To: The Engineering Faculty  
From: Division of Construction Engineering and Management  
Re: Professional Master of Science in Construction Engineering & Management

The Faculty of the Division of Construction Engineering and Management has approved a Professional MS in Construction Engineering and Management degree program, now submitted to the Engineering Faculty with a recommendation for approval.

1) MSCNE – Master of Science in Construction Engineering & Management  
2) Non-thesis  
3) 30-credit hours, up to 7 credit hours on-line  
4) The program will provide professionals with construction industry experience additional knowledge in several specialty areas of construction engineering. A primary feature of the program will include in-depth study of a complex problem in construction engineering.

Reason: The construction industry has become increasingly complex with high demands for practitioners to address areas of equipment automation, schedule and cost control, unique financial and legal arrangements, automation, virtualization, visualization, continuous project management, safety, and temporary structures. This program is envisioned to address these and other areas in a unique and desirable manner.

[Signature]

Makarand Hastak, Professor and Head  
Division of Construction Engineering & Mgmt.
Construction Engineering and Management

Title of Concentration: Professional MSCNE

Statement of the Mission

The mission of the Professional Master’s Concentration in Construction Engineering and Management (CEM) is to provide advanced technical education combined with leadership in key areas of interest in the construction sectors of regional, national, and international importance. The need for this concentration comes from discussions with people working in construction engineering and what they feel are the unmet needs.

The target audience will be:

- Current Purdue BS students wishing to undertake graduate studies, improve their skills, and increase their employability in key industry sectors.
- Domestic and international students at other institutions who, upon graduating, wish to receive a Professional Master’s concentration from Purdue to gain a professional degree from a top US Engineering College to improve their skills and increase their employability in key industry sectors.
- Practicing professional engineers wishing to return for additional technical depth and leadership, to improve their career path.
- Students interested in only pursuing a master’s degree with no interest in continuing on in a PhD program.

As construction is a service industry, the multidisciplinary aspect in research, education, training, and pedagogical development becomes even more important to prepare students to address the needs of clients/facility owners from diverse sectors. However, in its present form the graduate specialization in construction engineering is restricted to students entering the program through Civil Engineering, which limits the domain of complex problems and development to Civil Engineering topics. This proposal for a new CEM Professional Master’s degree consists of seven specialty areas: Heavy Highway, Industrial, Commercial, Energy, Equipment/Automation, Information Engineering, and Facilities Engineering, that are specific to the construction industry and its integration with multiple engineering fields; it represents unique learning opportunities for professionals.

Research Focus

The Professional Master’s concentration will not have a thesis/research component and will not have direct articulation to a PhD program. If a student decides during the course of their studies to pursue a PhD they can apply to the appropriate program.

Core and technical courses

There are 30 course hours in the plan of study, typically 10 3-credit hour courses or equivalent. Consistent with CEM’s undergraduate program of required internships, the professional-focused degree encourages the student to bring a complex problem from their employer and work with
Purdue’s experts to identify an effective process or solution, in addition to advanced coursework. 
(Those students that do not have a complex problem from their employer may be able to utilize a complex problem from a corporate supporter). This will be recorded as CEM 59800 – 
Independent Study (Complex project/problem) – 6 credits

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Industrial, Commercial, Energy, Equipment/Automation, Information Engineering, and Facilities 
Engineering, that are specific to the modern construction industry and its integration with 
multiple engineering fields; it represents unique learning opportunities for professionals. The 
figure below presents a matrix of functional and specialty areas for courses with individual 
courses listed below.

<table>
<thead>
<tr>
<th>Functional Areas</th>
<th>Heavy Highway</th>
<th>Industrial</th>
<th>Commercial</th>
<th>Energy</th>
<th>Equipment/Automation</th>
<th>Information Engineering</th>
<th>Facilities Engineering</th>
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<tbody>
<tr>
<td>Basic Engineering</td>
<td>1, 4, 5, 6</td>
<td>7, 15</td>
<td>16, 17</td>
<td>7, 11, 12, 16, 15, 17</td>
<td>2, 3, 8, 9, 10, 20, 21, 22, 24</td>
<td>1, 13, 14, 20, 22, 24, 28</td>
<td>23, 24, 25, 26, 27, 28</td>
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<td>Equipment</td>
<td>1, 2</td>
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<td>Project Controls &amp; Finance</td>
<td>3, 8, 9, 21</td>
<td>3, 8, 9, 14, 17, 21</td>
<td>3, 8, 9, 10, 14</td>
<td>3, 8, 9, 10, 14</td>
<td>3, 8, 9, 10, 14</td>
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<td>Legal Aspects</td>
<td>18, 19</td>
<td>18, 19</td>
<td>18, 19</td>
<td>18, 19</td>
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<td>Virtual Construction</td>
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<td>1, 3</td>
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<td>Project Management</td>
<td>6, 9, 13</td>
<td>9, 13</td>
<td>9, 13</td>
<td>9, 13</td>
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<td>9, 13</td>
<td>9, 13</td>
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<tr>
<td>Temporary Structures</td>
<td>29</td>
<td>29</td>
<td>29</td>
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The seven specialty areas will allow professionals with construction as well as non-construction 
engineering backgrounds the opportunity to increase knowledge and awareness of the 
complexities associated with construction including: constructability, scheduling, 4D/5D 
modeling, and automation. Likewise, advanced construction engineering instruction is 
applicable to other engineering areas including: manufacturing, chemical processing, power 
plants, and other areas where a complex process integrates physical or virtual objects over time.

Courses outside CEM that may be considered in the program include:

MGMT 54600 – Decision Support and Expert Systems 
MGMT 57100 – Data Mining 
MGMT 60000 – Accounting for Managers 
MGMT 65000 – Strategic Management I 
MGMT 6600 – Operations Management 
IE 53000 – Quality Control 
IE 54500 – Engineering Economic Analysis
IE 57700 – Human Factors in Engineering

Participating faculty:

Faculty Coordinator for the Professional Master’s concentration:

Participating Faculty: Makarand Hastak (Professor in CE/CEM and Head of CEM), Phillip Dunston (Professor in CE/CEM), Hubo Cai (Assoc. Professor in CE/CEM), Dulcy Abraham (Professor in CE), Theodore Weidner (Assoc. Professor of Engineering Practice in CEM),

Expected number of students

Initially we would expect 6 students both residential and on-line. Over time, we would expect this to increase to 32 students.

Learning Outcomes

The graduate pursuing this professional concentration will be able to:

- Demonstrate increased technical depth within construction engineering.
- Make sound engineering decisions
- Communicate, negotiate, and lead within local, regional, national, and international engineering enterprises.
- Demonstrate awareness of broader implications (economics, technical, ethical, and business aspects) of construction engineering.

CEM is uniquely positioned to offer a professional master’s degree that affords an opportunity for individuals from multiple backgrounds and experiences to leverage their undergraduate education and professional experiences with a diverse faculty and subject areas that are all dependent on the ability to integrate and optimize activities in a 4D or 5D environment. In such an environment, graduate students can tackle complex projects using both traditional non-traditional methods for construction engineering.