The University Of Toledo

New Graduate Program Proposal

* denotes required fields

College*: College of Engineering
Dept/Academic Unit*: Mechanical Industrial and Manufacturing
Contact Person*: Dr. Abdollah Afjeh Phone: 530-8205 (xxx-xxxx) Email: abdollah.afjeh@utoledo.edu

Program Code*: EN-ENGR-MEG
Program Name*: ENEN (Energy Engineer)
Degree to be granted (if applicable): Masters
Minimum number of credit hours for completion*: 30
Proposed effective term*: 201540 (e.g. 201140 for 2011 Fall)

List all courses which comprise the certificate or degree and identify term offered (summer/fall/spring):

Identify delivery method (Online/in class/off campus):

Please refer to http://www.utoledo.edu/catalog/ for university catalog.

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<tr>
<th>File Type</th>
<th>View File</th>
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<tbody>
<tr>
<td>Attachment</td>
<td>View</td>
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Comments/Notes:

This is not a new program but an additional concentration with the Master of Engineering degree. The COE offers several masters degrees including the following degree: Master in Engineering. The Master in engineering degree has two concentrations: a concentration in General engineering (a practice oriented program) and a concentration in Computer Sciences and Engineering. It is proposed to arrange the courses offered in these two concentrations to offer the Master of Engineering with a third concentration which is Energy Engineering. The Master in Engineering with a concentration in Energy Engineering - A Practice Oriented Program will have three tracks: Power Generation and Distribution, Energy Utilization and Management track, and the Advanced Energy Systems track. Each track can be completed following the project option or the coursework only option.

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Rationale:

See attached

Program Approval:

Department Curriculum Authority: Matthew Franchetti  Date: 2015/03/06

Department Chairperson: Abdollah Afjeh  Date: 2015/03/06

College Curriculum Authority or Chair: Efstratios Nikolaidis  Date: 2015/03/08

College Dean: Mohamed Samir Hefzy  Date: 2015/04/25

Graduate Council:

Dean of Graduate Studies:  

Office of the Provost:

Submit

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MASTER OF ENGINEERING WITH A CONCENTRATION IN ENERGY
ENGINEERING – A PRACTICE ORIENTED PROGRAM

LIST ALL COURSES THAT COMPRISEx THE DEGREE

The master of science in engineering program with a concentration in energy
engineering – a practice oriented program requires either 30 hours of approved
graduate-level coursework (coursework only option) or 24 hours of approved
graduate-level coursework and a six-hour, work-related project, for a total of 30 credit
hours (project option).

The Master of Engineering with a concentration in energy engineering will have three
tracks:

A. Power Generation and Distribution track (track 1), or
B. Energy utilization and management track (track 2), or
C. Advanced Energy Systems track (track 3).

The students are expected to complete the following requirements:

1) All students (in track 1, or track 2 or track 3) need to take the following
engineering course: MIME 5980 Energy sources, applications and economics
3 credit hours (offered in fall 15 and fall 16)

2) All students (in track 1, or track 2 or track 3) need to take at least one of these
law/business/management courses:
   i. LAW 5000 Law and the Legal System 3 credit hours (offered fall 15
      and fall 16)
   ii. BLAW 6100 Business Government and Society 3 credit hours – This is
       an online course (offered summer 15, spring 16, and summer 16)
   iii. MGMT 6100 Leading Through Ethical Decision Making 3 credit hours
       (offered fall 15, spring 16, and summer 16)

3) All students (in track 1, or track 2 or track 3) need to take at least one of the
following two engineering courses:
   i. CVLE 5690 Sustainability Engineering 3 credit hours - This is an on line
      course (offered in Spring 16)
   ii. MIME 5980 Sustainability Analysis and Design 3 credit hours – This is an
       online course (offered summer 16)

4) Only Students in track 1 need to take the following engineering course:
i. **Power Systems Operation** 3 credit hours (TBD when it will be offered). This course can also be taken as an elective by students following track 2.

5) Students may complete their course requirements by completing the following courses in consultation with their advisor:

i. Any of the above courses

ii. Any of the following elective courses

<table>
<thead>
<tr>
<th>course number</th>
<th>course title</th>
<th>on line (yes or no)</th>
<th>offerings</th>
<th>track</th>
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<tbody>
<tr>
<td>GNEN 5500</td>
<td>Application of Engineering Analysis</td>
<td>Yes</td>
<td>Fall 15 and Fall 16</td>
<td>1, 2, 3</td>
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<tr>
<td>GNEN 6700</td>
<td>Management of Projects &amp; Technology Innovation</td>
<td>Yes</td>
<td>Fall 15 and Fall 16</td>
<td>1, 2</td>
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<tr>
<td>GNEN 5700</td>
<td>Applied probability and Statistics in Engineering and Management</td>
<td>Yes</td>
<td>Spring 16</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>MIME 6630</td>
<td>Applied Statistical Methods</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>CHEE 6010</td>
<td>Green Engineering Principles for Chemical Processes</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>3</td>
</tr>
<tr>
<td>CHEE 6110</td>
<td>Green Engineering Applications in Chemical Industries</td>
<td>No</td>
<td>Spring 16</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 5980</td>
<td>Biochemical Engineering</td>
<td>No</td>
<td>Spring 16</td>
<td>3</td>
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<tr>
<td>BIOE 5650/ CHEE5410</td>
<td>Bioseparations (New Separations)</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>3</td>
</tr>
<tr>
<td>EECS 5480</td>
<td>Electronic Energy Processing I</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>2, 3</td>
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<tr>
<td>CHEE 6120</td>
<td>Biofuels</td>
<td>No</td>
<td>Spring 16</td>
<td>1, 3</td>
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<tr>
<td>EECS 5600</td>
<td>Solid State Devices</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>1</td>
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<tr>
<td>EECS 5410</td>
<td>Electro-Optics</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>1, 3</td>
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<tr>
<td>EECS 6980</td>
<td>Compound Semiconductor Materials and Devices</td>
<td>No</td>
<td>Spring 16</td>
<td>1, 3</td>
</tr>
<tr>
<td>MIME 5510</td>
<td>Turbomachinery</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>1, 2</td>
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<tr>
<td>MIME 5580</td>
<td>Design of Thermal Systems</td>
<td>No</td>
<td>TBD</td>
<td>1, 2</td>
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<tr>
<td>MIME 6120</td>
<td>Advanced Measurement Systems</td>
<td>No</td>
<td>Fall 15 and Fall 16</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>LAWI 9390</td>
<td>Natural Resources Law</td>
<td>No</td>
<td>Spring 16</td>
<td>3</td>
</tr>
<tr>
<td>LAWI 9330</td>
<td>Environmental Law LAWI 9330</td>
<td>NO</td>
<td>Fall 15 and Fall 16</td>
<td>1, 3</td>
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6) Students following the coursework only option can take up to 6 hours of independent study.
MS IN ENGINEERING WITH A CONCENTRATION IN ENERGY ENGINEERING: List all courses

Students may complete their course requirements if they choose the coursework only option in five semesters by taking two recommended courses per semester. If students choose the project option, they may complete the course requirements in four semesters by taking two recommended courses per semester, and then complete the project in one or two semesters.

In order to be awarded the Master of Science in engineering degree, the student must have at least a B average (minimum GPA of 3.0/4.0) for all graduate course credits in the program as well as for the entire graduate transcript.
MASTER OF ENGINEERING WITH A CONCENTRATION IN ENERGY ENGINEERING – A PRACTICE ORIENTED PROGRAM

RATIONALE

The mission of the College of Engineering at the University of Toledo is to achieve prominence as a student-focused college that educates engineers of recognized quality to be leaders in engineering disciplines, technology and society. In looking to the future, the College is committed to providing a diverse, student-centered, stimulating learning environment that actively engages students in engineering education, research, and technology transfer, while simultaneously benefitting society through the creation of new knowledge and technologies. It is with this vision that the College is launching this new Energy Engineering initiative to meet important technology and workforce needs in the energy field.

Opportunity:

It has been noted by experts in the energy field that fresh graduates who enter the energy workforce often lack sufficient understanding of topics such as power systems and applications, basic environmental requirements, project management, power quality and performance predictions, economics and trends, energy economics, just to name a few. Many such businesses feel the need to develop extensive training programs for their new employees to address this knowledge gap. This is time-consuming and certainly not cost-effective, as each industry or business attempts to develop its own training portfolio. Others have chosen to leave the training to an “on the job” mode, which is equally inefficient, if not counter-productive.

The energy field, which will be subject to ever-increasing challenges over the next 10 to 20 years, is vital to all aspects of the society and for assuring a sustainable quality of life for our nation and the world. It is important that a proactive and practice-relevant educational program be available to recent graduates as well as practicing professionals in order to address the current as well as emerging innovation in the energy field. The program has to be pragmatic both in topical content as well as the mode of instruction.

It is further noted that industry experts coming from a variety of areas in the energy field have expressed enthusiasm for such a program at UT College of Engineering. Accordingly, The UT College of Engineering formed and managed an Energy Engineering Task Force comprising of industry and academic professionals to develop a practice-oriented energy engineering program. The task force was chaired by Gary Leidich, Executive Vice President & President of FirstEnergy Generation FirstEnergy Corp (Retired). The committee included the following leaders from the industry:

- Daniel Fahrer, Director of Environment Fossil and Facilities, DTE Energy Co, Detroit, Michigan, and
- Donald Scarsella Program Manager, Energy at Owens Corning, Toledo, Ohio, and
- Donald Warner Vice President and Director of Quality and Training, SSOE, Toledo, Ohio retired and
- Kenneth Lovejoy, VP, Environmental, Health and Safety, Owens Illinois, Inc., Perrysburg, Ohio retired
The committee also included Dr. Nagi Naganathan, then Dean of the COE, Dr. Steven LeBlanc, Interim Dean of the COE, Mohamed Samir Hefzy, Associate Dean of Graduate Studies and Res. Administration of the COE, Abdollah Afjeh, Chair of the MIME department, Professors Tom Stuart and Rashmi Jah from the EECS department, and Professors Glenn Lipscomb and Sasidhar Varanasoi from the CHEE department.

The task force worked for about a year to develop the proposed additional concentration: Master of Engineering with a concentration in Energy Engineering – A Practice Oriented Program.

The proposed program includes courses offered by the College of Law and the College of Business and Innovation at UT. It also includes courses offered by several engineering departments to include mechanical engineering, electrical engineering, civil engineering, chemical engineering and bioengineering. It would address both technology and business aspects of energy engineering:

1. Advanced Energy - This would be advanced learning and education on the primary forms of the supply side of energy production. Fossil (coal), gas, hydro, renewables (wind, solar, biomass), nuclear, and distributed generation or fuel cells. This advanced educational activity would provide a deeper understanding of the energy conversion processes. In addition, it would examine the aspects of value and performance that bring to focus reliability, efficiency, cost, control methods, including the integration of these energy forms within the grid, emphasizing power system fundamentals.

2. Management – This curriculum would be associated with the various aspects of efficiency/optimization and utilization by the end user within the commercial and industrial marketplace. This would utilize engineering principles aligned with business process analysis to look at user usage and patterns to create value. It would also include basic economics, business acumen, and current trends on global energy resources and project management basics.

3. Policy - This curriculum would seek to integrate the many variables that would align economic and social challenges into regulatory or legislative policy creation. This would bring together the sciences with engineering to understand the short and long term strategic policy and regulatory implications in the energy field to create a knowledge capability that balances the engineering understanding and societal needs along with business acumen for framing strategic thinking principles to produce near and long term value.

An individual with this Master degree would have an immediate impact in many businesses that would include owners, policy makers, research firms, consultants in the commercial, industrial, and public sectors.
MASTER IN ENGINEERING WITH A CONCENTRATION IN GENERAL ENGINEERING

Coursework option: 30 credit hrs. of course work

Project option: 24 credit hrs. of course work +
6 hours of Special Projects in Engineering GNEN 6920

Required Courses:

A) 3 hrs. GNEN 6700 Management of Projects and Technological Innovation

B) One of the following two courses (3 hrs.): (may take both)

- 3hrs GNEN 5500 Applications of Engineering Analysis
- 3hrs. GNEM 5700 Applied Probability and Statistics in Engineering

C) Two of the following three course options (6 hrs.): (may take all three)

- 3 hrs. ACCT 5000 Introduction to Financial and Managerial Accounting
- 3 hrs. BLAW 6100 Business Government and Society
- 3 hrs. MGMT 6100 Leading Through Ethical Decision Making
- 3 hrs. OPMT 5520 Analysis of manufacturing and Service Systems

Elective Courses:

Eighteen (18) credit hours for the coursework option and Twelve (12) credit hours for the project option of Engineering Elective from the area of student's concentration. Elective courses may be taken on campus or via distance learning on the Internet. Graduate offerings from the Bioengineering (BIOE), Chemical and Environmental Engineering (CHEE), Civil Engineering (CIVE), Electrical Engineering and Computer Science (EECS), or Mechanical, Industrial and Manufacturing Engineering (MIME) departments are eligible for selection. The six-credit (6 hrs.) work-related project for the project option can be accomplished in coordination with the student's employer and utilize skills learned in this program.

MASTER IN ENGINEERING WITH A CONCENTRATION IN COMPUTER SCIENCE AND ENGINEERING

Coursework option: 30 credit hrs. of course work

Project option: 24 credit hrs. of course work +
6 hours of Special Projects

Thesis Option: 21 credit hrs. of course work +
9 credit hrs. of MS Thesis

1) In this MS program, graduate students typically select graduate courses in consultation with the thesis/project advisers - Those in the course and project option typically choose courses based on their own career interest and in consultation with the Graduate Director.

2) EECS Seminar course EECS 5930 is required of all students.