September 28, 2016

TO: Sarah Mangelsdorf, Provost
    William Karpus, Dean, Graduate School

FROM: James P. Blanchard, Executive Associate Dean

RE: Request for Name Change of an Existing Option in the Master of Engineering Degree, Engineering Major; Named Option: Applied Computing and Engineering Data Analytics

At its September 21, 2016 meeting, the College of Engineering Academic Planning Council unanimously endorsed the recommendation to change the name of the Applied Computing and Engineering Data Analytics named option in the Master of Engineering Degree, Engineering Major to “Data Analytics.” The College of Engineering Master of Engineering Oversight Committee also endorsed the proposed name change at their meeting on September 28, 2016.

Marketing research indicates potential students are more interested in the data analytics content of the program and less interested in applied computing. This change in the option name will allow for better recognition and less confusion by interested students and aligns with similar programs offered at other institutions.

I endorse the recommended change.

Cc: Jocelyn Milner, Academic Planning and Institutional Research
    Sara Kubah, Academic Planning and Institutional Research
    Marty Gustafson, Graduate School
    Matt Griswold, Engineering Professional Development
To: Matt Griswold, Program Director  
From: Wayne Pferdehirt, Chair, Master of Engineering Oversight Committee  
Date: September 28, 2016  
Subject: M.Eng. Applied Computing and Engineering Data Analytics  
CC: Susan Hagness, COE Associate Dean; Peggy Conklin, Executive Assistant to Dean  

This memorandum is to report that the College of Engineering’s Master of Engineering Oversight Committee conditionally approved and endorsed the proposal for revising the name and curriculum of the Master of Engineering, Applied Computing and Engineering Data Analytics named option at its meeting held on September 28, 2016. This approval is conditioned upon receipt of letters of support from relevant COE departments, including the Dept. of Electrical and Computer Engineering.  

Thank you for your helpful presentation of the proposal at the Committee’s meeting.  

Please contact me if you have any questions.
Dear Professor O'Leary,

The Department of Industrial and Systems Engineering voted unanimously to support the change in named option for the new distance-delivered Master of Engineering programs from Applied Computing and Engineering Data Analytics to Engineering Data Analytics. Like you, we feel that focusing solely on the Data Analytics aspect of the degree will increase its applicability and appeal. Our faculty look forward to working with you on developing appropriate course offerings.

Sincerely,

Jeff Linderoth

September 27, 2016

Phil O'Leary
Department Chair
Department of Engineering Professional Development
College of Engineering
University of Wisconsin-Madison
Phil O’Leary  
Professor and Chair  
Engineering Professional Development

September 28, 2016

Dear Phil,

I am writing to provide the Department of Mechanical Engineering’s support for the proposed change to name of the online Masters of Engineering degree in data analytics. The new title for the named option – Engineering Data Analytics – does not affect the support for this program from the Mechanical Engineering Department. We continue to see the value of such a degree option delivered at a distance, and will work with you to promote the program to practicing mechanical engineers.

Sincerely,

Jaal Ghandhi  
Professor and Chair
September 30, 2016

Philip R O’Leary  
Professor and Chair  
Department of Engineering Professional Development  
University of Wisconsin-Madison  
432 North Lake Street  
Madison, WI 53706  
Phone: (608) 262-0493  
Email: Phil.oleary@wisc.edu

Subject: Department of Electrical and Computer Engineering support for Name Change – Master of Engineering Named Option Applied Computing and Engineering Data Analytics

The Department of Electrical and Computer Engineering supports the name change for the new online Master of Engineering program from named option Applied Computing and Engineering Data Analytics to named option Engineering Data Analytics. As described in the program review, a focus on data analytics will open the program to a broader audience by increasing its applicability and appeal. We continue to see the value of such a degree option offered through online delivery.

Sincerely,

John Booske  
Professor and Chair  
Electrical and Computer Engineering  
2416 Engineering Hall  
1415 Engineering Drive  
Madison, WI 53706  
Phone: (608) 890-0804
September 25, 2016

Philip R. O'Leary
Professor and Chair
Department of Engineering Professional Development
University of Wisconsin-Madison
432 North Lake Street
Madison, WI 53706
Office & Mobile Phone: 608-262-0493
Email: phil.oleary@wisc.edu

Dear Professor O’Leary,

The Statistics Department strongly supports the development and revision of the new online Master of Engineering program on Engineering Data Analytics.

Due to technological advance and digital revolution, we have witnessed in recent years an explosion in data collection, and our society is flood with data. Nowadays scientific studies in a wide range of fields routinely generate large-scale data sets with complex structures. Such large data present unprecedented opportunities for statistics and computer science as well as other scientific and engineering fields, but also create unique challenges for these disciplines. We need to understand the profound impact of large data generated to support scientific research and knowledge discovery and response to the great challenges. Data science (or data analytics) emerges as a new field in response to the challenges in modern scientific studies with big data. Department of Statistics has successfully launched a MS program on Data Science, with 45 students enrolled in the program currently, and our first class graduated from the data science program in May, 2016. Data science involves statistics and computing as well as domain fields. Your proposed program called Engineering Data Analytics emphasizes on the engineering aspects of data science. It is great to see both departments have embraced the opportunities in data science and collaborated to develop the
new programs. In spite of some potential competition, we anticipate much mutual benefits from the collaboration between our two departments with common interests and shared resources, with an example of using Stat 327 data science class in your proposed program.

We look forward to continuing our tradition and working with the engineering school as you develop the new data analytics program.

Sincerely,

Yazhen Wang
Professor and Chair
September 26, 2016

TO: James “Jake” Blanchard, Executive Associate Dean
    College of Engineering

FROM: Jeffrey S. Russell, Vice Provost for Lifelong Learning and Dean
      Division of Continuing Studies

SUBJECT: Support for Name Change for Master of Engineering Online Named
         Option: Applied Computing and Engineering Data Analytics

Please accept the support of the Division of Continuing Studies for the proposed name change for the named option of Applied Computing and Engineering Data Analytics within the Master of Engineering degree programs. We support the College of Engineering’s belief that the proposed new name, Engineering Data Analytics, better reflects the outcomes expected by students and employers who expressed interest in a master’s degree in this area.

Please let me know if you have any question or need more information. Thank you.
REQUEST FOR NAME CHANGE OF AN EXISTING OPTION IN THE MASTER OF ENGINEERING DEGREE, ENGINEERING MAJOR; NAMED OPTION: APPLIED COMPUTING AND ENGINEERING DATA ANALYTICS (FULLY ONLINE)

1.0 REQUESTED ACTION

Approval from the Graduate Faculty Executive Committee is requested by the Department of Engineering Professional Development with the support of several participating departments and Wisconsin Applied Computing Center faculty for a name change for the existing non-pooled revenue, fully online Master of Engineering: Named Option Applied Computing and Engineering Data Analytics to be revised to the Master of Engineering: Named Option Engineering Data Analytics.

The proposal has been reviewed and approved by the Department of Engineering Professional Development Executive Committee. The College of Engineering Master of Engineering Oversight Committee and the College of Engineering Academic Planning Council have provided conditional approval contingent on receipt of all partner support letters. Letters have been requested and received by the Division of Continuing Studies, the Department of Electrical and Computer Engineering, the Department of Industrial and Systems Engineering, the Department of Mechanical Engineering, and the Department of Statistics. Outstanding letters include the College of Letters and Sciences and the Department of Computer Sciences.

2.0 BACKGROUND AND RATIONALE FOR NAME CHANGE

The Master of Engineering: Named Option Applied Computing and Engineering Data Analytics was approved by the College of Engineering Master of Engineering Oversight Committee in December 2014, the College Academic Planning Council in February 2015, and the Graduate Faculty Executive Committee in May 2015. The first cohort was to begin the Fall 2016 term, but the program did not reach the target number of applicants/enrollees, and the Department of Engineering Professional Development Executive Committee chose to delay the program launch one year to Fall 2017.

The intent of the degree is to deliver a high-quality graduate data analytics program created for engineers that is unique from other general data analytics graduate programs. Specifically, the program strives to offer working engineers the opportunity to advance their technical skills and business acumen by learning from an interdisciplinary set of faculty within the 1) technical areas of data analytics with a supporting knowledge of high performance computing and database design and management, 2) and professional development areas of communication, project management, and team-building. While an understanding of the differences and uses of high performance computing models was originally built into the program, the existing degree places a significant emphasis on this subject and should be revised to focus on a core in data analytics for engineers.

The degree is launching in a competitive space. This competition comes from 1) a small number of colleges of engineering offering online and on-campus data science programs tailored for practicing engineers, 2) nearly every peer institution offering a broad data science program, typically online, and 3) indirectly related programs in computer science, business management, software engineering, applied math, statistics, and engineering management. Competitors’ degrees in data analytics focused on engineering applications do not include a strong emphasis in hardware or computational coursework, and this has been seen as a disadvantage of the originally-approved program by inquiring students.

During marketing and recruitment for the degree program from December 2015 through June 2016 it became clear the degree name was causing brand confusion among interested students. Within marketing efforts, web search results showed no traffic for the term “applied computing”, and thus all spends were devoted to “engineering data analytics” and similar analytics terms. While this was used to attract students to inquire about
the program, when they reached the website or received printed materials, the degree name caused uncertainty and many students asked about the balance of data analytics courses versus computing courses. Competitors with engineering data analytics degrees have avoided this confusion by naming and focusing their programs on data analytics:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Data Science/Analytics Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Methodist University</td>
<td>Master of Science in Data Science</td>
</tr>
<tr>
<td>Georgia Tech University</td>
<td>Master of Science in Analytics</td>
</tr>
<tr>
<td>Cornell University</td>
<td>Master of Engineering: Concentration in Data Analytics</td>
</tr>
<tr>
<td>University of IL at Urbana-Champaign</td>
<td>Master of Science in Industrial Eng: Concentration in Data Analytics</td>
</tr>
<tr>
<td>Columbia University</td>
<td>Master of Science in Data Science</td>
</tr>
<tr>
<td>George Mason University</td>
<td>Masters in Data Analytics Engineering</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>Master of Science in Analytics</td>
</tr>
</tbody>
</table>

To assure the curriculum is more representative of the learning outcomes expected by prospective students and employers, revisions to the course plan will occur to match the name change. The originally-approved program design is 100% online, 30 credit degree with a fixed curriculum starting new cohorts each Fall semester. Courses from Mechanical Engineering, Industrial and Systems Engineering, Statistics, Engineering Professional Development and Library and Information Studies provide rigorous engineering depth with breadth in professional skills, and will continue to be part of the new plan of study.

Based on the course plans of competitors and student feedback, flexibility within the curriculum is key, and focusing on a data analytics core while de-emphasizing applied computing courses will allow for greater student choice among courses. The recommendation is to create a 1) create a 15 credit core in data analytics and 2) to diversify course options by allowing students to choose among 15 elective credits within other online engineering courses. This will allow practicing engineers to gain a strong foundation in data analytics while advancing their knowledge within their specific engineering domain. The original curriculum is equally balanced between data analytics and applied computing with four credits in professional development, representing an over-emphasis in applied computing.

The new plan of study includes a five course, 15 credit core in data analytics. Four of the five courses within the core are already part of the curriculum as noted in the included table. To allow practicing engineers to earn graduate level knowledge within their engineering discipline and to allow greater flexibility to the program, students will choose 15 credits from existing online engineering courses available within the engineering disciplines of manufacturing engineering, mechanical engineering, engine systems, environmental engineering, power, controls, materials engineering, engineering management. Students will continue to choose four professional development credits. The new plan continues to take advantage of the interdisciplinary nature of data analysis and the large number of departments on campus that teach aspects of this topic.
<table>
<thead>
<tr>
<th>In Original Curriculum</th>
<th>Course</th>
<th>Course Name</th>
<th>Keep/Remove/Add in New Plan</th>
<th>Core or Elective in New Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>ISyE 412</td>
<td>Industrial Data Analytics</td>
<td>Keep</td>
<td>Core</td>
</tr>
<tr>
<td>x</td>
<td>ME 759</td>
<td>Computing for Eng. Applications</td>
<td>Keep</td>
<td>Core</td>
</tr>
<tr>
<td>x</td>
<td>LIS 751</td>
<td>Intro to Database Design &amp; Mgmt</td>
<td>Keep</td>
<td>Core</td>
</tr>
<tr>
<td>x</td>
<td>EPD 416</td>
<td>Engineering Applications of Statistics</td>
<td>Keep</td>
<td>Core</td>
</tr>
<tr>
<td>x</td>
<td>EPD 784</td>
<td>Project Management</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>STAT 327</td>
<td>Introduction Data Analysis with R</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>STAT327</td>
<td>Intermediate Data Analysis with R</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>EPD 702</td>
<td>Professional Presentations</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>EPD 783</td>
<td>Leading Teams</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>EPD 700</td>
<td>Learning and Digital Proficiency</td>
<td>Keep</td>
<td>Elective</td>
</tr>
<tr>
<td>x</td>
<td>CS412</td>
<td>Intro to Numerical Methods</td>
<td>Remove</td>
<td>n/a</td>
</tr>
<tr>
<td>x</td>
<td>ECF/ME 532</td>
<td>Applications of Pattern Recognition</td>
<td>Remove</td>
<td>n/a</td>
</tr>
<tr>
<td>x</td>
<td>ISyE 635</td>
<td>Tools and Env. for Optimization</td>
<td>Remove</td>
<td>n/a</td>
</tr>
<tr>
<td>x</td>
<td>ME 535</td>
<td>Computer Aided Geometric Design</td>
<td>Remove</td>
<td>n/a</td>
</tr>
</tbody>
</table>

### Decision-making
Data to Decisions Add Core

### Manufacturing
Multiple Courses Add Elective

### Mechanical
Multiple Courses Add Elective

### Engine Systems
Multiple Courses Add Elective

### Power Systems
Multiple Courses Add Elective

### Control Systems
Multiple Courses Add Elective

### Materials
Multiple Courses Add Elective

### Eng. Mgmt
Multiple Courses Add Elective

## 3.0 ENROLLMENT PROJECTIONS

Through seven months of recruitment (December 2015-June 2016), 65 students inquired about the program resulting in nine applicants (five admitted, one intent to apply, one withdrawal, and two denied). While this was not a large enough class to begin in fall of 2016, it does show there is existing interest in UW-Madison launching a well-designed data analytics master’s degree for engineers.

Based on changes to the degree name and degree curriculum, enrollment of matriculated students in the program’s first year is assumed to be 12-15 students. Enrollment in subsequent years is assumed to ramp up by 5 students per year to 30 students by year four with the program reaching yearly profitability by the third year. These levels are “reasonable estimates” based on experience to date with other College of Engineering distance degree programs. The program is assuming it will achieve 90% retention and successful degree completion by matriculated students. Engineering Professional Development experience with existing online degree programs has demonstrated that this retention rate is achievable with high-quality courses in a fixed curriculum plan and proactive student services.

## 4.0 REQUEST FOR APPROVAL

It is respectfully requested that the committee review and approve the name change to enable UW-Madison to establish a visible leadership position in Engineering Data Analytics and allow the first class of students to begin studies in the 2017 fall session.