

## AGENDA

### **UW-GREEN BAY FACULTY SENATE MEETING NO. 6**

Wednesday, February 13, 2013

Alumni Rooms, 3:00 p.m.

Presiding Officer: Bryan Vescio, Speaker

Parliamentarian: Clifford Abbott

#### **1. CALL TO ORDER**

#### **2. APPROVAL OF MINUTES OF FACULTY SENATE MEETING NO. 5**

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#### **3. CHANCELLOR'S REPORT**

#### **4. NEW BUSINESS**

- a. Resolution on Transparency for Professional Advancement - first reading [page 5]  
Presented by David Dolan
- b. New Major in Electrical Engineering Technology - first reading [page 6]  
Presented by Greg Davis
- c. New Major in Environmental Engineering Technology - first reading [page 33]  
Presented by Greg Davis
- d. New Major in Mechanical Engineering Technology - first reading [page 59]  
Presented by Greg Davis
- e. Joint Committee on Student Misconduct [page 80]
- f. Request for future business

#### **5. PROVOST'S REPORT**

#### **6. OTHER REPORTS**

- a. Academic Affairs Council Report [page 81]
- b. University Committee Report - Presented by UC Chair Derek Jeffreys
- c. Academic Staff Report - Presented by Kristi Aoki
- d. Student Government Report - Presented by Heba Mohammad

#### **7. ADJOURNMENT**

[draft]

**MINUTES 2012-2013**  
**UW-GREEN BAY FACULTY SENATE MEETING NO. 5**  
Wednesday, January 23, 2013  
Phoenix Room C, University Union

Presiding Officer: Bryan Vescio, Speaker of the Senate  
Parliamentarian: Clifford Abbott

PRESENT: Francis Akakpo (SOWORK), Kimberly Baker (HUB), Susan Cooper (EDU), Greg Davis (NAS-UC), Michael Draney (NAS), Heidi Fencel (NAS), Adolfo Garcia (ICS), Thomas Harden (Chancellor *ex officio*), Derek Jeffreys (HUS-UC), Michael Knight (BUA), Mimi Kubsch (NUR-UC), Arthur Lacey (EDU), J. Vincent Lowery (HUS-alternate), Christopher Martin (HUS), Ryan Martin (HUD-UC), Michelle McQuade-Dewhirst (MUS), Steve Meyer (NAS-UC), Jennifer Mokren (AND), Adam Parillo (URS), Uwe Pott (HUB), Chuck Rybak (HUS), Mussie Teclezion (BUA), Christine Vandenhouten (NURS), Bryan Vescio (HUS-UC), Julia Wallace (Provost, *ex officio*), Jill White (HUD), Georjeanna Wilson-Doenges (HUD).

NOT PRESENT: Andrew Austin (DJS), Forrest Baulieu (ICS), Franklin Chen (NAS), Kaoime Malloy (Theatre and Dance), and Laurel Phoenix (PEA).

REPRESENTATIVES: Heba Mohammad, Student Government; Kristi Aoki, Academic Staff

GUESTS: Steve Vanden Avond, Lucy Arendt, and Andrew Kersten

**1. Call to Order.** Speaker Vescio called the Senate meeting to order round 3 p.m.

**2. Approval of Minutes of Faculty Senate Meeting No. 4, November 14, 2012.** Speaker Vescio asked for any comments or corrections to the minutes and, upon hearing none, declared the minutes approved.

**3. Chancellor's Report.**

The Chancellor, having offered commentary on a number of issues earlier in the day at Convocation, had nothing in addition and simply stood for questions. The Senate, playing it cool, opted for passive over aggressive and offered none.

**4. New Business.**

a. Report of the Joint Committee on Workload and Compensation. CWC Chair Dave Dolan reported on the status of the Committee's work, which he predicted would bring some issues forward for Senate perhaps at the next meeting. The Committee is calling for greater transparency, working with the University's consultant on compensation, expecting a revised draft on a compensation philosophy, awaiting new data on comparable, and will be tackling some workload benchmarking soon.

b. Request for future business. Speaker Vescio made the standard request and the Senate, still playing it cool, offered none.

## **5. Provost's Report.**

The Provost noted the record number of graduates at the December commencement and offered there was very little to report over the last month. There has been no real progress on the Flexible Degree but the System committee she is on will be meeting soon in its search for an appropriate business model for the program.

## **6. Other Reports.**

a. Academic Affairs Council Report. Speaker Vescio noted the written report attached to the Senate's agenda.

b. Faculty Rep's Report. Steve Meyer reported on three issues discussed at the November 30, 2012 meeting in Madison. On the Flex Degree (apparently now being referred to as Flexible Option to a Degree) there were assurances that each campus has local control of how it accepts transfer credits but that doesn't totally prevent some possibilities for credit laundering. Also reported was that the degree completion rate for Western Governor's University was rather low and it took WGU about a decade of operation to break even. One projection for the Flex Degree is an investment of 14 million with five years to break even. A second issue was possibilities for differential tuition. UW-Madison has some in place for programs in engineering and business. The third issue was compensation. The Regents reportedly may like to get independent authority for authorizing a pay plan, something now subject to legislative control. There were no questions from senators but the Speaker did elaborate that the amount of local control of transfer credits was limited by agreements already in place.

c. University Committee Report. UC Chair Derek Jeffreys reported on two issues on the UC's agenda. One is continued monitoring of the Flex Degree's development and the second is discussing ways of better supporting research and scholarly activity on campus. He also reported a security lapse (the use of employee ID numbers by United Way) that has apparently been corrected for the future.

d. Academic Staff Report. Kristi Aoki reported the Academic Staff Committee is working on awards for academic staff, the work of the Committee on Workload and Compensation, and preparations for an Academic Staff Assembly for the spring semester.

e. Student Government Report. Heba Mohammad reported on a number of items: leadership changes and challenges within student government; the ice rink is now in use; planning for hydration stations; a February 4th childcare forum; and a stand against changes to Wisconsin's same day voter registration.

**7. Open Forum on Advising.** Cliff Abbott was called upon to prime the pump for this discussion. He did so by posing five questions:

- Is the large number of course substitutions evidence of an advising problem?
- What resources are available to faculty as they learn to advise? Are they used?
- Is the electronic processing of advising actions working? Could it be improved?
- How are lines of communication among advisors working?
- Is there a need for a governance mechanism (a standing committee, a task force, some policy changes) for improving advising?

About a dozen people joined the discussion. Some of the contributions were claims such as: advising complaints (even to the extent of angry parents threatening legal action) are on the increase; students report getting most advice from family and friends (NSSE data); students prefer individual attention to on-line resources (HUD experience); student satisfaction rates with advising are below rates at other

schools (Equity Scorecard data); retention is crucially dependent on satisfactory advising; the percentage of faculty perceived as not knowledgeable about their own programs is surprisingly high (Equity Scorecard data). Many of the other comments were complaints such as: the amount of advising in some units (whether done by a single individual or distributed) is a workload issue; on-line resources are inconsistent, not standardized, and sometimes hard to find; the routes of appeals for bad advising are unclear; some students receive advising too late to be valuable; electronic forms unintentionally enable avoidance of advisors; electronic forms are not well programmed (the need to enter much data just to be able to say no - email or even paper may be preferable); communication among advisors is limited and problematic. There were also some suggestions such as: simpler program requirements make for simpler advising; linking advisors to first-year seminars might be effective; we should collect information on what we are telling students; we should collect feedback from students; we should have a committee to coordinate communication and problem identification; we should bring back the paper catalog.

**8. Adjournment.** The Speaker adjourned the meeting with the conclusion of business just before 4 p.m.

Respectfully submitted,

Clifford Abbott, Secretary of the Faculty and Academic Staff

## **Resolution on Transparency for Professional Advancement**

*WHEREAS*, the success and reputation of UW-Green Bay depends on the effective recruitment, retention, and advancement of talented employees; and

*WHEREAS*, information is essential to increase capacity and productivity across UW-Green Bay; and

*WHEREAS*, faculty and staff are professionally and personally reliant upon information provided to them by administration;

*THEREFORE, BE IT RESOLVED*, that the UW-Green Bay Faculty Senate, Academic Staff Committee, the Classified Staff Advisory Council, and the Compensation and Workload Committee supports the establishment of an online resource site with readily accessible documents including any and all requirements, information, and steps needed for all employees to enter into the promotion process throughout the campus. This information will include measurable steps or benchmarks for all employment areas; and,

*BE IT FURTHER RESOLVED*, the administration should monitor the progress of individuals who attempt to initiate the process and report annually a summary of recruitment, retention, and advancement results.

**Faculty Senate New Business 4a 2/13/2013**

## **Authorization for a Collaborative Program with a Major in Electrical Engineering Technology**

**A. Abstract:** A description of the proposed program in 50 words or less.

- The collaborative Electrical Engineering Technology program prepares students to pursue an engineering technician career within the broad field of Electrical Engineering Technology as a practitioner in the application of electrical engineering knowledge and skills. Graduates will fulfill the practical engineering needs of industrial and manufacturing employers.

### **B. Program Identification:**

1. Institution name

UW Green Bay

UW Oshkosh

2. Title of proposed program

Electrical Engineering Technology

3. Degree/major designation

BS degree with a major in Electrical Engineering Technology

4. Mode of delivery

The program will use a face-to-face delivery model. Faculty members will integrate additional technology-enhanced experiences into the program.

5. Single institution or collaboration

This program is a collaboration among two four-year UW Universities, five UW Colleges, and four institutions from the Wisconsin Technical College System and a tribal college, the College of Menominee Nation. See list of program participants in the narrative. An administrative oversight committee, with representation of staff, administration and faculty from all the

institutions involved, will focus on admissions, recruitment, advising and the administration of student services. Additionally, the oversight committee will approve and evaluate the curriculum, administer the assessment plan and review the selection of faculty to teach program courses. A Memorandum of Understanding will outline the roles and responsibilities of each institution in this collaboration. An Advisory Committee consisting of higher education members and representatives from the professions will guide the programs in relation to practices and trends in the field of engineering.

6. Projected enrollment by year five of the program

The initial year of the program will have approximately 50 students enrolled. An additional 25 students will be admitted each year. At the end of five years, a total of 150 students, 75 each for UW Oshkosh and UW Green Bay, will be enrolled in the program.

7. Tuition structure (i.e., standard tuition, differential tuition, etc.)

Tuition will be paid to the institution where the student is enrolled at the time. Each institution will charge a technology fee in addition to the tuition for this program.

8. Department or functional equivalent

UW Oshkosh-Department of Physics

UW Green Bay- College of Liberal Arts Sciences

9. College, School, or functional equivalent

UW Oshkosh College of Letters and Science

UW Green Bay College of Arts and Science

10. Proposed date of implementation

Fall 2013

**C. Introduction:**

### 1. Why is the program being proposed?

The proposal is for a collaborative program with a major in Electrical Engineering Technology (Bachelor of Science degree). The proposed program is based on the needs of manufacturers and municipalities in northeastern Wisconsin and beyond. According to the Bureau of Labor Statistics, between 2010 and 2020 positions in electrical engineering technology are projected to increase 14%. The program will have graduates that assist local industries, manufacturing, and engineering services firms. The program provides a highly competent and technically knowledgeable workforce with expertise related to Electrical Engineering Technology. The graduates will fill positions in industry and aid in corporate technology advancement endeavors. The proposed program reflects a distinctive, collaborative degree between NEW North institutions. Business and industry in the region will benefit from state-of-the-art technology and training centers in regional technical colleges, UW institutions, and regional industrial facilities. The collaboration between regional technical colleges, UW institutions, and a tribal college is unprecedented. The program furthers the UW System and Board of Regent's interest in providing collaborative degree programs that meet the unique needs of our region. The universities and colleges will have the advantage of highly involved regional industrial employers offering capstone projects, internships, and employment opportunities.

The program will benefit students, employers, and the educational institutions involved in the collaboration. Students will be prepared for future careers as they build their competence in applied electrical engineering knowledge and skills through coursework focusing on analytical and critical thinking. Students are technically skilled through hands-on implementation. Employers will benefit from having more knowledgeable employees who will continue to build their confidence and competence relative to their employment positions. This will assist employers in retaining employees for the long term. Educational institutions will set and maintain the high standards, by example and reputation, of quality Engineering Technology programs. The institutions involved in the collaboration will make more efficient use of their intellectual, human, and physical resources through collaboration efforts.

What is the program's relation to the institution's mission?



The program objectives are consistent with the select missions of the degree granting institutions of UW-Green Bay and UW- Oshkosh. Specifically, the Electrical Engineering Technology program relates to the mission of UW-Green Bay by emphasizing interdisciplinary problem-focused learning and engaged citizenship and to the mission of UW Oshkosh by providing a quality educational opportunity to the people of northeastern Wisconsin and beyond through the discovery, synthesis, preservation and dissemination of knowledge. Both institutions are committed to increasing the number of college-educated persons in their service areas.

## 2. How does the program fit into the institutions' overall strategic plans?

This program will help address a primary goal of the UW System Growth Agenda by increasing the number of graduates through programs that target student populations not currently served by UW-Oshkosh or UW-Green Bay. The demand mentioned by local businesses in the NEW North suggests that the Electrical Engineering Technology has the potential to be a popular major at both institutions.

Once approved by the faculty at UW-Green Bay and UW-Oshkosh and by the UW System Board of Regents, students will be able to begin their studies at any of the area's four technical colleges, five UW colleges, the College of Menominee Nation, UW-Green Bay, and UW-Oshkosh. Program completion will occur at UW-Green Bay or UW-Oshkosh with the conferral of a Bachelor of Science in Electrical Engineering Technology. The program is targeted to launch during the 2013-14 academic year.

## 3. Do current students need or want the program?

UW-Oshkosh and UW-Green Bay have currently enrolled students who are interested in the program. Both UW-Oshkosh and UW-Green Bay have pre-engineering programs and articulations with another UW System institution where engineering is offered. Over the last six years, 43% of the 317 students who indicated an interest in engineering on their applications actually enrolled at UW- Oshkosh. At UW-Green Bay, 40% of the 366 students who indicated an interest in pre-engineering enrolled at the institution over the last six years. Students may transfer to UWO or UWGB from engineering programs within the Wisconsin Technical College System.

## 4. Does market research indicate demand?

A May 2010 survey with NEW North manufacturers demonstrated a strong demand for engineering technologists—34% of the manufacturers' had current openings or were planning to hire engineering technologists with bachelor degrees. These facts demonstrated the demand for new talent and a commitment by employers to invest in their current employees to advance skills for the attainment of a bachelor's degree. Graduates in electrical engineering technology will be able to assist the electrical industry as electronic systems and computer systems become more integrated. According to the Bureau of Labor Statistics 2012 reports, demand is expected to be high for technicians in this program. As more electronics are integrated into automobiles, various portable and household electronics systems, GPS technologies, computers and cellular phone technologies, more electrical engineering technology will be needed.

The longstanding existence of significant manufacturing in northeastern Wisconsin provides a relevant context in which to develop and offer this degree. Nearly one-quarter (24%) of the jobs within this region are in manufacturing, exceeding overall percentages for both the state of Wisconsin (19%) and the U.S. (11%). The institutions involved in this collaboration created this program in response to employer needs, taking into account the nature and type of industry in the region and the requirements found necessary for the economic vitality of the region. Employers in this region are seeking engineering technology graduates. The NEW Manufacturing Alliance (a manufacturer led organization in the region) sponsored a November 2010 survey that targeted manufacturers that had \$3M or more in revenue and 25 or more employees. Of the 378 companies in the NEW North region that met those criteria, 179 companies completed the survey. Of the respondents, 41% were planning some form of capital expansion in the following 12-24 months; with a median investment of \$250,000. Similarly, 48% of firms were planning plant modernization at a median investment of \$225,000. Clearly, almost half of the manufacturers polled were investing in some form of capital expansion and modernization, indicating a high demand for engineers.

Other positive contributions to the region are related to how technology jobs drive economic vitality in the region. The most popular industries for engineering technologists are energy, aerospace, defense, water and wastewater, and biotechnology—and there are several major employers of these technologies within the region. There are numerous opportunities for

employment of program graduates within Wisconsin's dairy industry. This industry is located in the NEW North region, which is the service area for the institutions involved in this collaborative program. Almost 30% of the state's dairy economic activity is generated in this region, representing more than \$6.3 billion in 2004. Initiatives are already underway for this region to take a leadership role in new agri-businesses such as biofuels and biogas generation.

5. How does the program represent emerging knowledge or new directions in the professions and disciplines?

The field of Electrical Engineering Technology is very broad, ranging from laboratory and field measurements to system design and operations. An accredited Electrical Engineering Technology program will prepare students to fulfill the practical engineering needs of industrial and manufacturing employers, thereby contributing to the success of such businesses and related endeavors, wherever that may be geographically. The program intends to meet the electrical engineering technology employee needs of all applicable employers of northeastern Wisconsin, including members of The NEW North Inc. and members of the Northeast Wisconsin Manufacturing Alliance (NEWMA).

**D. Description of Program:**

1. Describe the general structure of the program, including:

*a. The ways in which the program fits into the institutional program array and academic plan.*

UW-Oshkosh and UW-Green Bay are committed to offering programs in high demand areas, especially as they relate to STEM fields. The academic plan of UW-Oshkosh stresses engaged learning, student excellence, globalization, diversity, sustainability, and community engagement. This degree will draw a more diverse student population, which is another priority of the academic program plan at UW-Oshkosh. UW-Green Bay is committed to offering high quality, interdisciplinary, problem-focused programs that have real world applications, especially in the areas of ecology and sustainability. This degree fits well within the institution's primary mission and broadens its reach into the community by advancing the capacity of the region to build economic infrastructure.

The program objectives and coursework support the preparation of engineering technologists who are specialists in the portion of the technological spectrum closest to product improvement, manufacturing, construction, and operational engineering functions. This engineering technology program typically includes instruction in various engineering support functions for research, production, and operations, and applications to specific engineering specialties. Coursework will provide engineering technologist professionals with hands-on and applications-based engineering knowledge in product design, testing, development, field engineering, technical operations, and quality control.

### **Program Objectives**

The coursework for the Electrical Engineering Technology program provides students with a solid foundation through the completion of supporting and fundamental courses as well as advanced study courses.

The UW Electrical Engineering Technology Baccalaureate Program shall serve to:

- Prepare students to select and pursue an engineering career within the broad field of Electrical Engineering Technology as practitioners in the application of electrical engineering knowledge and skills.
- Prepare students to obtain experience and develop competence through the application of specific knowledge and skills in their employment situation(s).
- Prepare students through both conceptual and hands-on practical training in real world applications.
- Prepare students to fulfill the practical engineering needs of industrial and manufacturing employers, thereby contributing to the success of such businesses and related endeavors, wherever that may be geographically.
- Meet the electrical engineering technology employee needs of all applicable employers of northeastern Wisconsin, including members of The NEW North Inc. and members of the Northeast Wisconsin Manufacturing Alliance (NEWMA).
- Qualify Baccalaureate graduates for jobs that require development and implementation of electrical/electronic(s) systems, including those with the title engineer.

*b. The extent to which the program is duplicative of existing programs in the University of Wisconsin System.*

UW-Green Bay and UW-Oshkosh have joint programs in Engineering with other UW Institutions. UW-Green Bay has a joint engineering program with UW-Milwaukee offering degrees in civil, electrical, industrial and manufacturing, materials, and mechanical engineering. UW-Green Bay also has an articulation agreement with Northwest Wisconsin Technical College to offer a manufacturing engineering degree. UW-Oshkosh has a dual degree program with UW-Madison and the University of Minnesota in which students earn a major in Physics at UW-Oshkosh and a major in a selected engineering field from the other Schools of Engineering.

UW-Green Bay and UW-Oshkosh also provide pre-professional courses for transfer into other engineering programs at UW System Schools of Engineering (UW-Milwaukee, UW-Madison, UW-Platteville, UW-Stout). Typically, students can take at least two years at UW-Green Bay or UW-Oshkosh and then transfer to a School of Engineering for their final two years. Required coursework is drawn from mathematics, physics, chemistry, computer science, engineering drawing, engineering mechanics, and other related courses. UW-Green Bay also offers an interdisciplinary program in Environmental Science as well as disciplinary programs in Chemistry and Math and a minor program in Physics. UW-Oshkosh offers majors in physics, Chemistry, and Math and an interdisciplinary Environmental Studies program. All of these programs could have some relationship with the proposed Electrical Engineering Technology program.

UW-Green Bay has a cooperative program in Engineering with the University of Wisconsin-Milwaukee, where students can take three years at UW-Green Bay and then transfer to UW-Milwaukee for their final two years. UW-Madison, UW-Milwaukee, and UW-Platteville offer a degree in Electrical Engineering. UW-Stout offers a subfield in Electrical Engineering. The Platteville program is available at UW-Fox Valley and UW-Rock County.

While offering strong programs for north-central Wisconsin residents, the existing degree programs do not meet the needs of many students in northeastern Wisconsin who graduate from two-year programs and who are geographically bound. In addition, as noted in the previously

collected data, the need for engineering technologists across Wisconsin far exceeds the resource capabilities of a single institution.

*c. The collaborative nature of the program, if appropriate, including specific institutional responsibilities.*

### **Industry Partnership**

Northeastern Wisconsin regional industry partners are committed to providing co-operative and internship opportunities for students, including practical case studies and projects – in which engineering technologists can experience real world issues and provide innovative solutions by applying the knowledge, concepts, and skills they learn in this program. These partners may be affiliated with, but not limited to, the NEW North Inc. and the Northeast Wisconsin Manufacturers Alliance.

### **Shared Facilities**

Students in the Electrical Engineering Technology program will have the advantage of learning in state-of-the-art technology laboratories in northeastern Wisconsin at the technical colleges— Fox Valley Technical College, Northeast Wisconsin Technical College, Moraine Park Technical College and Lakeshore Technical College. These Technology Centers are equipped to offer a broad range of applied learning experiences in electrical engineering. To minimize duplication and make more efficient use of facilities, courses will be offered at the locations that best utilize available faculty, classroom and lab facilities.

### **Program Participants**

The Electrical Engineering Technology baccalaureate degree program will be delivered through a collaboration of the members of the Northeast Wisconsin Educational Resource Alliance (NEW ERA). Currently participating in this collaboration are:

- University of Wisconsin- Green Bay
- University of Wisconsin- Oshkosh
- University of Wisconsin Colleges

Fond du Lac Campus

Fox Valley Campus  
Manitowoc Campus  
Marinette Campus  
Sheboygan Campus

- Wisconsin Technical Colleges

Fox Valley Technical College  
Lakeshore Technical College  
Moraine Park Technical College  
Northeast Wisconsin Technical College

- College of the Menominee Nation

These institutions are committed to challenging students to achieve their greatest potential through the collaborative use of each institution's faculty expertise and the use of their well-equipped laboratories, classrooms and other facilities. To assure program coordination among the participating schools, the Electrical Engineering Technology program curriculum, assessment, admissions and advising will be planned and continuously maintained by a cooperative curriculum committee. Each institution will be represented by at least one faculty member who is involved with the Electrical Engineering Technology program.

*d. The ways in which the program prepares students through diverse elements in the curriculum for an integrated and multicultural society (may include inclusion of diversity issues in the curriculum or other approaches).*

Both UW-Oshkosh and UW-Green Bay are committed to finding ways to expand the diversity of its student body and faculty, curriculum and student learning experiences. Expanding the diversity of the student body is reflected in the UW-Oshkosh Academic Program Plan and in its commitment to meet the strategic challenges for diversification of the student body and faculty. At UW-Green Bay, faculty members have been engaged in several significant initiatives to recruit a more diverse student body and close the achievement gap among students of color. Students in this collaborative program, recruited state-and region-wide, will have access to a variety of academic and student support programs, some of which are specifically created for students of color through the UW-Oshkosh Center for Academic Support and Diversity and the

Center for Academic Resources. UW-Green Bay will build upon the work of the American Intercultural Center and the Center for the Advancement for Teaching and Learning to foster diverse experiences for students in this program. The proposed BS degree with a major in Electrical Engineering will serve non-traditional students as well as transfer and first year cohort students. The faculty at the Wisconsin Technical Colleges and the two-year UW Colleges will create transfer paths and articulation agreements serving more diverse student populations. It is also expected that regional collaborations within Wisconsin will expand relationships with tribal colleges as well as business and industry partners. Students will participate in internships in diverse settings across the region including in larger urban areas and small corporate settings. Plans are underway to actively recruit students for the major from the McNair Scholars Program on the UW-Oshkosh campus by engaging students in undergraduate research, participation in student organizations, and through presentations. Women in Science programs at both four-year campuses will also be used to recruit students. These students are first-generation college students and have an interest in the STEM fields. Recruiting through campus student organizations based on ethnicity on campus will also provide access to STEM fields for underserved populations.

2. Explain briefly the program's plan for assessing student learning outcomes, including:

*a. Specifying what students will know and be able to do as a result of completing the program.*

The Electrical Engineering Technology Baccalaureate Degree Programs will prepare graduates to achieve the program educational objectives through the following student outcomes.

**General Engineering Technology Student Outcomes (ABET):**

Graduates of the Engineering Technology Baccalaureate degree programs must demonstrate:

- A. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
- B. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies



- C. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
- D. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
- E. an ability to function effectively as a member or leader on a technical team;
- F. an ability to identify, analyze and solve broadly-defined engineering technology problems;
- G. an ability to apply written, oral and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;
- H. an understanding of the need for and an ability to engage in self-directed continuing professional development;
- I. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;
- J. a knowledge of the impact of engineering technology solutions in a societal and global context; and
- K. a commitment to quality, timeliness and continuous improvement.

**Electrical Engineering Technology Specific Student Outcomes:**

In addition to the general EET student Outcomes, graduates of the Electrical Engineering Technology baccalaureate degree program must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

- L. the application of circuit analysis and design, computer programming, associated software, analog and digital electronics and microcomputers, and engineering standards to the building, testing, operation and maintenance of electrical/electronic(s) systems;
- M. the applications of physics or chemistry to electrical/electronic(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry;
- N. the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems;
- O. the ability to apply project management techniques to electrical/electronic(s) systems; and

- P. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems.

*b. How the program will continuously assess (using both direct and indirect assessment measures) the extent to which the learning outcomes are accomplished.*

The chairs of the programs, in collaboration with the program oversight committee, will have responsibility for the assessment of student learning. The curriculum committee of the Electrical Engineering program will set specific learning goals for each course that are designed to address identified core competencies. The assessment plan outlines how each of the outcomes are assessed throughout the program. Direct and indirect assessments of program learning outcomes will take place throughout the students' enrollment in the program. Instructors will assess student learning via hands-on laboratory work, theoretical problems, examinations and longer term, integrative projects as direct assessments of learning. As documented in the ABET accreditation for general program outcomes, the program has documented student outcomes that prepare graduates to attain the program educational objectives. At the conclusion of the program, graduates will complete a survey, an indirect measure, related to their level of satisfaction with the program during their last semester of study. Additional indirect measures or satisfaction surveys will be distributed to program graduates and employers.

The plan will be evaluated for the clarity of the learning outcomes, the appropriate alignment of assessment tools and the learning outcomes, the process used to collect, analyze and interpret data and the use of data to inform program changes and continuous improvement decisions. The program oversight committee reviews assessment data to inform any program or curricular changes.

### 3. Describe the programmatic curriculum, including:

*a. How the curriculum is structured (include web links to courses, prerequisites, and other programmatic components).*

See appendices for a description of the four-year curriculum plan.

*b. Projected time to degree*

Students will be able to complete the degree in a four-year period. Students will follow an academic plan for each year of the program. Transfer student pathways will be addressed through articulation agreements among two- and four-year institutions.

4. Summarize the program review process, including:

*a. How and when the program will be reviewed by the institution.*

The educational objectives of the program will be reviewed regularly by the program oversight committee and revised as needed to meet current ETAC of ABET accreditation requirements, and to serve the education and training needs of the engineering technology students, employees, and employers in northeastern Wisconsin. Changes to the objectives may be proposed by the advisory committee or faculty and will be considered by the EET curriculum committee representing the collaborating educational institutions. The program will be reviewed on a seven year cycle as a part of the university program review policy. Each program is reviewed concurrently at each four-year institution. The department, the college program review committee, the dean of the appropriate college and an external reviewer will conduct reviews before the senior administration completes the program review. Additionally, the program will be reviewed by the appropriate section of the ABET professional accrediting association.

*b. A discussion of what aspects will be evaluated to determine the quality of the program.*

Program review at the campus level will include the following components:

Curriculum program goals and learning outcomes;

Program description and curriculum components;

Program performance/quality/evaluation;

Assessment results;

Continuous improvement efforts related to assessment and the curriculum;

External reviewer report;

Changes/modifications to program;

Curriculum management;  
External Activities;  
Faculty qualifications;  
Institutional Support;  
Support staff and services;  
Inclusivity; and  
Number of graduates.

*c. How the review will provide consideration to equity and inclusive excellence, as appropriate.*

Advising is one key way that the program will integrate inclusive excellence into the program. Because there are many institutions participating in this program, an advisor will be needed at each one. This person will need to coordinate with campus student advising offices and will need to be familiar with the program curriculum and how the home institution's course offerings fit within that framework. Assuming that a director position and office is established for this program and the corresponding mechanical, and environmental engineering technology, it would be very helpful to have a central advisor who can field inquiries from all campuses. Given the complexity of the offerings at different campuses and the different student backgrounds, high quality advising is critical to the success of this program.

*d. Need for external accreditation.*

This program is intended to be accredited under the Criteria for Accrediting Engineering Technology Programs of the ABET Engineering Technology Accreditation Commission (ETAC). Programs requesting an initial accreditation must have at least one graduate prior to the academic year when the on-site review occurs. In order to take advantage of the substantial advantages that accreditation confers upon a program, the EET baccalaureate program will seek accreditation under the Criteria for Accrediting Engineering Technology Programs of the ABET Engineering Technology Accreditation Commission (ETAC).

## Electrical Engineering Technology Curriculum

### Overview by Semester

(122 Total Credits)

<b>Years</b>	<b>First Semester</b>	<b>Second Semester</b>
<b>1</b>	<b>Fundamentals of Engineering (2)</b> <b>General Physics I (5)</b> <b>DC Circuits (3)</b> <b>Gen Eds (6)</b>  <b>16 total</b>	<b>Fundamentals of Drawing (3)</b> <b>General Physics II (5)</b> <b>AC Circuits (3)</b> <b>Gen Eds (6)</b>  <b>17 total</b>
<b>2</b>	<b>Calculus I (4)</b> <b>Chemistry for Engineers (5)</b> <b>Semiconductor Devices (2)</b> <b>Computer Science OOP (3)</b> <b>Gen Eds (3)</b>  <b>17 total</b>	<b>Calculus II (4)</b> <b>Digital Circuits (3)</b> <b>Linear Circuits (3)</b> <b>Gen Eds (5)</b>  <b>15 total</b>

<b>3</b>	<b>Microcontrollers (3)</b> <b>Automation Devices &amp; PLC's (3)</b> <b>Advanced Circuit Analysis I (3)</b> <b>SCADA 1 (3)</b> <b>Gen Eds (3)</b>  <b>15 total</b>	<b>Lean Business Management (2)</b> <b>Industrial Motors/Drives (4)</b> <b>Advanced Circuit Analysis II (3)</b>  <b>Advanced PLC's (2)</b> <b>SCADA 2 (3)</b>  <b>14 total</b>
<b>4</b>	<b>Project Management (3)</b> <b>Advanced Process Control (3)</b>  <b>Advanced HMI (2)</b> <b>Electromagnetic Fields &amp; Apps (3)</b>  <b>Business Intro (3)</b>  <b>14 total</b>	<b>Capstone Project or Intern or Mechatronics (4)</b>  <b>Data Communication &amp; Protocols (3)</b>  <b>Electrical Power Systems &amp; Distribution (2)</b>  <b>Gen Eds (5)</b>  <b>14 total</b>

**122 Total Program Credits**

General Education    41 credits total

Fundamental Group    45 credits total

Advanced Group        36 credits total

## **BSEET Course Descriptions**

### **Semester 1**

#### **Intro to Engineering Technology – ET 100 (2cr)**

#### **Fundamentals of Engineering (2 cr, 100-level)**

This course is designed to equip engineering students with the necessary tools and background information to prepare them to be successful engineering students as well as a successful practicing engineer. Topics covered in this course include ethics, project management, team work, working with data, creating presentations, engineering design, and a thorough understanding of the engineering profession.

#### **General Physics I (5 cr, 100/200-level, with lab)**

A survey of kinematics, dynamics and thermodynamics including fundamentals of mechanics, Newton's laws of motion, energy conservation, and momentum conservation. Concepts are connected to their use in technology and their manifestation in natural phenomena. Course may be algebra-based or calculus-based. Prerequisite: concurrent registration or prior completion of Calculus I if calculus-based.

#### **DC Circuits (3cr) 100 level**

This course uses a balance of theory and practical application through laboratory investigation, with an introduction to circuit analysis software, to introduce basic electrical and circuit analysis principles by primarily examining DC circuits containing DC voltage and current sources (non-time-varying) and resistors.

This course also introduces the concepts of electric and magnetic fields, variation of voltage and current with time, capacitors and the time delay of voltage change, inductors and the time delay of current change, and basic electromagnetic device operation in relays and solenoids.

*(The following bulleted items do not have to be included in the course description. They have been included at this point for clarification.)*

More specifically, this course covers:

- Electrical terminology, standard notation, symbols, diagrams, schematics, and documentation techniques are taught and utilized.
- Creation and interpretation of DC circuit schematics and wiring diagrams and breadboard construction of circuits from them.

- Definition and measurement of current, voltage, resistance, and calculation of power. Voltage and current dangers to humans and equipment, and the limitations and hazards of parameter measurement
- Resistor types, construction, ratings, and color-coding. The theoretical voltage-current relationship of resistors (Ohm's Law) and its limitations; and the equivalence of series, parallel, and more complex resistor networks; and the practical application of these principles.
- Prediction, and verification of total circuit power delivery and dissipation as well as component power dissipation
- Validity and application of the Kirchhoff circuit parameter relationships of voltage and current in series and parallel resistor circuits.
- Usefulness of Thevenin and Norton circuit models and the conversion between voltage and current sources as a circuit analysis technique.
- Power in DC circuits, including maximum power transfer, and maximum voltage transfer.
- Application of Circuit analysis techniques and theorem including voltage division, current division, series-parallel circuit analysis and its limitations, equivalent circuit substitution, superposition, mesh analysis, and nodal analysis.
- Resistor bridge circuits, unbalanced and balanced

\* Pre / Co-requisite: Mathematics, including powers of numbers, ratios and proportions, basic algebraic manipulation of equations, solution of simultaneous equations, solution of polynomial equations, matrices, determinants, equation graphing/plotting.

## **Semester 2**

### **Fundamentals of Drawing (3cr) 100 level**

Introduces common industry drafting practices in the design process with an emphasis on computer-aided drafting (CAD). Topics include sketching, drawing setup and organization, dimensioning, orthographic and isometric projections, and CAD standards and guidelines.

### **General Physics II (5 cr, 100/200-level, with lab)**

A survey of electricity, magnetism, and electromagnetic waves with applications to electrical circuits and optics. Material is developed using concepts from General Physics I. Course may be algebra-based or calculus-based. Prerequisite: concurrent registration or prior completion of Calculus II if calculus-based.

### **AC Circuits (3cr) 100 level**

This course uses a balance of theory and practical application through laboratory investigation, with applications of circuit analysis software, to investigate and understand circuits with the



simplest of time varying voltages and currents. Only circuits with purely sinusoidal time varying voltage and current sources will be considered, and analysis will be restricted to time periods long after the initial turning on of the circuit, i.e. after the circuit has settled to a “steady state”. Reactive components (inductors and capacitors) will be considered as well as resistors. Transformers, three-phase power, and frequency response analysis will also be introduced.

*(The following bulleted items do not have to be included in the course description. They have been included at this point for clarification.)*

More specifically, this course covers:

- Mathematical expressions and plots of sinusoidal voltages and currents and the relationships among peak, peak to peak, average, and RMS values.
- Basics of the generation of single and three-phase voltage.
- Inductors and their voltage-current relationship in sinusoidally excited systems.
- Capacitors and their voltage-current relationship in sinusoidally excited systems.
- “Phasor” representation of sinusoidal functions.
- Impedance of resistors, inductors, and capacitors.
- Power in AC circuits, including complex power, maximum power transfer, and power factor.
- Application of all DC circuit analysis principles and techniques to sinusoidally excited circuits containing inductive, capacitive, and resistive components, using phasors and complex number mathematics.
- Introduction to series and parallel RLC resonance and Bode plots.
- Introduction to two port parameters, transfer functions, and frequency response.
- Frequency response of basic passive filters and basic op-amp circuits and Bode plots.
- Introduction to mutual inductance, transformers, and transformer models.
- Three phase power system basics, including line and load voltage current relationships and power factor correction.

\* Prerequisite: DC Circuits

\* Pre / Co-requisite: Higher level Mathematics, including algebra, trigonometry, complex numbers, polynomials, simultaneous equations, vectors, and matrices.

### **Semester 3**

#### **Calculus I (4 cr, 100-level)**

Real valued functions of a single variable. Concept of derivative, antiderivative, and definite integral. Differentiation and applications, including optimization and curve-sketching. Emphasis on problem solving, approximation, data analysis, visualization.

### **Chemistry for Engineers (5cr) 200 level**

A one-semester chemistry course for engineering students. Topics include measurements, atomic theory, stoichiometry, molecular structure, thermochemistry, electrochemistry, solid state, material science, and organic chemistry. Prerequisite: Grade of C- or better in CHE 112 or CHE 125 or grade of B or higher in high school chemistry and a grade of C or better in MAT 110 or MAT 124 or placement into MAT 221 based on placement test score, or cons. instr

### **Semiconductor Devices (2cr) 200 level**

Introduces semiconductor materials, the operation of diodes, zener diodes and the construction of rectifier and filter circuits. Laboratory experiments are performed to verify the theory. Examines the operation and theory of transistors and the construction of amplifiers. In-depth coverage of transistor biasing and special diodes are covered as well. Covers DC and AC analysis of amplifiers. Bypass and coupling capacitor functions, along with circuit limitations due to circuit configuration, are also examined. Covers Field Effective Transistor (FET) characteristics along with switching and amplification operations. Students also do circuit analysis of amplifier configurations. Laboratory experiments are performed to verify the theory. Prerequisite: AC Circuits

### **Computer Science OOP CS221 (3cr)**

A first course in problem solving, software design, and computer programming using an object-oriented language. Problem solving/software design techniques include: flow charts, pseudo code, structure charts, structure charts, and UML class diagrams. Data structures and algorithms include: arrays, characters strings, Linear search. Programming topics include; data types assignment statements, standard input/output, selection, repetition, functions/methods, parameters, scope of identifiers, debugging.

## **Semester 4**

### **Calculus II (4 cr, 100-level)**

Definite integration and applications, several techniques of integration, approximation, and improper integrals. Numerical differential equations, slope fields, Euler's method, and mathematical modeling. Taylor and Fourier Series. Prerequisite: Calculus I

### **Digital Circuits (3cr) 200 level**

Introduces digital electronics including Boolean, the operation of logic gates, and the theory of combination logic circuits. Examines data manual usage. Programmable logic devices, Karnaugh mapping, encoders, decoders, multiplexers, binary adders and parity circuits are introduced. Examines the operation of various shift registers, flip-flops, arithmetic circuits, numbering systems and practical digital devices. Mono-stable and a-stable multi-vibrators as well as glitch-free clocks are covered. Counters, Sum-of-Products and Product of Sums and more in-depth coverage of Karnaugh maps is also included. Laboratory activities are performed to verify the theory.

### **Linear Circuits (3cr) 200 level**

This course focuses on understanding the operation, analysis, and application of linear active circuits utilizing transistors, operational amplifiers, comparators, mixers, and other circuits and integrated circuit functions such as converters, phase locked loops, etc.

This course uses a balance of theoretical knowledge presentation, analysis using circuit analysis software, and practical application through laboratory breadboard investigation and troubleshooting.

*(The following bulleted items do not have to be included in the course description. They have been included at this point for clarification.)*

More specifically, this course covers:

- Bipolar transistor amplifiers
- JFET and/or MOSFET transistor amplifiers
- Operational amplifier characteristics, advantages, limitations, and specifications.
- Operational amplifier IC applications, including amplification, summation, multiplication (mixing), differentiation, integration, comparison, hysteresis, wave shaping, regulation, oscillation, and active filtering.
- Introduction to higher level linear functions available in integrated circuit packages, potentially including: regulator, phase lock loop, mixer, coder, decoder, digital to analog and analog to digital converter, etc.

Prerequisite: Semiconductor Devices

## **Semester 5**

### **Microcontrollers (3cr) 200 level**

This course introduces students to embedded computer systems through exploration of microcontroller operation, architecture and programming and explores midrange microcontroller peripherals using assembly and C programming. Also covered is an introduction to serial

communications applications. The use of wireless communication devices is discussed. Students will interface various external devices to the microcontroller. Prerequisite: Digital Circuits

### **Auto Devices & Programmable Logic Controller's (3cr) 200 level**

This course starts with an introduction to electric motor control components such as switches, relays, starters, transformers, sensors, timers, and counters. An overview of how to safely mount and install motor and motor control components and perform related wiring and troubleshooting of motor control circuits is provided. Programmable logic controller programming and troubleshooting is covered. PLC topics such as timers, counters, sequencers, data move, math, and analog input and output are covered. Project will include programming a PLC system to operate a discrete and analog process adhering to a functional specification or timing diagram. An introduction to machine wiring, including basic documentation, labeling, and wiring practices; an overview of NFPA 70 machinery, safety and installation standards is also provided. Prerequisite: Digital Circuits

### **Advanced Circuit Analysis 1 (3cr) 200 level**

This course uses a balance of theory and practical application through laboratory investigation, with applications of circuit analysis software, to investigate and understand circuit operation with more depth, insight, and understanding than the prerequisite DC and AC circuit studies could reveal. The simultaneous analysis of exponential and steady state responses and responses to special and useful circuit stimuli are investigated. The application of calculus, linear differential equations, and other higher order mathematics are utilized. The study of circuits with active linear components such as transistors and operational amplifiers is also included.

*(The following bulleted items do not have to be included in the course description. They have been included at this point for clarification.)*

More specifically, this course covers:

- Complex frequency (the s-domain), and the DC, exponential, sinusoidal, exponentially damped sinusoidal cases
- The Laplace Transform
- Other forcing functions: unit step, unit impulse, exponential, ramp
- The Inverse Laplace Transform
- Laplace theorems
- Circuit analysis in the s-domain
- Frequency response in the s-domain; poles and zeroes
- Resonance in the s-domain
- Passive filters in the s-domain

Pre-requisites: AC Circuit Analysis, Calculus 1, and Calculus 2

### **Supervisory Control and Data Acquisition 1 – SCADA1 (3cr) 200 level**

This course incorporates embedded controllers, DAQ and knowledge acquired from previous courses. Students work in small teams to complete tasks for larger projects. Advanced DAQ, DDC, SCADA and interactive remote network and single point access topics are included.

## **Semester 6**

### **Lean Business Management (2cr) 300 level**

This course is a course focused on the time value of money as well as operating a business using lean manufacturing using the Six Sigma model, Just In Time production, and an introduction to operations management. Topics covered include making decisions under risk, choosing the best alternative using various economic models, present worth analysis, uniform series, rate of return, benefit cost ratios, analysis.

### **Industrial Motors/Drives (4cr) 300 level**

This course covers power circuitry of DC and AC drives and application of industrial DC and AC drives to DC and AC motors. Drive setup, interfacing and implementation are also covered. DC motors and generator configurations, as well as brushless and permanent magnet motors are included. AC single and three phase motors are covered as well. Prerequisite: DC and AC Circuits

### **Advanced Circuit Analysis II (3cr) 300 level**

This course uses a balance of theory and practical application through laboratory investigation, with applications of circuit analysis software, to investigate and understand circuit operation with further depth, insight, and understanding than the prerequisite circuit analysis courses revealed. This course utilizes Fourier analysis.

*(The following bulleted items do not have to be included in the course description. They have been included at this point for clarification.)*

More specifically, this course covers:

- Trigonometric form of the Fourier Series
- The use of symmetry
- Complete response to sinusoidal forcing functions
- Complex form of the Fourier Series
- Definition of the Fourier Transform
- Some properties of the Fourier Transform
- Fourier transform pairs for some simple time functions
- The Fourier transform of a general periodic time function
- The system function and response in the frequency domain
- The physical significance of the system function

Pre-requisites: AC Circuit Analysis, Calculus 2

### **Advanced Programmable Logic Controllers (2cr) 200 level**

Topics such as interfacing PLC's to communicate between each other, remote control of inputs and outputs, and networking devices together into a complete system are covered. Prerequisite: Auto Devices & Programmable Logic Controller's

### **SCADA 2 (2cr) 200 level**

This course is a continuation of Supervisory Control and Data Acquisition 1. Advanced data acquisition, direct digital control and typical data sharing networking applications are covered. Topics include recipes, trending of historical data, bridging data and Web-enabled applications. Prerequisite: SCADA 1

## **Semester 7**

### **Project Management (3cr) BUS 411**

Topics include pre-construction planning; project scheduling systems, critical path management, risk analysis, and software programs. Prerequisite: Design Problems (This course is equivalent of UWO COB 411. N.B. Prerequisites for this particular course are extensive.)

### **Advanced Process Control (3cr) 400 level**

Covers the history of metrology, terminology, traceability, electrical/electronic measurements and the principles of the calibration system. Discusses the techniques for precision measurements, the reasons for these techniques and interpreting measurement data. Hands-on laboratory experiments are provided to demonstrate and verify the concepts in precision

measurement theory as it relates to process measurements and the accuracy of electrical measurements in industry. Covers a broad variety of sensor and transducer operation and utilization. Signal conditioning and connection configurations are studied and applied. Actuators used in typical industrial-related processes are covered, including operation, connection and configuration. Operation and application of electronic instrumentation, measurement devices and methods of measurements--pressure, force, temperature, etc. are also covered. Principles of open and closed loop control systems are applied, including an introduction to PID control terminology and techniques. Prerequisite: Linear Circuits

### **Advanced HMI (2cr) 400 level**

This course covers the following topics: Summarize the functions of Human Machine Interface; generate PLC program to communicate with a Operator Interface Terminal; produce a tag database with screen objects for Operator Interface Terminal; troubleshoot a Operator Interface Terminal application; validate an Operator Interface Terminal application via written specification; apply advanced functions of Operator Interface Terminal; differentiate between Human Machine Interface software and Operator Interface Terminal functionality; illustrate the basic setup of PLC/Human Machine Interface system; generate PLC program to communicate with a Human Machine Interface Software; produce a tag database with screen objects for Human Machine Interface Software. Prerequisite: Advanced Programmable Logic Controllers

### **Electromagnetic Fields and Applications (3cr) 400 level**

This course starts with math review incorporating vectors, quantities, operations and spherical, cylindrical, and rectangular coordinate systems. Concepts & units pertaining to electric & magnetic fields, laws and circuit concepts are covered. Electrostatic topics are introduced. The course concludes with applications pertaining to transmission lines, antennas & waveguides. Laboratory activities reinforce the concepts taught. Prerequisite: Linear Circuits

### **Business Intro (3cr) 400 level**

Provides an overview of the variety of activities in the world of business. It focuses on the responsibilities connected with operating a business from both organizational and managerial viewpoints. It also examines the role of government in business.

## **Semester 8**

### **Capstone Project or Internship (4cr) 400 level**

Students form teams as directed and define a technological problem. Detailed problem specifications are formed. Each project team develops a formal project proposal and delivers a formal presentation. Each student maintains a bounded engineering log notebook. Prerequisite: Senior standing

### **Data Communication & Protocols (3cr) 400 level**

The concepts needed to understand the increasingly important field of data communications and networking are presented in this course. The principles associated with data communication, transmission media, interfaces, error control, flow control, synchronization, circuit switching and packet switching are investigated. Ethernet as a LAN configuration is studied. The course concentrates on the physical and data link layers of communication links and networks. The student examines the various options available in networks and systems. Commonly used protocols and interface standards are emphasized. Prerequisite: Digital Circuits

### **Electrical Power Systems and Distribution (2cr) 400 level**

Characteristics of various three-phase power configurations and in-plant power distribution are covered. Students will also gain exposure to utility systems interconnection from generation through distribution which includes: powerhouse, hydroelectric, wind, solar and nuclear, EHV and HV transmission, the utility grid, device coordination, metering, protective relays, fuses, breakers, and fault current interrupting. Prerequisite: AC Circuits and Automation Devices & PLC's

### **Mechatronics (4 cr), 400-level with lab**

The study of the integration of mechanical, electrical and electronic systems. Topics include semiconductor devices, digital circuitry, sensors. Students will design and build a project using an electromechanical control system. Prerequisites: Basic Electrical Circuits, Design Problems

**Faculty Senate New Business 4b 2/13/2013**



## **Authorization for a Collaborative Program with a Major in Environmental Engineering Technology**

**B. Abstract:** A description of the proposed program in 50 words or less.

- An accredited Environmental Engineering Technology program prepares graduates to work in a number of environmental positions where they can apply their knowledge of biology, chemistry, mathematics and physics, to solve modern environmental problems. Graduates understand the professional practice and the roles and responsibilities of organizations pertaining to environmental engineering technology.

### **B. Program Identification:**

#### 1. Institution name

UW Green Bay

UW Oshkosh

#### 2. Title of proposed program

Environmental Engineering Technology

#### 3. Degree/major designation

BS degree with a major in Environmental Engineering Technology

#### 4. Mode of delivery

The program will use a traditional face-to-face delivery model. Faculty members will integrate additional technology enhanced experiences into the program.

#### 5. Single institution or collaboration

This program is a collaboration among two four-year UW Universities, five UW Colleges, and four institutions from the Wisconsin Technical College System and a tribal college, the College of Menominee Nation. See list of program participants in collaborative section of this narrative. An administrative oversight committee, with representation of staff, administration and faculty from all the institutions involved, will focus on admissions, recruitment, advising and the

administration of student services. Additionally, the oversight committee will approve and evaluate the curriculum, administer the assessment plan and review the selection of faculty to teach program courses. A Memorandum of Understanding will outline the roles and responsibilities of each institution in this collaboration. An Advisory Committee consisting of higher education members and representatives from the professions will guide the programs in relation to practices and trends in the field of engineering.

6. Projected enrollment by year five of the program

The initial year of the program will have approximately 50 student enrolled. An additional 25 students will be admitted each year. At the end of five years, a total of 150 students, 75 each for UW Oshkosh and UW Green Bay, will be enrolled in the program.

7. Tuition structure (i.e., standard tuition, differential tuition, etc.)

Tuition will be paid to the institution where the student is enrolled at the time. Each institution will charge a technology fee in addition to the tuition for this program.

8. Department or functional equivalent

UW Oshkosh-Department of Physics

UW Green Bay- Department of Natural and Applied Sciences

9. College, School, or functional equivalent

UW Oshkosh College of Letters and Science

UW Green Bay College of Arts and Science

10. Proposed date of implementation

Fall 2013

**C. Introduction:**

1. Why is the program being proposed?

The proposal is for a collaborative program with a major in Environmental Engineering Technology (Bachelor of Science degree). The proposed program is based on the needs of manufacturers and municipalities in northeastern Wisconsin and beyond. In fact, between 2010 and 2020, positions in environmental engineering technology are projected to increase 24%. The program will have graduates that assist local industries by providing a trained workforce able to provide cutting-edge expertise on contemporary topics in Environmental Engineering Technology. The graduates will fill vacant positions in industry, and aid in corporate technology advancement endeavors. The proposed program reflects a distinctive, collaborative degree between NEW North institutions. Business and industry in the region will benefit from state-of-the-art technology and training centers in regional technical colleges, UW institutions, and regional industrial facilities. The collaboration between regional technical colleges, UW institutions, and a tribal college is unprecedented. The program furthers the UW System and Board of Regent's interest in providing collaborative degree programs that meet the unique needs of our region. The universities and colleges will have the advantage of highly involved regional industrial employers offering capstone projects, internships, and employment opportunities.

The program will benefit students, employers, and the educational institutions involved in the collaboration. Students will be prepared for future careers as they build their competence in applied environmental engineering knowledge and skills through coursework focusing on critical thinking and hands-on implementation. Employers will benefit from having more knowledgeable employees who will continue to build their confidence and competence relative to their employment positions. This will assist employers in retaining employees for the long term. Educational institutions will set and maintain the high standards, by example and reputation, of quality Engineering Technology programs. The institutions involved in the collaboration will make more efficient use of their intellectual, human, and physical resources through collaboration efforts.

What is the program's relation to the institution's mission?

The program objectives are consistent with the select missions of the degree granting institutions of UW-Green Bay and UW-Oshkosh. Specifically, the Environmental Engineering Technology

program relates to the mission of UW-Green Bay by emphasizing interdisciplinary problem-focused learning, ecological sustainability, and engaged citizenship and to the mission of UW-Oshkosh by providing a quality educational opportunity to the people of northeastern Wisconsin and beyond through the discovery, synthesis, preservation and dissemination of knowledge. Both institutions are committed to increasing the number of college-educated persons in their service areas.

## 2. How does the program fit into the institutions' overall strategic plans?

This program will help address a primary goal of the UW System Growth Agenda by increasing the number of graduates through programs that target student populations not currently served by UW-Oshkosh or UW-Green Bay. The demand mentioned by local businesses in the NEW North suggests that the Environmental Engineering Technology has the potential to be a popular major at both institutions.

Once approved by the faculty at UW-Green Bay and UW-Oshkosh and by the UW System Board of Regents, students will be able to begin their studies at any of the area's four technical colleges, five UW colleges, the College of Menominee Nation, UW-Green Bay and UW-Oshkosh. Program completion will occur at UW-Green Bay or UW-Oshkosh with the conferral of a Bachelor of Science in Environmental Engineering Technology. The program is targeted to launch during the 2013-14 academic year.

## 3. Do current students need or want the program?

UW-Oshkosh and UW-Green Bay currently have enrolled students who are interested in the program. Both UW-Oshkosh and UW-Green Bay have pre-engineering programs and articulations with another UW System institution where engineering is offered. Over the last six years, 43% of the 317 students who indicated an interest in engineering on their applications actually enrolled at UW-Oshkosh. At UW-Green Bay, 40% of the 366 students who indicated an interest in pre-engineering enrolled at the institution over the last six years. Students may transfer to UWO or UWGB from engineering programs within the Wisconsin Technical College System.

#### 4. Does market research indicate demand?

A May 2010 survey with NEW North manufacturers demonstrated a strong demand for engineering technologists—34% of the manufacturers' had current openings or were planning to hire engineering technologists with bachelor degrees. In the same survey, 15 of the companies recommended that their existing employees complete a Environmental Engineering Technology degree. These facts demonstrated the current demand for new talent and a commitment by employers to invest in their current employees to advance skills for the attainment of a bachelor's degree. Graduates in environmental engineering technology will be able to assist state and local governments with efforts that focus on efficient water use, and wastewater treatment, which is a significant concern in many areas. The increasing demands of mandates by Congress and the Environmental Protection Agency will sustain employment prospects for these graduates. ( Bureau of Labor Statistics Job Outlook, 2012)

The longstanding existence of significant manufacturing in northeastern Wisconsin provides a relevant context in which to develop and offer this degree. Nearly one-quarter (24%) of the jobs within this region are in manufacturing, exceeding overall percentages for both the state of Wisconsin (19%) and the U.S. (11%). The institutions involved in this collaboration created this program in response to employer needs, taking into account the nature and type of industry in the region and the requirements found necessary for the economic vitality of the region. Employers in this region are seeking engineering technology graduates. The NEW Manufacturing Alliance (a manufacturer led organization in the region) sponsored a November 2010 survey that targeted manufacturers that had \$3M or more in revenue and 25 or more employees. Of the 378 companies in the NEW North region that met those criteria, 179 companies completed the survey. Of the respondents, 41% were planning some form of capital expansion in the following 12-24 months; with a median investment of \$250,000. Similarly, 48% of firms were planning plant modernization at a median investment of \$225,000. Clearly, almost half of the manufacturers polled were investing in some form of capital expansion and modernization, indicating a high demand for engineers.

Other positive contributions to the region are related to how technology jobs drive economic vitality in the region. The most popular industries for engineering technologists are energy, aerospace, defense, water and wastewater, and biotechnology—and there are several major employers of these technologies within the region. There are numerous opportunities for employment of program graduates within Wisconsin’s dairy industry. This industry is located in the NEW North region, which is the service area for the institutions involved in this collaborative program. Almost 30% of the state’s dairy economic activity is generated in this region, representing more than \$6.3 billion in 2004. Initiatives are already underway for this region to take a leadership role in new agri-businesses such as biofuels and biogas generation.

5. How does the program represent emerging knowledge, or new directions in the professions and disciplines?

The field of Environmental Engineering Technology is very broad, ranging from laboratory and field measurements to system design and operations. An accredited Environmental Engineering Technology program will prepare graduates to work in a number of environmental positions where they can apply their knowledge of biology, chemistry, mathematics and physics, to solve modern environmental problems. Graduates will also understand the concepts of professional practice and the roles and responsibilities of public institutions and private organizations pertaining to environmental engineering technology from local, state, national and global perspectives.

**D. Description of Program:**

1. Describe the general structure of the program, including:

*a. The ways in which the program fits into the institutional program array and academic plan.*

UW-Oshkosh and UW-Green Bay are committed to offering programs in high demand areas, especially as they relate to STEM fields. The academic plan of UW-Oshkosh stresses engaged learning, student excellence, globalization, diversity, sustainability, and community engagement. This degree will draw a more diverse student population, which is another priority of the academic program plan at UW-Oshkosh. UW-Green Bay is committed to offering high quality, interdisciplinary, problem-focused programs that have real world applications, especially in the

areas of ecology and sustainability. This degree fits well within the institution's primary mission and broadens its reach into the community by advancing the capacity of the region to build economic infrastructure.

The program objectives and coursework support the preparation of engineering technologists who are specialists in the portion of the technological spectrum closest to product improvement, manufacturing, construction, and operational engineering functions. This engineering technology program typically includes instruction in various engineering support functions for research, production, and operations, and applications to specific engineering specialties. Coursework will provide engineering technologist professionals with hands-on and applications-based engineering knowledge that in product design, testing, development, field engineering, technical operations, and quality control.

### **Program Objectives**

The coursework for the Environmental Engineering Technology program provides students with a solid foundation through the completion of supporting and fundamental courses in biology, chemistry, geosciences, mathematics, physics and introductory courses in air, solid waste, water and wastewater. Through the upper level fundamentals courses, students will also learn about environmental economics, environmental systems, GIS, hydrology and soil science. The advance study courses include a required course in project management, a required capstone project or internship/coop experience, and a number of other electives where students can focus on a particular area of Environmental Engineering Technology. These areas include specific environmental issues like air, hazardous waste, solid waste, water, or wastewater, but could also include courses in environmental data analysis, environmental law, industrial safety and hygiene, pollution prevention, or renewable energy.

*b. The extent to which the program is duplicative of existing programs in the University of Wisconsin System.*

UW-Green Bay and UW-Oshkosh have joint programs in Engineering with other UW Institutions. UW-Green Bay has a joint engineering program with UW Milwaukee offering degrees in civil, electrical, industrial and manufacturing, materials, and mechanical engineering.

UW-Green Bay also has an articulation agreement with Northwest Wisconsin Technical College to offer a manufacturing engineering degree. The UW-Oshkosh has a dual degree program with UW-Madison and the University of Minnesota with a major in Physics at UW-Oshkosh and a major in a selected engineering field from the other Schools of Engineering.

UW-Green Bay and UW-Oshkosh also provide pre-professional courses for transfer into other engineering programs at UW System Schools of Engineering (UW-Milwaukee, UW-Madison, UW-Platteville, UW-Stout). Typically, students can take at least two years at UW-Green Bay or UW-Oshkosh and then transfer to a School of Engineering for their final two years. Required coursework is drawn from mathematics, physics, chemistry, computer science, engineering drawing, engineering mechanics, and other related courses. UW-Green Bay also offers an interdisciplinary program in Environmental Science as well as disciplinary programs in Chemistry and Math and a minor program in Physics. UW-Oshkosh offers majors in physics, Chemistry, and Math and an interdisciplinary Environmental Studies program. All of these programs could have some relationship with the proposed Environmental Engineering Technology program.

There currently is one other engineering technology program offered in the State of Wisconsin at UW-Stout. While offering strong programs for north-central Wisconsin residents, the existing degree programs not meet the needs of many students in northeastern Wisconsin who graduate from two-year programs and who are geographically bound. UW-Stout also offers a BS in Mechanical Engineering in collaboration with NWTC in Green Bay, but not an Engineering Technology BS. In addition, as noted in the previously collected data, the need for engineering technologists in Wisconsin far exceeds the resource capabilities of a single institution.

*c. The collaborative nature of the program, if appropriate, including specific institutional responsibilities.*

### **Industry Partnership**

Northeastern Wisconsin regional industry partners are committed to providing co-operative and internship opportunities for students, including practical case studies and projects in which



engineering technologists can experience real world issues and provide innovative solutions by applying the knowledge, concepts, and skills they learn in this program. These partners may be affiliated with, but not limited to, the NEW North Inc. and the Northeast Wisconsin Manufacturers Alliance.

### **Shared Facilities**

Students in the Environmental Engineering Technology program will have the advantage of learning in state-of-the-art technology laboratories in northeastern Wisconsin at the technical colleges—Fox Valley Technical College, Northeast Wisconsin Technical College, Moraine Park Technical College and Lakeshore Technical College. These Technology Centers are equipped to offer a broad range of applied learning experiences in Environmental engineering. To minimize duplication and make more efficient use of facilities, courses will be offered at the locations that best utilize available faculty, classroom and lab facilities.

### **Program Participants**

The Environmental Engineering Technology baccalaureate degree program will be delivered through a collaboration of the members of the Northeast Wisconsin Educational Resource Alliance (NEW ERA). Currently participating in this collaboration are:

- University of Wisconsin- Green Bay
- University of Wisconsin- Oshkosh
- University of Wisconsin Colleges
  - Fond du Lac Campus
  - Fox Valley Campus
  - Manitowoc Campus
  - Marinette Campus
  - Sheboygan Campus
- Wisconsin Technical Colleges
  - Fox Valley Technical College
  - Lakeshore Technical College
  - Moraine Park Technical College
  - Northeast Wisconsin Technical College

- College of the Menominee Nation

These institutions are committed to challenging students to achieve their greatest potential through the collaborative use of each institution's faculty expertise and the use of their well-equipped laboratories, classrooms and other facilities. To assure program coordination among the participating schools, the Environmental Engineering Technology program curriculum, assessment, admissions, and advising will be planned and continuously maintained by a cooperative curriculum committee. Each institution will be represented by at least one faculty member who is involved with the EET program.

*d. The ways in which the program prepares students through diverse elements in the curriculum for an integrated and multicultural society (may include inclusion of diversity issues in the curriculum or other approaches).*

Both UW-Oshkosh and UW-Green Bay are committed to finding ways to expand the diversity of its student body and faculty, curriculum and student learning experiences. Expanding the diversity of the student body is reflected in the UW-Oshkosh Academic Program Plan and in its commitment to meet the strategic challenges for diversification of the student body and faculty. At UW-Green Bay, faculty members have been engaged in several significant initiatives to recruit a more diverse student body and close the achievement gap among students of color. Students in this collaborative program, recruited state-and region-wide, will have access to a variety of academic and student support programs, some of which are specifically created for students of color through the UW-Oshkosh Center for Academic Support and Diversity and the Center for Academic Resources. UW-Green Bay will build upon the work of the American Intercultural Center and the Center for the Advancement for Teaching and Learning to foster diverse experiences for students in this program. The proposed BS degree with a major in Environmental Engineering will serve non-traditional students as well as transfer and first year cohort students. The faculty at the Wisconsin Technical Colleges and the two-year UW Colleges will create transfer paths and articulation agreements serving more diverse student populations. It is also expected that regional collaborations within Wisconsin will expand relationships with tribal colleges as well as business and industry partners. Students will participate in internships in diverse settings across the region including in larger urban areas and small corporate settings.

Plans are underway to actively recruit students for the major from the McNair Scholars Program on the UW-Oshkosh campus by engaging students in undergraduate research, participation in student organizations, and through presentations. Women in Science programs at both four-year campuses will also be used to recruit students. These students are first-generation college students and have an interest in the STEM fields. Recruiting through campus student organizations based on ethnicity on campus will also provide access to STEM fields for underserved populations.

2. Explain briefly the program's plan for assessing student learning outcomes, including:

*a. Specifying what students will know and be able to do as a result of completing the program.*

**Learning Outcomes**

The following learning outcomes have been identified for those students completing the Environmental Engineering Technology Program:

- An ability to identify, analyze and solve environmental problems by applying knowledge, modern instrumentation and techniques, and technical skills;
- An ability to select and apply a knowledge of mathematics, science, engineering, and technology to environmental problems that require the application of principles and applied procedures or methodologies;
- An ability to conduct standard tests and measurements and to conduct, analyze and interpret experiments;
- An ability to apply written, oral and graphical communication and identify and use appropriate technical literature;
- An ability to function effectively as a member or leader of technical teams;
- An understanding of the need for continuing professional development;
- An understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity;
- A knowledge of the impact of engineering technology solutions in local, regional, national and global context;
- A commitment to quality, timeliness and continuous improvement.

*b. How the program will continuously assess (using both direct and indirect assessment measures) the extent to which the learning outcomes are accomplished.*

The chairs of the programs, in collaboration with the program oversight committee, will have responsibility for the assessment of student learning. As documented in the ABET accreditation for general program outcomes, the engineering program has documented student outcomes that prepare graduates to attain the program educational objectives. The curriculum committee of the program will set specific learning goals for each course that are designed to address identified core competencies related to ABET. The assessment plan outlines how each of the abet competencies are assessed throughout the program. Direct and indirect assessments of program learning outcomes will take place throughout the students' enrollment in the program. A more detailed assessment plan will be created as the courses are implemented during the next two years that is aligned to the ABET assessment matrix. The assessment plan will be evaluated for the clarity of the learning outcomes, the appropriate alignment of assessment tools and the learning outcomes, the process used to collect, analyze and interpret data and the use of data to inform program changes and continuous improvement decisions. The program oversight committee reviews assessment data to inform any program or curricular changes.

3. Describe the programmatic curriculum, including:

*a. How the curriculum is structured (include web links to courses, prerequisites, and other programmatic components).*

See appendices for a description of the four-year curriculum plan.

*b. Projected time to degree*

Students will be able to complete the degree in a four-year period. Students will follow an academic plan for each year of the program. Transfer student pathways will be addressed through articulation agreements among two- and four-year institutions.

4. Summarize the program review process, including:

*a. How and when the program will be reviewed by the institution.*

The educational objectives of the program will be reviewed regularly by the program oversight committee and revised as needed to meet current ETAC of ABET accreditation requirements, and to serve the education and training needs of the engineering technology students, employees, and employers in northeastern Wisconsin. Changes to the objectives may be proposed by the advisory committee or faculty and will be considered by the Environmental Engineering Technology curriculum committee representing the collaborating educational institutions. The program will be reviewed on a seven-year cycle as a part of the university program review policy. Each program is reviewed concurrently at each four-year institution. The department, the college program review committee, the dean of the appropriate college and an external reviewer will conduct reviews before the senior administration completes the program review. Additionally, the program will be reviewed by the appropriate section of the ABET professional accrediting association.

*b. A discussion of what aspects will be evaluated to determine the quality of the program.*

Program review at the campus level will include the following components:

Curriculum program goals and learning outcomes;

Program description and curriculum components;

Program performance/quality/evaluation;

Assessment results;

Continuous improvement efforts related to assessment and the curriculum;

External reviewer report;

Changes/modifications to program;

Curriculum management;

External Activities;

Faculty qualifications;

Institutional Support;

Support staff and services;

Inclusivity; and

Number of graduates.

*c. How the review will provide consideration to equity and inclusive excellence, as appropriate.*

Advising is one key way that the program will integrate inclusive excellence into the program. Because there are many institutions participating in this program, an advisor will be needed at each one. This person will need to coordinate with campus student advising offices and will need to be familiar with the program curriculum and how the home institution's course offerings fit within that framework. Assuming that a director position and office is established for this program and the corresponding electrical and mechanical engineering technology, it would be very helpful to have a central advisor who can field inquiries from all campuses. Given the complexity of the offerings at different campuses and the different student backgrounds, high quality advising is critical to the success of this program.

*d. Need for external accreditation.*

The two four year universities in this collaboration will propose the BS degree with a major in Environmental Engineering for accreditation by the Engineering Accreditation Commission. Programs requesting an initial accreditation must have at least one graduate prior to the academic year when the on-site review occurs. In order to take advantage of the substantial advantages that accreditation confers upon a program, the EET baccalaureate program will seek accreditation under the Criteria for Accrediting Engineering Technology Programs of the ABET Technology Accreditation Commission (ETAC).

## **Bachelor of Science Degree with a major in Environmental Engineering Technology Curriculum**

Overview by Course Group (129-132 Total Credits)

General Education Credits (37-39 credits at UWGB and 41 credits at UWO) : To be determined by UWGB and UWO, with some of the program credits also being included in the General Education Requirements.

### **PROGRAM CREDITS (88-91 credits)**

#### **SUPPORT GROUP (41 credits)**

Fundamentals of Engineering (2 credits) – available on-line

Calculus I & II (8 credits)

Chemistry I & II (10 credits)

Biology (4 credits) - organisms, ecology and evolution

Physics I (5 credits) – calculus or non-calculus based

Introduction to Business (3 credits)

Introductory Statistics (3 credits)

Drafting (2 credits)

Surveying (3 credits)

#### **FUNDAMENTALS GROUP (37 credits)**

##### 200 Level Courses (23 credits)

Environmental Microbiology (4 credits)

Fluids/Hydraulics (3 credits)

Geosciences (4 credits)

Introduction to Air (3 credits)

Introduction to Solid Waste (3 credits)

*Introduction to Water (3 credits)*

*Introduction to Wastewater (3 credits)*

*NOTE: Introduction to Water and Introduction to Wastewater may be counted as an Advanced Study Group elective based on students passing competency tests from the Wisconsin Department of Natural Resources (WDNR)*

300 Level Courses (17 credits)

- Environmental Economics (3 credits)
- Environmental Systems (4 credits)
- Hydrology (3 credits)
- Soil Science (4 credits)
- Geographic Information Systems (3 credits)

**ADVANCED STUDY GROUP (13-15 credits)**

300/400 Level Courses

(Required)

- Project Management (3credits)

(One or more of the following)

- Advanced Air (3 credits)
- Advanced Solid Waste (3 credits)
- Advanced Water (3 credits)
- Advanced Wastewater (3 credits)

(One or more of the following)

- Environmental Data Analysis (3 credits)
- Hydrogeology (3 credits)
- Hazardous Waste Management (3 credits)
- Pollution Prevention (3 credits)
- Renewable Energy (3 credits)
- Water Resources Management (3 credits)
- Industrial Safety and Hygiene (3 credits)



Environmental Law (3 credits)

Lean Processes (3 credits)

(One or more of the following)

Capstone Project (3 credits)

Co-op or Internships (3 credits)

## **Course Descriptions**

### **SUPPORT GROUP**

Fundamentals of Engineering (2 cr, 100-level) - This course is designed to equip engineering students with the necessary tools and background information to prepare them to be successful engineering students as well as a successful practicing engineer. Topics covered in this course include ethics, project management, team work, working with data, creating presentations, engineering design, and a thorough understanding of the engineering profession.

Calculus I (4 credits) - Real valued functions of a single variable. Concept of derivative, antiderivative, and definite integral. Differentiation and applications, including optimization and curve-sketching. Emphasis on problem solving, approximation, data analysis, visualization.

Calculus II (4 credits) – Definite integration and applications, several techniques of integration, approximation, and improper integrals. Numerical differential equations, slope fields, Euler's method, and mathematical modeling. Taylor and Fourier Series. Prerequisite: Calculus I

Chemistry I (5 credits) –Topics covered include: atomic theory, atomic and electronic structure, chemical bonding, mole concept, stoichiometry, state of matter, formulas and equations, solutions and colloids. Prerequisites: Credit for or concurrent enrollment in College Algebra or completion/placement of any higher math course.

Chemistry II (5 credits) – Topics covered include: molecular structure, chemistry of metals and selected nonmetals, intermolecular forces, chemical equilibrium. Prerequisite: Chemistry I with a grade of (C) or better and either completion of College Algebra with a grade of C or better, completion/placement of any higher math course.

Biology II (4 credits) – Biological principles, structure and function of organisms, with consideration of interactions at cellular level and examination of the relationships of organisms to the environment. Includes laboratories.

Physics I (5 credits) – A non-calculus physics sequence covering fundamentals of mechanics, energy, power, thermodynamics and sound with applications to the areas of biology, chemistry, the earth science and technology.

Introduction to Business (3 credits) – The major components of the business enterprise and its resources, competitive and regulatory environment; pricing, profit, finance planning, controls, ethics, environmental impact, social responsibility and other important concepts; environmental issues that challenge the business leader.

Introductory Statistics (3 credits) – Descriptive and inferential statistics; frequency distributions; graphical techniques; measure of central tendency and of dispersion; probability regression correlation, analysis of count data, analysis of variance.

Drafting (2 credits) – Computer aided drafting using AutoCAD software focusing on template settings; creating and manipulating layers; basic drawing, editing, and inquiry commands; blocks and attributes; and plotting.

Note that the Mechanical Engineering Technology group is using Engineering Graphics (3 credits) – This course utilizes computer aided drafting using AutoCAD software focusing on template settings; creating and manipulating layers; basic drawing, editing, and inquiry commands; blocks and attributes; and plotting. An introduction to technical communication,

annotation, geometric construction, model, orthographic and pictorial, section and auxiliary views and dimensioning is also provided.

Surveying (3 credits) – Fundamental concepts and theory of engineering measurements; adjustment and use of instruments; computations; errors; measurement of distance, difference in elevation, angles and directions; route surveying, construction surveys. Probability concepts and statistical analysis of field data

### **FUNDAMENTALS GROUP**

#### **200 Level Courses (23 credits)**

Environmental Microbiology (4 credits) – The course covers basic concepts of microbiology, through chemical and physiological properties, genetics, evolution, and diseases caused by microbes and the microbial activities beneficial to human. Special emphasis on the role of microorganisms in environmental processes. Laboratory covers standard microbiological techniques, environmental sampling, and isolation and identification of bacteria. Prerequisite: Biology 105 and one year of general chemistry. .

Fluids/Hydraulics (3 credits) – Provides students with a unified understanding of fluid dynamic systems. Topics will include but are not limited to hydrostatics, Bernoulli, pipe flow and loss, and lift and drag.

NOTE: NWTC has four 1-credit fluid mechanics classes that are summarized below.

Fluids 1: Basic Pneumatics - What fluid power is, differentiate between hydraulics and pneumatics, implement basic pneumatic circuits, utilize schematics, apply Pascal's Law, define properties of fluids, and implement airflow control and hydraulics cylinder circuits.

Fluids 2: Basic Hydraulic - Hydraulic pumps, basic hydraulics actuator circuits, hydraulic schematics, apply Pascal's Law, summarize the effects of fluids friction, define properties of hydraulic energy, design hydraulic circuits with directional control valves.

Fluids 3: Inter Hydraulics - Design of cylinder actuating circuits with pressure-compensated flow control valves, how to control pressure, pilot-operated check valve applications, accumulator operation and application, hydraulic motor types and applications.

Fluids 4: Advanced Hydraulics - Components of hydraulic pump power, characteristics of fluid conductors, issues of hydraulic system maintenance, basics of hydraulic flow and pressure in pipelines, design a hydraulic system from a specification.

Geosciences (4 credits) – Description and analysis of the geological processes that shape the earth's major internal and external features. Origins, properties and use of the earth's rock and mineral resources.

Introduction to Air (3 credits) – An overview of global air currents, major air pollutants and sources, transport of these by air currents, EPA standards for air pollutants, into to abatement methods like scrubbers on coal burning power plants, non-attainment status and consequences

Introduction to Solid Waste (3 credits) – Topics include generation, processing, and disposal of municipal, industrial, and agricultural waste materials with emphasis on the technical and economic feasibility of various processes.

Introduction to Water (3 credits) – Overview of global water sources, drinking water quality and treatment, pollutants and sources and consequences to water quality, storm water management systems and storm water quality.

Introduction to Wastewater (3 credits) – Physical, chemical, and biological principles of operation of wastewater treatment systems are studied. The basic unit processes, control

parameters, and mathematical problem solving related to collection systems and treatment facilities are introduced. Laboratory procedures and practices involved with operation of wastewater analysis and treatment including industrial waste treatment technologies.

NOTE: INTRODUCTION TO WATER AND INTRODUCTION TO WASTEWATER MAY BE COUNTED AS AN ADVANCED STUDY GROUP ELECTIVE BASED ON STUDENTS PASS THE COMPETENCY TESTS FROM THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES (WDNR)/

300 Level Courses (17 credits)

Environmental Economics (3 credits) – Applications of tools such as cost-benefit analysis and other economic concepts in current public decision-making, with special emphasis upon common property resources management.

Environmental Systems (4 credits) – Physical and chemical aspects of natural environmental processes. The movement, transformation, and fate of materials and contaminants.

Hydrology (3 credits) – Qualitative study of the principal elements of the water cycle, including precipitation, runoff, infiltration, evapotranspiration and ground water; applications to water resource projects such as low flow augmentation, flow reregulation, irrigation, public and industrial water supply and flood control.

Soil Science (4 credits) – The physical, chemical and biological properties and principals of soils; formation, classification and distribution of major soil orders; function and management of soils in natural, agricultural and urban environments. Includes field and laboratory experiences.

GIS (3 credits) - Uses state-of-the-art software to integrate digitized data maps, transfer data, manage relational databases, overlay maps, display, query, edit interactive graphics, and geocode addresses. Applications are tailored to fit student interests and may include tax base analysis,

property mapping, natural resources inventory, crime demography, transportation routing, and other tasks.

### **ADVANCED STUDY GROUP (16 credits)**

#### 300/400 Level Courses

Project Management (3credits) – There are two primary objectives for this course. The first objective is to develop student knowledge and skills in project management. The second objective is to develop student knowledge and skills in the distributed, or client/server, information systems. The course is a capstone course for the MIS major. It is designed to meet the two objectives with instructor support and lecture while providing the student an environment in which they can manage project management skills. Upon completion of the course the students is expected to be able to:

1. Identify and explain the importance and context of project management,
2. identify and explain the components and process of scope management,
3. identify and explain the components and process of risk management,
4. identify and explain the components and process of schedule management,
5. identify and explain the components and process of cost management,
6. identify and explain the components and process of resource management,
7. identify and explain the components and process of project evaluation and control,
8. demonstrate ability to perform project management calculations, and
9. use Microsoft Project to manage projects.

Advanced Air (3 credits) – This course will discuss primary air pollution chemistry, fate and transport of pollutants, secondary air pollution, indoor air quality, and air permitting.

Advanced Solid Waste (3 credits) – This course will focus on technical concepts of solid waste management related to the design and operation of landfills, waste-to-energy systems, composting facilities, recycling facilities and other emerging waste management technologies.

Advanced Water (3 credits) – Topics covered will include surface water quality modeling and the physical conveyance systems for both potable and sewage water systems. Also included would be the design and retrofitting of pumping stations, analysis of gravity versus pumped systems and advanced drinking water treatment systems including physical and chemical methods such as chlorination, ozonation, micro and ultrafiltration and reverse osmosis.

Advanced Wastewater (3 credits) – This course covers sewage treatment for municipal and industrial sources via activated sludge, as well as advanced methods such as ion exchange and other methods to remove nutrients. Solids treatment and stabilization via process such as aerobic digestion, anaerobic digestion and composting are also discussed.

Environmental Data Analysis (3 credits) – This course emphasizes the principles of data analysis using the SAS (Statistical Analysis System) software package. It employs primarily environmental examples to illustrate procedures for elementary statistical analysis, regression analysis, analysis of variance and nonparametric analysis. P: introductory statistics course.

Hydrogeology (3 credits) – Introduction to the geological and physical principles governing ground water flow. Description of aquifer properties, chemical processes, equation of flow, well hydraulics, and environmental concerns.

Hazardous Waste Management (3 credits) – Topics will include the handling, processing, and disposal of materials, which have physical, chemical, biological and radiological properties that present hazards to human, animal, and plant life. Procedures for worker safety and regulatory monitoring and compliance will also be discussed.

Pollution Prevention (3 credits) – Emphasizes principles of pollution prevention and environmentally conscious products, processes and manufacturing systems. Also addresses post-use product disposal, life cycle analysis, and pollution prevention economics.

Renewable Energy (3 credits) – Study of alternate energy systems, which may be the important energy sources in the future, such as solar, wind, biomass, fusion, ocean thermal, fuel cells and magneto hydrodynamics.

Water Resources Management (3 credits) – This course focuses on groundwater and surface water resources and regulations that cover the geology, properties, flow and pollution of water systems. This includes techniques for ground and surface water characterization and water quality monitoring. Additional aspects of this course include local, regional and global aspects of water resources, surface water pollution, mining of fossil aquifers, and water conflicts at the local regional, national, and international levels.

Industrial Safety and Hygiene (3 credits) – Potential hazards that can adversely affect safety and health will be analyzed. The course will also evaluate and assess safety and health risks associated with equipment, material, processes and activities. Also covered will be occupational health and safety management principles, systems and supporting techniques to initiate and/or improve an organization's safety management system.

Environmental Law (3 credits) – An overview of major environmental laws such as the Clean Air and Clean Water Acts, with emphasis on how these laws are implemented by the federal and state governments.

Lean Processes (3 credits) – This course is a course focused on the time value of money as well as operating a business using lean manufacturing using the Six Sigma model, Just In Time production, and an introduction to operations management. Topics covered include making decisions under risk, choosing the best alternative using various economic models, present worth analysis, uniform series, rate of return, benefit cost ratios, analysis.

Capstone Project (3 credits) – This is the capstone course in the Environmental Engineering Technology program. Contemporary environmental issues are chosen for review and analysis in



a seminar format, with a consideration of the technical, economic and social aspects of these issues. P: major in Environmental Engineering Technology and senior standing.

Co-op or Internships (1-3 credits) – Co-ops or internships are offered on an individual basis at the student's request and consists of a program of learning activities planned in consultation with a faculty member. A student wishing to study or conduct research in an area not represented in available scheduled courses should develop a preliminary proposal and seek the sponsorship of a faculty member. The student's advisor can direct him or her to instructors with appropriate interests. A written report or equivalent is required for evaluation, and a short title describing the program must be sent early in the semester to the registrar for entry on the student's transcript.

**Four-Year Plan of Courses**

Years	First Semester	Second Semester
1	Intro to Engineering Technology(2) Introduction to Business (3) Biology II (4) Drafting (2) Gen Eds (3-6)  SEMESTER TOTAL (14-17)	Surveying (3) General Physics I (5) Introductory Statistics (4) Gen Eds (3)  SEMESTER TOTAL (15)
2	Calculus I (4) Chemistry I (5) Intro to Water (3) Geosciences (4)  SEMESTER TOTAL (16)	Calculus II (4) Chemistry II (5) Intro to Wastewater (3) Environmental Systems (4)  SEMESTER TOTAL (16)
3	Intro to Solid Waste (3) Soil Science (4) Fluids/Hydraulics (3)	Intro to Air (3) Hydrology (3) Environmental Economics (3)

	Environmental Microbiology (4) Gen ed (0-3)  SEMESTER TOTAL (14-17)	Advanced (3) Gen ed (3)  SEMESTER TOTAL (15)
4	Gen Eds (6-9) GIS (3) Advanced (3-6) Co-op/Internship (1-3)  SEMESTER TOTAL (15)	Capstone Project (4) Advanced (3-6) Gen Eds (3-6)  SEMESTER TOTAL (16)

**Faculty Senate New Business 4c 2/13/2013**

## **Authorization for a Collaborative Program with a Major in Mechanical Engineering Technology**

**C. Abstract:** A description of the proposed program in 50 words or less.

- The collaborative Mechanical Engineering Technology program that prepares students to pursue an engineering technician career within the broad field of Mechanical Engineering Technology as a practitioner in the application of mechanical engineering knowledge and skills. Graduates will fulfill the practical engineering needs of industrial and manufacturing employers.

### **B. Program Identification:**

1. Institution name

UW Green Bay

UW Oshkosh

2. Title of proposed program

Mechanical Engineering Technology

3. Degree/major designation

BS degree with a major in Mechanical Engineering Technology

4. Mode of delivery

The program will use a traditional face-to-face delivery model. Faculty members will integrate additional technology-enhanced experiences into the program.

5. Single institution or collaboration

This program is a collaboration among two four-year UW Universities, five UW Colleges, and four institutions from the Wisconsin Technical College System and the College of the Menominee Nation. See list of program participants in the collaboration section of the narrative.

An administrative oversight committee, with representation of staff, administration and faculty from all the institutions involved, will focus on admissions, recruitment, advising and the administration of student services. Additionally, the oversight committee will approve and evaluate the curriculum, administer the assessment plan and review the selection of faculty to teach program courses. A Memorandum of Understanding will outline the roles and responsibilities of each institution in this collaboration. An Advisory Committee consisting of higher education members and representatives from the professions will guide the programs in relation to practices and trends in the field of engineering.

6. Projected enrollment by year five of the program

The initial year of the program will have approximately 50 student enrolled. An additional 25 students will be admitted each year. At the end of five years, a total of 150 students, 75 each for UW Oshkosh and UW Green Bay, will be enrolled in the program.

7. Tuition structure (i.e., standard tuition, differential tuition, etc.)

Tuition will be paid to the institution where the student is enrolled at the time. Each institution will charge a technology fee in addition to the tuition for this program.

8. Department or functional equivalent

UW Oshkosh-Department of Physics

UW Green Bay- Department of Natural and Applied Sciences

9. College, School, or functional equivalent

UW Oshkosh College of Letters and Science

UW Green Bay College of Arts and Science

10. Proposed date of implementation

Fall 2013

**C. Introduction:**

1. Why is the program being proposed?

The program proposal is for a collaborative Bachelor of Science degree with a major in Mechanical Engineering Technology. The proposed program is based on the needs of manufacturers and municipalities in northeastern Wisconsin and beyond. In fact, between 2010 and 2020 these positions are projected to increase 14%. (Bureau of Labor Statistics, 2012) The program will have graduates that assist local industries by providing a trained workforce able to provide cutting-edge expertise on contemporary topics in Mechanical Engineering Technology. According to the Bureau of Labor Statistics (2012), demand for mechanical engineering technicians is expected to increase as the interest and demand for alternative energy sources such as wind power and solar power increase. The graduates will fill vacant positions in industry and aid in corporate technology advancement endeavors. Graduates may also work with firms in engineering services and in research and development. The proposed program reflects a distinctive, collaborative degree between NEW North institutions. Business and industry in the region will benefit from state-of-the-art technology and training centers in regional technical colleges, UW institutions, and regional industrial facilities. The collaboration between regional technical colleges, UW institutions, and a tribal college is unprecedented. The program furthers the UW System and Board of Regent's interest in providing collaborative degree programs that meet the unique needs of our region. The universities and colleges will have the advantage of highly involved regional industrial employers offering capstone projects, internships, and employment opportunities.

The program will benefit students, employers, and the educational institutions involved in the collaboration. Students will be prepared for future careers as they build their competence in applied mechanical engineering knowledge and skills through coursework focusing on critical thinking and hands-on implementation. Employers will benefit from having more knowledgeable employees who will continue to build their confidence and competence relative to their employment positions. This will assist employers in retaining employees for the long term. Educational institutions will set and maintain the high standards, by example and reputation, of quality Engineering Technology programs. The institutions involved in the collaboration will make more efficient use of their intellectual, human, and physical resources through collaboration efforts.

### What is the program's relation to the institution's mission?

The program objectives are consistent with the select missions of the degree granting institutions of UW-Green Bay and UW-Oshkosh. Specifically, the Mechanical Engineering Technology program relates to the mission of UW-Green Bay by emphasizing interdisciplinary problem-focused learning and engaged citizenship and to the mission of UW-Oshkosh by providing a quality educational opportunity to the people of northeastern Wisconsin and beyond through the discovery, synthesis, preservation and dissemination of knowledge. Both institutions are committed to increasing the number of college-educated persons in their service areas.

### 2. How does the program fit into the institutions' overall strategic plans?

This program will help address a primary goal of the UW System Growth Agenda by increasing the number of graduates through programs that target student populations not currently served by UW-Oshkosh or UW-Green Bay. The demand mentioned by local businesses in the NEW North suggests that the Mechanical Engineering Technology has the potential to be a popular major at both institutions. Once approved by the faculty at UW-Green Bay and UW-Oshkosh and by the UW System Board of Regents, students will be able to begin their studies at any of the area's four technical colleges, five UW colleges, the College of Menominee Nation, UW-Green Bay and UW-Oshkosh. Program completion will occur at UW-Green Bay or UW-Oshkosh with the conferral of a Bachelor of Science in Mechanical Engineering Technology. The program is targeted to launch during the 2013-14 academic year.

### 3. Do current students need or want the program?

UW-Oshkosh and UW-Green Bay currently have enrolled students who are interested in the program. Both UW-Oshkosh and UW-Green Bay have pre-engineering programs and articulations with another UW System institution where engineering is offered. Over the last six years, 43% of the 317 students who indicated an interest in engineering on their applications actually enrolled at UW Oshkosh. At UW Green Bay, 40% of the 366 students who indicated an interest in pre-engineering enrolled at the institution over the last six years. Students may transfer to UWO or UWGB from engineering programs within the Wisconsin Technical College System.

#### 4. Does market research indicate demand?

A May 2010 survey with NEW North manufacturers demonstrated a strong demand for engineering technologists—34% of the manufacturers' had current openings or were planning to hire engineering technologists with bachelor degrees. In the same survey, 15 of the companies recommended that their existing employees complete a Mechanical Engineering Technology degree. These facts demonstrated the current demand for new talent and a commitment by employers to invest in their current employees to advance skills for the attainment of a bachelor degree.

The longstanding existence of significant manufacturing in northeastern Wisconsin provides a relevant context in which to develop and offer this degree. Nearly one-quarter (24%) of the jobs within this region are in manufacturing, exceeding overall percentages for both the state of Wisconsin (19%) and the U.S. (11%). The institutions involved in this collaboration created this program in response to employer needs, taking into account the nature and type of industry in the region and the requirements found necessary for the economic vitality of the region. Employers in this region are seeking engineering technology graduates. The NEW Manufacturing Alliance (a manufacturer led organization in the region) sponsored a November 2010 survey that targeted manufacturers that had \$3M or more in revenue and 25 or more employees. Of the 378 companies in the NEW North region that met those criteria, 179 companies completed the survey. Of the respondents, 41% were planning some form of capital expansion in the following 12-24 months; with a median investment of \$250,000. Similarly, 48% of firms were planning plant modernization at a median investment of \$225,000. Clearly, almost half of the manufacturers polled were investing in some form of capital expansion and modernization, indicating a high demand for engineers.

Other positive contributions to the region are related to how technology jobs drive economic vitality in the region. The most popular industries for engineering technologists are energy, aerospace, defense, water and wastewater, and biotechnology—and there are several major employers of these technologies within the region. There are numerous opportunities for

employment of program graduates within Wisconsin's dairy industry. This industry is located in the NEW North region, which is the service area for the institutions involved in this collaborative program. Almost 30% of the state's dairy economic activity is generated in this region, representing more than \$6.3 billion in 2004. Initiatives are already underway for this region to take a leadership role in new agri-businesses such as biofuels and biogas generation.

5. How does the program represent emerging knowledge or new directions in the professions and disciplines?

The curriculum emphasizes interdisciplinary learning, which aligns well with the current focus on the preparation and requirements for engineers of the 21<sup>st</sup> century. The interdisciplinary approach supports creative problem solving, critical thinking, teamwork, leadership, communication, and cultural diversity to enrich and engage students. These concepts are aligned with the LEAP outcomes adopted by the UW System campuses and are reflected in the general education outcomes at the system campuses. This approach benefits students completing the Mechanical Engineering Technology program at UW Green Bay or UW Oshkosh by enhancing their long-term performance as engineering technologists.

After mastering concepts associated with basic physics, chemistry and math, students will take courses in specialized areas that reflect current and new directions in the field including:

- drawing, modeling and analysis using state of the art software packages
- behaviors and characteristics of materials and machine system components
- advanced study of thermal and fluid systems
- the integration of mechanical, electrical and electronic systems
- designing projects and managing them from start to finish

**D. Description of Program:**

1. Describe the general structure of the program, including:

*a. The ways in which the program fits into the institutional program array and academic plan.*



UW- Oshkosh and UW- Green Bay are committed to offering programs in high demand areas, especially as they relate to STEM fields. . The academic plan of UW- Oshkosh stresses engaged learning, student excellence, globalization and diversity, sustainability, and community engagement. This degree will draw a more diverse student population, which is another priority of the academic program plan at UW- Oshkosh. UW- Green Bay is committed to offering high quality, interdisciplinary, problem-focused programs that have real world applications. This degree fits well within the institution's primary mission and broadens its reach into the community by advancing the capacity of the region to build economic infrastructure.

The program objectives and coursework support the preparation of engineering technologists who are specialists in the portion of the technological spectrum closest to product improvement, manufacturing, construction, and operational engineering functions. This engineering technology program typically includes instruction in various engineering support functions for research, production, and operations, and applications to specific engineering specialties. Coursework will provide engineering technologist professionals with hands-on and applications-based engineering knowledge in product design, testing, development, field engineering, technical operations, and quality control.

### **Program Objectives**

The Mechanical Engineering Technology Baccalaureate Program will:

- Prepare students to select and pursue an engineering career within the broad field of Mechanical Engineering Technology as a practitioner in the application of mechanical engineering knowledge and skills.
- Prepare students to obtain experience and develop competence through the application of specific knowledge and skills in their employment situation(s).
- Prepare students through both conceptual and hands-on practical training in real world applications.
- Prepare students to fulfill the practical engineering needs of industrial and manufacturing employers, thereby contributing to the success of such businesses and related endeavors, wherever that may be geographically.

- Meet the mechanical engineering technology employee needs of all applicable employers of northeastern Wisconsin, including members of The NEW North Inc. and members of the Northeast Wisconsin Manufacturing Alliance (NEWMA).

*b. The extent to which the program is duplicative of existing programs in the University of Wisconsin System.*

UW-Green Bay and UW-Oshkosh have joint programs in Engineering with other UW Institutions. UW-Green Bay has a joint engineering program with UW Milwaukee offering degrees in civil, electrical, industrial and manufacturing, materials, and mechanical engineering. UW-Green Bay also has an articulation agreement with Northwest Wisconsin Technical College to offer a manufacturing engineering degree. UW-Oshkosh has a dual degree program with the University of Wisconsin at Madison and the University of Minnesota with a major in Physics at UW Oshkosh and a major in a selected engineering field from the other Schools of Engineering.

UW-Green Bay and UW-Oshkosh also provide pre-professional courses for transfer into other engineering programs at UW System Schools of Engineering (UW-Milwaukee, UW-Madison, UW-Platteville, UW-Stout). Typically, students can take at least two years at UW-Green Bay or UW-Oshkosh and then transfer to a School of Engineering for their final two years. Required coursework is drawn from mathematics, physics, chemistry, computer science, engineering drawing, engineering mechanics, and other related courses. UW-Green Bay also offers an interdisciplinary program in Environmental Science as well as disciplinary programs in Chemistry and Math and a minor program in Physics. UW-Oshkosh offers majors in physics, Chemistry, and Math and an interdisciplinary Environmental Studies program. All of these programs could have some relationship with the proposed Mechanical Engineering Technology program.

There currently is one other engineering technology program offered in the State of Wisconsin at UW-Stout. While offering strong programs for north-central Wisconsin residents, the existing

degree programs do not meet the needs of many students in northeastern Wisconsin who graduate from two-year programs and who are geographically bound. UW-Stout also offers a BS in Mechanical Engineering in collaboration with NWTC in Green Bay, but not an Engineering Technology BS. In addition, as noted in the previously collected data, the need for engineering technologists in Wisconsin far exceeds the resource capabilities of a single institution.

*c. The collaborative nature of the program, if appropriate, including specific institutional responsibilities.*

### **Industry Partnership**

Northeastern Wisconsin regional industry partners are committed to providing co-operative and internship opportunities for students, including practical case studies and projects in which engineering technologists can experience real world issues and provide innovative solutions by applying the knowledge, concepts, and skills they learn in this program. These partners may be affiliated with, but not limited to, the NEW North Inc. and the Northeast Wisconsin Manufacturers Alliance.

### **Shared Facilities**

Students in the Mechanical Engineering Technology program will have the advantage of learning in state-of-the-art technology laboratories in northeastern Wisconsin at the technical colleges— Fox Valley Technical College, Northeast Wisconsin Technical College, Moraine Park Technical College and Lakeshore Technical College. These Technology Centers are equipped to offer a broad range of applied learning experiences in mechanical engineering. To minimize duplication and make more efficient use of facilities, courses will be offered at the locations that best utilize available faculty, classroom and lab facilities.

### **Program Participants**

The Mechanical Engineering Technology baccalaureate degree program will be delivered through a collaboration of the members of the Northeast Wisconsin Educational Resource Alliance (NEW ERA). Currently participating in this collaboration are:

- University of Wisconsin- Green Bay

- University of Wisconsin- Oshkosh
- University of Wisconsin Colleges
  - Fond du Lac Campus
  - Fox Valley Campus
  - Manitowoc Campus
  - Marinette Campus
  - Sheboygan Campus
- Wisconsin Technical Colleges
  - Fox Valley Technical College
  - Lakeshore Technical College
  - Moraine Park Technical College
  - Northeast Wisconsin Technical College
- College of the Menominee Nation

These institutions are committed to challenging students to achieve their greatest potential through the collaborative use of each institution’s faculty expertise and the use of their well-equipped laboratories, classrooms and other facilities. To assure program coordination among the participating schools, the MET program curriculum will be planned and continuously maintained by a cooperative curriculum committee. Each institution will be represented by at least one faculty member who is involved with the MET program.

*d. The ways in which the program prepares students through diverse elements in the curriculum for an integrated and multicultural society (may include inclusion of diversity issues in the curriculum or other approaches).*

Both UW-Oshkosh and UW-Green Bay are committed to finding ways to expand the diversity of its student body and faculty, curriculum and student learning experiences. This goal is reflected in the UW-Oshkosh Academic Program Plan and in its commitment to meet the strategic challenges for diversification of the student body and faculty as identified by the University. At UW-Green Bay, faculty members have been engaged in several significant initiatives to recruit a more diverse student body and close the achievement gap among students of color. Students in

this collaborative program, recruited state-and region-wide, will have access to a variety of academic and student support programs, some of which are specifically created for students of color through the UW-Oshkosh Center for Academic Support and Diversity and the Center for Academic Resources. UW-Green Bay will build upon the work of the American Intercultural Center and the Center for the Advancement for Teaching and Learning to foster diverse experiences for students in this program. The proposed BS degree with a major in Mechanical Engineering will serve non-traditional students as well as transfer and first year cohort students. The faculty at the Wisconsin Technical Colleges and the two-year UW Colleges will create transfer paths and articulation agreements serving more diverse student populations. It is also expected that regional collaborations within Wisconsin will expand relationships with tribal colleges as well as business and industry partners. Students will participate in internships in diverse settings across the region including in larger urban areas and small corporate settings. Plans are underway to actively recruit students for the major from the McNair Scholars Program on the UW-Oshkosh campus by engaging students in undergraduate research, participation in student organizations, and through presentations. Women in Science programs at both four-year campuses will also be used to recruit students. These students are first-generation college students and have an interest in the STEM fields. Recruiting through campus student organizations based on ethnicity on campus will also provide access to STEM fields for underserved populations.

2. Explain briefly the program's plan for assessing student learning outcomes, including:

*a. Specifying what students will know and be able to do as a result of completing the program.*

**Learning Outcomes**

The expected learning outcomes for students completing the Bachelor of Science degree with a major in mechanical engineering technology curriculum include:

- a command of techniques and instrumentation associated with mechanical engineering technology in the specific areas of mechanical design and instrumentation control systems that integrate mechanical and electrical systems
- an ability to design systems, components, and processes for engineering technology

problems in mechanical design and integrated control systems

- the capability to conduct experiments and to analyze and interpret the results in order to improve performance or accommodate changes
- the basis for life-long learning in general and a specific ability to adapt to ever changing knowledge and technology in science, mathematics and engineering
- the ability to function effectively and productively within a team and to do so with an awareness of ethical responsibilities
- an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature

*b. How the program will continuously assess (using both direct and indirect assessment measures) the extent to which the learning outcomes are accomplished.*

The chairs of the programs, in collaboration with the program oversight committee, will have responsibility for the assessment of student learning. As documented in the ABET accreditation for general program outcomes, the engineering program has documented student outcomes that prepare graduates to attain the program educational objectives. The curriculum committee of the program will set specific learning goals for each course that are designed to address identified core competencies related to ABET. The assessment plan outlines how each of the abet competencies are assessed throughout the program. Direct and indirect assessments of program learning outcomes will take place throughout the students' enrollment in the program. A more detailed assessment plan will be created as the courses are implemented during the next two years that is aligned to the ABET assessment matrix. The assessment plan will be evaluated for the clarity of the learning outcomes, the appropriate alignment of assessment tools and the learning outcomes, the process used to collect, analyze and interpret data and the use of data to inform program changes and continuous improvement decisions. The program oversight committee reviews assessment data to inform any program or curricular changes.

3. Describe the programmatic curriculum, including:

*a. How the curriculum is structured (include web links to courses, prerequisites, and other programmatic components).*

See appendices for a description of the four-year curriculum plan.

*b. Projected time to degree*

Students will be able to complete the degree in a four-year period. The program will be outlined for students on an academic plan for each year of the degree program. Transfer student pathways will be addressed through articulation agreements among two- and four-year institutions.

4. Summarize the program review process, including:

*a. How and when the program will be reviewed by the institution.*

The educational objectives of the program will be reviewed regularly by the program oversight committee and revised as needed to meet current ETAC of ABET accreditation requirements, and to serve the education and training needs of the engineering technology students, employees, and employers in northeastern Wisconsin. Changes to the objectives may be proposed by the advisory committee or faculty and will be considered by the BS MET curriculum committee representing the collaborating educational institutions. The program will be reviewed on a seven year cycle as a part of the university program review policy. Each program is reviewed concurrently at each four-year institution. The department, the college program review committee, the dean of the appropriate college and an external reviewer will conduct reviews before the senior administration completes the program review. Additionally, the program will be reviewed by the appropriate section of the ABET professional accrediting association.

*b. A discussion of what aspects will be evaluated to determine the quality of the program.*

Program review at the campus level will include the following components:

Curriculum program goals and learning outcomes;

Program description and curriculum components;

Program performance/quality/evaluation;

Assessment results;

Continuous improvement efforts related to assessment and the curriculum;

External reviewer report;  
Changes/modifications to program;  
Curriculum management;  
External Activities;  
Faculty qualifications;  
Institutional Support;  
Support staff and services;  
Inclusivity; and  
Number of graduates.

*c. How the review will provide consideration to equity and inclusive excellence, as appropriate.*

Advising is one key way that the program will integrate inclusive excellence into the program. Because there are many institutions participating in this program, an advisor will be needed at each one. This person will need to coordinate with campus student advising offices and will need to be familiar with the program curriculum and how the home institution's course offerings fit within that framework. Assuming that a director position and office is established for this program and the corresponding electrical and environmental engineering technology, it would be very helpful to have a central advisor who can field inquiries from all campuses. Given the complexity of the offerings at different campuses and the different student backgrounds, high quality advising is critical to the success of this program.

*d. Need for external accreditation.*

The BS degree with a major in Mechanical Engineering will be proposed for accreditation by the Engineering Accreditation Commission. Programs requesting an initial accreditation must have at least one graduate prior to the academic year when the on-site review occurs. In order to take advantage of the substantial advantages that accreditation confers upon a program, the MET baccalaureate program will seek accreditation under the Criteria for Accrediting Engineering Technology Programs of the ABET Technology Accreditation Commission (ETAC).



# Bachelor of Science Degree with a Major in Mechanical Engineering Technology Curriculum

## Overview by Course Groups

### Support Group (29 or 34 cr)

Calculus I & II (4 cr ea)  
Statistics (3 cr)  
General Physics I & II (5 cr ea)  
Chemistry for Engineers (5 cr) or General Chemistry I & II (5 cr ea)  
Basic Electrical Circuits (3 cr)

### Fundamentals Group (25 cr)

Statics & Dynamics (3 cr ea)  
Fundamentals of Drawing (3 cr)  
Parametric Modeling I & II (2 cr ea)  
Mechanics of Materials (3 cr)  
Machine Components (3 cr)  
Basic Manufacturing Processes (3 cr)  
Design Problems (3 cr)

### Advanced Study Group (24 cr)

Thermodynamics (3 cr)  
Heat Transfer (3 cr)  
Advanced Materials (3 cr)  
Fluids (4 cr)  
Finite Element Analysis (3 cr)  
Mechatronics (4 cr)  
Capstone Project (4 cr)

## Sample Schedule

**Year 1:** 18 program credits (math not included)

### First Semester

Calculus I — 4 cr  
General Physics I — 5 cr  
Fundamentals of Drawing — 3 cr  
Fundamentals of Engineering — 2 cr

### Second Semester

Calculus II — 4 cr  
General Physics II — 5 cr  
Statics — 3 cr

**Year 2:** 15 program credits (math & chemistry not included)

### First Semester

Mechanics of Materials — 3 cr  
Parametric Modeling I — 2 cr  
Chemistry for Engineers — 5 cr  
Fluids I — 2 cr

### Second Semester

Machine Components — 3 cr  
Parametric Modeling II — 2 cr  
Dynamics — 3 cr  
Statistics — 3 cr

**Year 3:** 20 program credits

### First Semester

Basic Electrical Circuits — 3 cr  
Fluids II — 2 cr

### Second Semester

Motors & Drives — 3 cr  
Thermodynamics — 3 cr

Finite Element Analysis — 3 cr  
Basic Manufacturing Processes — 3 cr

Design Problems — 3 cr

**Year 4:** 17 program credits

**First Semester**

Heat Transfer — 3 cr  
Project Management — 3 cr  
Mechatronics – 4 cr

**Second Semester**

Materials Science — 3 cr  
Capstone Project – 4 cr

**Course Descriptions—Supporting Courses**

**Calculus I (4 cr, 100-level)**

Real valued functions of a single variable. Concept of derivative, antiderivative, and definite integral. Differentiation and applications, including optimization and curve-sketching. Emphasis on problem solving, approximation, data analysis, visualization.

**Calculus II (4 cr, 100-level)**

Definite integration and applications, several techniques of integration, approximation, and improper integrals. Numerical differential equations, slope fields, Euler's method, and mathematical modeling. Taylor and Fourier Series. Prerequisite: Calculus I

**Statistics (3 cr, 200-level)**

Elementary probability models, discrete and continuous random variables, sampling and sampling distributions, estimation, and hypothesis testing. Prerequisite: Calculus II

**Chemistry for Engineers (5 cr, 100-level, with lab)**

A survey of the typical two-semester general chemistry sequence specifically designed for engineering applications. Topics include atomic theory, atomic and molecular structure, chemical bonding, reactions and products, stoichiometry, chemistry of metals and polymers, and chemical equilibrium.

**General Physics I (5 cr, 100/200-level, with lab)**

A survey of kinematics, dynamics and thermodynamics including fundamentals of mechanics, Newton's laws of motion, energy conservation, and momentum conservation. Concepts are connected to their use in technology and their manifestation in natural phenomena. Course may be algebra-based or calculus-based. Prerequisite: concurrent registration or prior completion of Calculus I if calculus-based.

**General Physics II (5 cr, 100/200-level, with lab)**

A survey of electricity, magnetism, and electromagnetic waves with applications to electrical circuits and optics. Material is developed using concepts from General Physics I. Course may be algebra-based or calculus-based. Prerequisite: concurrent registration or prior completion of Calculus II if calculus-based.

**Course Descriptions—Engineering Technology Courses**

**Fundamentals of Engineering (2 cr, 100-level)**

This course is designed to equip engineering students with the necessary tools and background information to prepare them to be successful engineering students as well as a successful practicing engineer. Topics covered in this course include ethics, project management, team work, working with data, creating presentations, engineering design, and a thorough understanding of the engineering profession.

**Basic Electrical Circuits (3 cr, 100-level, with lab)**

Introduces students in the mechanical engineering technology program to the fundamentals of DC and AC circuit analysis. Topics covered in this course include Ohm's law, Kirchhoff's laws, resistance, capacitance, inductance, series and parallel circuits, single- and three-phase circuits, transformers, and electric power.

**Basic Manufacturing Processes (3 cr, 100-level, shop/lab)**

Introduces machining, stamping, casting, forging and joining of metallic and non-metallic materials. Covers the basic machining processes used to cut, form and shape materials to desired

forms, dimensions and surface finishes. Students examine the manufacturing of metals, heat treating, foundry work, metals and plastics casting, rolling, extrusion and welding.

### **Machine Components (3 cr, 200-level)**

Introduces the basic concepts and techniques used in the design of a machine. The components studied include gears, shafts, cams, bearings, belts and other hardware. The importance of using reference handbooks and catalog specifications in choosing appropriate components for various applications is stressed.

### **Fundamentals of Drawing (3 cr, 100-level)**

Introduces common industry drafting practices in the design process with an emphasis on computer-aided drafting (CAD). Topics include sketching, drawing setup and organization, dimensioning, orthographic and isometric projections, and CAD standards and guidelines.

### **Parametric Modeling I (2 cr, 100-level)**

Introduces parametric-based solid modeling techniques. Topics include creating and editing solid parts, assemblies and working drawings. Students will learn to create exploded views and bills of materials and to apply top-down and bottom-up assembly techniques in the context of product design. Prerequisite: Fundamentals of Drawing

### **Parametric Modeling II (2 cr, 200-level)**

Topics include advanced techniques for creating fully dimensioned orthographic drawings for part models, cast parts, molded parts, and sheet metal components with weldments. Surface modeling will be emphasized, and students will be introduced to finite element stress analysis and kinematics software tools. Prerequisites: Parametric Modeling I

### **Mechanics of Materials (3 cr, 200-level)**

Introduces the distribution of forces in materials, trusses and other rigid structures under load. Topics include stress and strain, torsion, shear and bending moments, thermal expansion and

stress, Mohr's Circle, and column theory. Analysis techniques to ensure that a component is safe with respect to strength, rigidity and stability are included. Prerequisite: Statics

**Statics (3 cr, 200-level)**

Static force systems in two and three dimensions. Includes composition and resolution of force vectors, principles of equilibrium applied to various bodies, simple structures, and friction. centroids and moments of inertia

**Dynamics (3 cr, 200-level)**

Particle and rigid body motion including translation and rotational kinematics, energetics, impulse and momentum. Uses vector representations of forces, torques, linear and angular momentum, and moments of inertia. Prerequisite: Statics.

**Motors and Drives (3 cr, 300-level)**

Selection, setup and circuitry associated with AC and DC drives and motors. Topics include DC motors and generator configuration, shunt, compound, and permanent magnet DC motor performance and characteristics. Series DC, compound DC, AC induction, specialty machine performance and characteristics, stepper motors, servomotors, and three-phase power systems are also included. Prerequisite: Basic Electrical Circuits

**Thermodynamics (3 cr, 300 level)**

Topics include the first and second laws of thermodynamics, thermodynamic properties of real and ideal gases, vapors, and mixtures, and analysis of power and refrigeration cycles.

Prerequisites: General Physics II, Calculus II

**Heat Transfer (3 cr, 400-level)**

Heat transfer principles including conduction, convection and radiation for transient and steady state conditions, thermal resistance networks, and Nusselt number correlations. Practical applications include thermal insulation, heat sink and heat exchanger design. Prerequisite: Thermodynamics

**Finite Element Analysis (3 cr, 300-level)**

Introduces the finite element analysis (FEA) method and its application to stress analysis and structural mechanics. Topics include standard FEA techniques in one-, two- and three-dimensional systems, design optimization using FEA, incorporation of failure criteria and other constraints, and the interpretation of FEA results to ensure correctness. Prerequisites: Mechanics of Materials, Parametric Modeling II, Calculus II

**Fluids I (2 cr, 100-level w/ lab)**

An introduction to hydraulics and pneumatics including properties of fluids, basic pneumatic and hydraulic circuits and their schematics, and airflow control. Applications include Pascal's Law, effects of fluid friction, and designing hydraulic circuits with control valves.

**Fluids II (2 cr, 300-level w/ lab)**

The theory of fluids including hydrostatics, hydrostatic forces, buoyancy and stability, Bernoulli's Equation, pipe flow, open-channel flow, and drag and lift. Prerequisite: Fluids I

**Design Problems (3 cr, 300-level)**

Students apply design principles and methods to create a product or a machine. Students work within a team to prepare concept sketches, assembly drawings, detail drawings, and perform stress and cost analysis. Prerequisites: Parametric Modeling I, Mechanics of Materials, Machine Components

**Project Management (3 cr, 400-level)**

Topics include pre-construction planning; project scheduling systems, critical path management, risk analysis, and software programs. Prerequisite: Design Problems (This course is equivalent of UWO COB 411. N.B. Prerequisites for this particular course are extensive.)

**Mechatronics (4 cr, 400-level with lab)**

The study of the integration of mechanical, electrical and electronic systems. Topics include semiconductor devices, digital circuitry, and sensors. Students will design and build a project

using an electromechanical control system. Prerequisites: Basic Electrical Circuits, Design Problems

**Materials Science (3 cr, 300-level with lab)**

The study of materials including metals, polymers, composites, and ceramics. Fatigue, hardness, failure criteria, material structures, and stress-strain diagrams. Prerequisites: Chemistry for Engineers

**Capstone Project (4 cr, 400-level)**

Students form teams as directed and define a technological problem with detailed specifications. Following the development of formal project proposals, teams work toward solutions while applying principles of technical design from the curriculum and documenting results. Each team delivers a formal presentation upon completion. Prerequisite: senior standing.

**Faculty Senate New Business 4d 2/13/2013**

## **Proposal to Establish a Joint Governance Committee**

### **Committee on Student Misconduct**

1. The Committee on Student Misconduct shall be composed of three faculty representatives serving three-year staggered terms, three academic staff representatives serving three-year staggered terms, and three student representatives serving single-year terms. Faculty representatives are appointed by the Chancellor or designee on the advice of the Committee on Committees and Nominations. Academic staff representatives are appointed by the Chancellor or designee on the advice of the Academic Staff Committee. Student representatives are appointed by the Student Government Association President.

2. Members attend regularly scheduled trainings during the academic year. These are provided by the Dean of Students Office and provide members with background on handling misconduct issues both academic governed by UWS 14 and non-academic governed by UWS 17.

3. Members serve as a pool of individuals from which a hearing examiner or a hearing committee can be appointed by the Chancellor or designee when required by UWS 14 or UWS 17.

a. For academic misconduct cases, a student academic misconduct hearing committee shall consist of at least three persons, including a student or students, and the presiding officer shall be appointed by the Chancellor or designee. The presiding officer and at least one other member shall constitute a quorum at any hearing held pursuant to due notice. A hearing examiner shall be selected by the chancellor or designee from the faculty and staff of the institution.

b. For non-academic misconduct cases, a hearing committee shall consist of at least three persons, including at least one student, except that no such committee shall be constituted with a majority of members who are students. The presiding officer shall be appointed by the Chancellor or designee. The presiding officer and at least one other member shall constitute a quorum at any hearing held pursuant to due notice.

4. The Committee on Student Misconduct also advises the Dean of Students on misconduct policies and submits an annual report to the Secretary of the Faculty and Academic Staff.

**Faculty Senate New Business 4e 2/13/2013**



## AAC Senate Report 2-11-13

- The Committee approved the following curricular actions:
  - CLAS 235 Form CMF MUSIC 423 – change periodicity
  - CLAS 257 Form CMF ART 380 – New course
  - CLAS 259 Form CCF PSYCH 300 – add writing emphasis
  - CLAS 261 Form CCF AVD 298 – discontinue course
  - CLAS 262 Form CCF AVD 478 – discontinue course
  - CLAS 263 Form CCF BIO 202 - change prerequisite
  - CLAS 264 Form CCF BIO 302 – change prerequisite
  - CLAS 265 Form CCF BIO 304 - change prerequisite
  - CLAS 266 Form CCF BIO 308 – change prerequisite
  - CLAS 267 Form CCF BIO 340 – change prerequisite
  - CLAS 268 Form CCF BIO 402 – change prerequisite
  - CLAS 269 Form CCF BIO 411 – change prerequisite and periodicity
  - CLAS 270 Form CCF HUB 204 – change prerequisite
  - CLAS 271 Form CCF HUB 208 – change periodicity
  - CLAS 272 Form CCF HUB 210 – change periodicity
  - CLAS 273 Form CCF HUB 331 – change periodicity
  - CLAS 274 Form CCF HUB 350 – change prerequisite
  - CLAS 275 Form CCF HUB 351 – change prerequisite
  - CLAS 276 Form CCF HUB 403 – change prerequisite
  - CLAS 277 Form CCF HUB 405 – change title and prerequisite
  - CLAS 278 Form CCF HUB 413 – change periodicity
  - CLAS 279 Form CCF HUB 423 – change prerequisite
  - CLAS 280 Form CCF HUB 444 – change periodicity
  - CLAS 281 Form NCF HUB 426 – new course
  - CLAS 282 Form NCF HUB 427 – new course (lab for 426)
  - CLAS 284 Form CCF COMMSCI 205 – change catalog description
  - CPS# 74 Form CCF Bus Admin 216 – change catalog description
  - CLAS 284 Form CCF COMMSCI 205 – change catalog description
  - CLAS 287 Form CA ElecEngTech Major – establish new collaborative major
  - CLAS 288 Form CA EnviroEngTech - establish new collaborative major
  - CLAS 289 Form CA MechEngTech - establish new collaborative major
  - CLAS 291 Form CCF IST 400 – change catalog description
  - CLAS 294 Form CMF HMONG 298 – New course – independent study
  - CLAS 295 Form CCF FNS 399 – change prerequisite
  - CLAS 296 Form CCF ENV S & P 794 – change periodicity
  - CPS#73 Form CA International Business Minor – Change language requirement
- The committee determined that no action on our part was necessary on the following curricular actions, as the course involved is variable topic, and variable topics do not require AAC action:
  - CPS#75 Form CCF NURS 492 – change course topic title

CPS# 76 Form NCR NURS 492 – new topic in variable topic course

- The committee is currently reviewing the following program reviews:

First Nation Studies  
Information Sciences  
Interdisciplinary Studies  
Communication  
Computer Science

respectfully submitted,

Kaoime E. Malloy