, minimizing repetition and extraneous information.
3) Written communications are comprehensive, without gaps of missing information.

Objective 3b: Oral presentation is persuasive and audience-tailored.

Criterion
1) Student presentations are persuasive.
2) Student presentations are tailored to their audiences.

Goal 4: Disciplinary Knowledge

Objective 4a: Demonstrate knowledge necessary for a MEM graduate.

Criterion
1) Student have acquired disciplinary knowledge in finance.
2) Student have acquired disciplinary knowledge in accounting
3) Student have acquired disciplinary knowledge in operations management and project management.
4) Student have acquired disciplinary knowledge in technology and innovation domains.

The program will only use existing and regularly offered courses. The SBE expects the list to evolve as new courses are developed across campus.
It will be a course-based master’s program; therefore, the designation of Masters in Engineering Management is appropriate.

The SBE Graduate Programs Committee started the curriculum identification process by determining the requisite skills and knowledge necessary for a MEM graduate. From that abstract, high-level view, specific courses were identified that contain the content that aligns with the profile from an academic perspective. Based on this process, five courses were identified as requirements for all students in the MEM. These courses span the accounting, finance, operations, project management and management of technology and innovation domains.

Students will also have the flexibility to enroll in more business courses or technical courses via a set of focused electives. The program director will advise MEM students to encourage a coherent combination of electives suited to a particular domain.

Finally, a set of technical electives will augment the anticipated strong STEM background of the target student population. The proposed program balances business knowledge with an expansion of technical competency of students from various undergraduate backgrounds in engineering and science, which is not readily possible with the current Tech MBA® program. The SBE Dean and SBE Associate Dean met with Department Chairs and the College of Engineering Associate Deans from various units across campus over the summer to obtain feedback on the MEM proposal. These representatives provided guidance on courses to include (and to delete) based on relevance to the intended expertise of MEM graduates and course availability. Again, the program director will advise MEM students to encourage a coherent combination of technical electives suited to a particular domain.

5. Title of the program: Masters in Engineering Management (MEM)

6. Rationale

(a) We are creating this specialized graduate degree for the following reasons:

i. To give students the opportunity to pursue a career requiring a foundation in both engineering and business. The curriculum enables students to enhance their technical depth with technical electives while adding vital management competency and awareness.

ii. To introduce technical graduates (e.g. engineering undergraduates) to a subset of current business principles and processes while learning to better assess the commercial ramifications of their technical design decisions. Their engineering skill set is augmented with essential business expertise, including knowledge of organizational behavior, cost management, and leadership skills. Thereby, future graduates of the MEM program are prepared to manage people, lead scientific or engineering operations, head
complex technical projects, or pursue entrepreneurial endeavors within a high-technology context. We anticipate graduates will secure better entry level jobs employing their technical skills. We also expect graduates to rapidly transition into upper level management positions employing their business skills.

iii. To aid students with technical majors in broadening and diversifying career opportunities that were previously unavailable to purely technical graduates. Discussions with alumni clearly reflect regret at the missed opportunity to study business earlier in their careers. With business credentials on their resumes, engineering graduates will differentiate themselves from their peer group.

(b) In addition, the MEM program will contribute to the SBE’s vision to produce tech-savvy business graduates and business-savvy tech graduates. The MEM program takes advantage of a business school embedded in a technological university. While the Bureau of Labor Statistics does not track Engineering Management as a separate category, the related job title of Industrial Engineers can provide relevant information. According to the Bureau of Labor Statistics, this career field is growing faster than the national average (10% growth rate) over the next decade. Furthermore, the number of jobs in this field is very large compared to other engineering fields. We anticipate strong career placement for MEM graduates.

7. Discussion of related programs within the institution and at other institutions

The Tech MBA® program currently offered by the School of Business and Economics will be the backbone of the proposed program where engineering and science students are exposed to business aspects of engineering, technology, and innovation.

By definition, a MBA degree provides broad coverage across the spectrum of business disciplines. An MBA is widely considered to be a generalized graduate program with equal representation of the primary core functions (and theoretical foundations) applied in most business schools. The MBA is more attractive for a career that requires overall business knowledge. Indeed, our prior Tech MBA® program required 12 business courses, whereas the MEM degree requires only a portion of the Tech MBA® courses.

By definition, a M.S. degree is a focused, deeper and more precise degree program. In this case, the MEM is focused on technical knowledge and abilities combined with the primary business content required for expertise in management of operations within technical industries. Indeed, students will be able to extend their technical education through graduate courses in the various engineering and science departments. This degree requires a strong background in a technical domain through the electives selected. Students will be encouraged to select courses that present a logical connection, appealing to recruiters in a well-defined
industry or area. Graduates will more likely remain in supervisory levels within a technical unit as a career choice. Again, the proposed program balances business knowledge with the technical competency of students from various undergraduate backgrounds in engineering and science, which is not readily possible with the current Tech MBA® program.

Other institutions in the State of Michigan (Lawrence Technological University - Master of Engineering Management, University Detroit Mercy - Master of Science in Technical Management, University Michigan Dearborn – Master of Science in Engineering Management, Western Michigan University - Master of Science in Engineering Management, Wayne State University – Master of Science in Engineering Management, and Eastern Michigan University - Master of Science in Engineering Management) offer programs which are quite engineering-centric, and generally lack core business components. Michigan State University also offers a Master of Science program in Operations and Engineering Management, but the curriculum is primarily business courses.

The proposed program will be hosted in the School of Business and Economics with a focus on providing students with a unique opportunity to further develop their skill sets in their respective engineering and science fields as well as expand required knowledge in business, innovation, and technology management.

8. Projected enrollment

The enrollment is projected to be 20 students in the first year, with a gradually increasing enrollment of +5% each year until the program plateaus with an estimated 40 students annually admitted.

The proposed program is a 30-credit course-based degree.

**Business Requirements (15 credits)**
1. BA 5300: Financial Reporting & Control
2. BA 5400 Financial Risk Management & Decision Making (Prereq: BA 5300)
3. BA 5610: Operations Management
4. MGT 4600: Management of Technology and Innovation
5. ENG/OSM 4300: Project Management
   OR BA5650 Project Management

**Focused Electives (6 credits)**
1. BA 5200: Information Systems Management & Data Analysis
2. BA 5700: Managing Behavior in Organizations
3. BA 5800: Marketing, Technology & Globalization
4. CEE 5350: Life Cycle Engineering
5. MEEM 4650: Quality Engineering OR
   OSM 4650: Six Sigma Fundamentals OR
MEEM 5650: Advanced Quality Engineering
6 MGT 3800: Entrepreneurship

Prerequisites
MA 3710: Engineering Statistics (or any other stats course)
(CEE 3710 Stats for Civil Engineering)

Technical Electives* (9 credits)
Civil & Environmental Engineering
1 CEE 5710: Modeling and Simulation Applications
2 CEE 5404: Transportation Planning
3 CEE 5417: Transportation Design
4 CEE 5501: Environmental Process Engineering
5 CEE 5730: Probabilistic Analysis and Reliability
6 CEE 5760: Optimization Methods in Civil/Env. Engineering
7 EC 3400: Economic Decision Analysis

Chemical Engineering
1 CM 3310: Process Control
2 CM 5100: Applied Mathematics for Chemical Engineering
3 CM 5300: Advanced Transport Phenomena
4 CM 5400: Advanced Reactive Systems Analysis
5 EC 3400: Economic Decision Analysis

Computer Science
1 CS 3712 Software Quality Assurance
2 CS 4712 Data Mining
3 CS 5471 Computer Security
4 CS 5841 Machine Learning
5 EC 3400: Economic Decision Analysis

Electrical & Computer Engineering
1 EE 3261: Control Systems
2 EE 5300: Mathematical & Computational Methods in Engineering
3 EE 5451: Cyber Risk Assessment Critical Inference
4 EE 5500: Probability and Stochastic Processes
5 EE 5511: Information Theory
6 EE 5521: Detection Estimation
7 EE 5821: Computational Intelligence
8 EE 5230: Power Systems Operations
### Mechanical Engineering
1. MEEM 3600: Introduction to Manufacturing
2. MEEM 5680: Optimization I
3. EC 3400: Economic Decision Analysis

*Courses may be double-counted by MTU undergraduate students who follow the Accelerated track*

* This list of technical electives is just an example; other courses are open for consideration. Students will need to satisfy the course prerequisites in selection of their technical electives.

10. New course descriptions

   There will be no new course added for the program.

11. Model schedule (Business courses only)

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<th>Fall</th>
<th>Spring</th>
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<tr>
<td>requirements</td>
<td>MGT 4600: Management of Technology and Innovation</td>
<td>Making</td>
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<td>**Focused</td>
<td>Focused Elective 1</td>
<td>Focused Elective 2</td>
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<td>Technical Elective 1</td>
<td>Technical Elective 3</td>
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<td>Technical Elective 2</td>
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See the MTU course catalog for the semesters the different focused and technical electives are offered.

12. Library and other learning sources
The library and other learning resources will be identical to those for current students.

13. Faculty resumes

14. Description of available/needed equipment

   No new or specific equipment needed for the program.

15. Program costs

   The proposed program leverages the Tech MBA® program and other courses currently offered by engineering and science programs. Therefore, no specific additional cost will be incurred from the program.

16. Space

   No new space is needed.

17. Accreditation requirement

   This program will be reviewed and accredited by AACSB (Association to Advance Collegiate Schools of Business); therefore, no further accreditation will be required by any additional accreditation body, including the Higher Learning Commission.

18. Program specific policies, regulations, and rules

   (Not applicable)

http://www.admin.mtu.edu/usenate/policies/p108-1-1.htm

Spouses or partners who evaluate the same graduate student

“Graduate Student” means:
   (i) a student enrolled in a Masters or doctoral programs, EdD and DMA students; and
   (ii) an applicant for admission as a Graduate Student.

“Evaluation” means participation in any capacity in evaluating a Graduate Student including evaluating applications for admission as a Graduate Student, evaluating applications or nominations for fellowships, awards, and the like, for employment (as TAs or GRAs, for example), supervising Graduate Students, serving on a supervisory committee or examining committee, and evaluating comprehensive examinations.

“Spouse or Partner” of a UBC faculty member includes a spouse or partner who is not a UBC faculty member. For example, you are a faculty member at UBC, and your spouse/partner is a faculty member at Simon Fraser University, and you both supervise the same Graduate Student.

In any case in which a UBC faculty member and the Spouse or Partner of that UBC faculty member participate together in an Evaluation, care must be taken to ensure that there is no actual or perceived conflict of interest.

Please do everything reasonably possible to ensure that you and your Spouse or Partner do not participate together in an Evaluation.

If there is an academic necessity, as distinct from a mere preference or convenience, for a UBC faculty member and their Spouse or Partner to participate together in an Evaluation, please do the following:

- As soon as reasonably possible tell the Graduate Student and the Graduate Advisor about the participation of your Spouse or Partner in the Evaluation. Do not assume that just because people know you or work with you that they also know of your marriage/partnership.
- Expand all committees for that Graduate Student by one member and make sure everyone on the committee knows why.
- Explain to all committee members the personal relationship that exists between you and your Spouse or Partner. Do not assume that just because people know you or work with you that they also know of your marriage/partnership.
- Ask all committee members to speak up if they have any reason for thinking that your marriage/partnership is impacting the Graduate Student, and to speak up even if the benefit is ostensibly to the Graduate Student.
- Make sure only one of you sits on the Graduate Student’s thesis/dissertation examining committee.
- Ask someone who is a peer or senior to you to act as a kind of ombudsperson. For example, if it is the Head, everyone involved (Graduate Student, committee members, Graduate Advisor) knows who to go to if something just isn’t going well (and seems to be because of the co-supervision by a couple). It can be very helpful for a Graduate Student to know this in advance even if they never need to contact the person.

Add all this info, and the steps taken (i.e., your management plan), to your conflict of interest declaration. And to both declarations, if you are both UBC faculty members.