



Mechanical Engineering - Enterprise Enrollment Guidelines (Undergraduate) – Dec. 2018

Enterprise project work (ENT3950/3960/4950/4960) and other Enterprise Concentration requirements such as Enterprise Modules are required for students completing the BSME-Enterprise Concentration as shown on the **BSME-Enterprise Concentration pink flowchart**. Students may enroll in Enterprise project work (e.g., ENT3950) and participate on an Enterprise team prior to declaring the Enterprise Concentration. If the student decides not to complete the Enterprise Concentration, any Enterprise project credits can be applied to free electives for the standard BSME (Green Flowchart). If the student chooses to complete the Enterprise Concentration, he/she must declare the Enterprise Concentration by visiting <https://www.mtu.edu/registrar/students/major-degree/curriculum/index.html> for instructions. This should be done prior to enrolling in ENT4950 at the latest (see page 5 and the appendix).

Suggested Enterprise teams for mechanical engineering undergraduate students are shown below. It is possible for an ME student to participate on other Enterprise teams provided the student's planned project work for ENT4950 and ENT4960 meets the capstone requirements defined by the ME-EM department to satisfy ABET accreditation requirements. For all teams the capstone project must be defined for ENT4950 and 4960 (a full two-semester project) prior to registration in ENT4950. Regardless of enterprise team, mechanical engineering students will not register for ENT4950 or ENT4960 until the capstone project is fully defined and approved (see page 6 and appendix for further details).

The minimum Enterprise team participation for ME students completing the BSME-Enterprise Concentration is four project semesters (ENT3950/3960/4950/4960) with the same Enterprise team. Three one-credit Enterprise modules are also required. Refer to the **BSME-Enterprise Concentration pink flowchart notes (reverse/page 2 of flowchart)** for more details. All required forms and templates are shown in the appendix of this document and are available on the wall outside the ME Advising Center (204/205 MEEM) and at <http://www.mtu.edu/mechanical/undergraduate/advising/>.

ME-EM faculty advised or ME-focused Enterprises (Projects always available that meet ME Enterprise capstone criteria) the following guidelines apply through the first week of classes each semester. Registration after that date will follow late add procedures in addition to the guidelines below.

Advanced Metalworks (AME, L01) – Advisor: Dr. Joe Licavoli, jjlicavo@mtu.edu
<http://www.michigantechame.com/>

Component design/modeling, fabrication (machining, casting, wrought processing), and performance characterization (microstructure, mechanical properties). Primarily working on industry-sponsored projects related to machining, casting, and wrought processing of metals and metallic components. Fabrication of patterns for sand molding, permanent molds, dies for die-casting, and specialized testing equipment for our sponsors and other enterprises on campus.

Registration: Contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Aerospace (L21) – Advisor: Dr. Brad King, MEEM 1014, lbking@mtu.edu
<http://www.aerospace.mtu.edu/>

Design, test, and launch spacecraft with an emphasis on systems engineering in the areas of structures, avionics, software, and communications. Industry and Military-sponsored projects.

Registration: Students are required to apply through the Aerospace Enterprise website and obtain instructor approval. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Baja SAE (Blizzard Baja, L06) – Advisor: Kevin Johnson, MEEM 704, kevinj@mtu.edu
<http://www.baja.mtu.edu>

Design and fabricate an off-road vehicle for competition with a focus on frame, chassis, drivetrain, and suspension improvements. Competition based on performance, manufacturability, cost, and ergonomics. *Registration:* To join the Enterprise for the first time, submit a resume to the Enterprise Advisor. You will be interviewed by the Baja Enterprise Executive Board. If accepted on the team you will need to contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6). Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit on this team.

Blue Marble Security (BMS, L02) – Advisor: Dr. Glen Archer, EERC 629, gearcher@mtu.edu
<http://bluemarblesecurity.eit.mtu.edu/>

Working to develop security solutions for people in their homes, for local governments to protect their communities, for industries to protect their workers and their infrastructure, and for international markets. Additionally, developing initiatives in counter-surveillance, imaging solutions, environmental monitoring, and industrial process control.

Registration: Instructor (Enterprise advisor) approval. Submit a signed Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Board Sport Technologies (BST, L11) – Advisor: Dr. Ibrahim Miskioglu, MEEM 821, imiski@mtu.edu
<http://www.enterprise.mtu.edu/boardsports/>

Invent innovative boarding designs, materials, and processes in the construction of boards and associated structures/products for a variety of board sports such as snowboarding, wakeboarding, and skateboarding. Work on industry-sponsored innovation projects.

Registration: To join the Enterprise each semester, see an ME academic advisor during open registration periods. The academic advisor will check academic standing and register students for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6). Instructor (Enterprise advisor) approval is required for ENT1960, ENT3980 and ENT4961. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit on this team.

SAE Clean Snowmobile Challenge (CSC, L07) – Advisor: Dr. Jason Blough, MEEM 1020A,
jrblough@mtu.edu
<http://csc.enterprise.mtu.edu/>

Design and modify a snowmobile to achieve a reduction in emissions and noise levels while maintaining high performance and fuel efficiency. Compete in both gasoline and diesel utility divisions.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join CSC and description of your intended contribution to the team) to the Enterprise advisor. If approved by the Enterprise Executive Board, contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6). Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit on this team.

Consumer Product Manufacturing (CPM, L08) – Co-advisor: Dr. Tony Rogers, Chem Sci 305C, tnrogers@mtu.edu; Co-advisor: Dr. Sean Clancey, Chem Sci 202E, msclance@mtu.edu
<http://cpmenterprise.mtu.edu/>

CPM aims to empower students with the entrepreneurial, technical, and professional skills to conceive, develop, and market successful products in a company setting. The team's most recent projects include biogas development in Houghton, identifying recyclable materials to replace petroleum based products used for flexible packaging, designing an environmentally friendly parking structure to relieve parking congestion on the Michigan Tech campus, optimizing and designing hockey sticks and alpine skis using a unique magnesium alloy known as "nanoMAG", modeling wind loads imparted on light poles by banners and exploring the use of ultrasonic plastic welding to create enhanced automotive interior spaces.

Registration: Contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT 4950, see ENT 4950 INSTRUCTIONS on page 6).

Formula SAE Racing Team (FSAE, L05) – Advisor: Dr. Jim DeClerck, MEEM 906, jdeclerck@mtu.edu
<http://formulasae.mtu.edu>

Design and build an Indy-style race car for competition with a focus on optimization of chassis, frame, wheel, and engine design. Competition includes dynamic performance, engineering design, and business case. *Registration:* To join the enterprise for the first time, visit the "Interested in Joining?" tab on the team web page and submit a resume and a personal statement (why you want to join FSAE and description of your intended contribution to the team). **Preference will be given to undergraduates with at least 6 semesters of eligibility and graduate students with at least 4 semesters of eligibility.** Interested students are encouraged to visit the FSAE shop and attend a team meeting (Tuesdays at 7pm at ATDC). If approved by FSAE Leaders, the instructor will contact you to complete an enrollment survey or obtain a signed Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6). Students must be in good academic standing (i.e., not on academic probation) to be registered for project credit on this team.

Innovative Global Solutions (IGS, L16) – Co-advisor: Dr. Radheshyam Tewari, MEEM 818, rtewari@mtu.edu; Co-advisor: Dr. Nathan Manser, Dillman 105C 722, ndmanser@mtu.edu
<http://igs.enterprise.mtu.edu>

IGS offers a unique opportunity for students interested in entrepreneurship to innovate, design and build systems and products that solve real problems. Through working with other organizations on campus including the Pavlis Institute, the Peace Corps program, and International Senior Design, they will implement or introduce these solutions in targeted developing countries.

Registration: Contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Mining Innovation and Engineering (MINE, L32) – Advisor: Dr. Paul van Susante, MEEM 925, pivansus@mtu.edu;

In MINE the objective is to design, test, and implement mining innovation technology, mine design, economic, environmental and safety analysis for industry and government partners. Some of these aspects include the improvement of safety and working conditions, increased productivity and efficiency as well as equipment design and optimization. We have worked on open pit and underground mining design, equipment, robot and automation design, Earth, extreme environment and space mining projects. We meet once a week as a whole enterprise to report progress and discuss enterprise wide activities and once a week per project team for technical and management working discussions.

Registration: Contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Robotic Systems Experiences (RSE, L15) – Advisors: Dr. Jeremy Bos, EERC 623, jbos@mtu.edu & Dr. Darrell Robinette, MEEM 933, dlrobine@mtu.edu

<http://rse.enterprise.mtu.edu/>

The Robotic Systems Enterprise focuses on seamlessly integrating exceptional knowledge in electronics, robotics, and programming to solve real-world engineering problems. All majors are welcome—the team depends on more than just the skills and talents of engineering and science majors. The Robotic Systems Enterprise produces solutions that contribute to industry, recreation, and medical research.

Registration: Contact the Jeremy Bos to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. This signed form is required for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6).

Strategic Education through Naval Systems Experiences (SENSE, L09) – Advisors: Dr. Andrew Barnard, MEEM 930, arbarnar@mtu.edu & Dr. Nina Mahmoudian, MEEM 1009, ninam@mtu.edu

<http://sense.enterprise.mtu.edu/>

SENSE's mission is to enable the workforce of tomorrow to redefine the boundaries for air, land, sea, and cyber supremacy through experiential learning and discovery. Students will design, build, and test engineering systems with a focus on Navy applications in all domains: space, air, land, sea, and undersea. Get hands-on experiences with cutting-edge defense technologies that directly impact the safety and success of our armed forces. Prepare for civilian employment opportunities in Department of Defense research labs or with DoD contractors.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join SENSE and description of your intended contribution to the team) to the Enterprise advisor. If approved by the Enterprise Executive Board, contact the instructor to sign the Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register. Returning students **do not** need this form signed by the Enterprise Advisor. However, students must remain in good academic standing (i.e., not on academic probation) to be registered for project credit on this team and the registration procedures for ENT4950 (see ENT 4950 INSTRUCTIONS on page 6) still apply to returning students.

Supermileage Systems (SSE, L13) – Advisor: Mr. Rick Berkey, M&M 722, rjberkey@mtu.edu

<http://www.enterprise.mtu.edu/SSE/>

Development and construction of innovative, extremely energy-efficient vehicles for the SAE Supermileage and Shell Eco-marathon Americas competitions. Supermileage Systems is a multidisciplinary student-led organization where team members gain valuable experience in leadership, teamwork, communication, project management, and vehicle development. Primary focus areas include: body/chassis design, powertrain development, and electrical/control systems. In addition to engineering experience, team members also develop business acumen through active participation in organizational support teams. The Supermileage competition focuses on optimization of a four-cycle internal combustion engine whereas Shell Eco-marathon allows for a broader range of propulsion types including battery electric vehicles (BEV)

Registration: To join the Enterprise each semester, see an ME academic advisor during open registration periods. The academic advisor will check academic standing and register students for each project semester course except ENT4950 (see ENT 4950 INSTRUCTIONS on page 6). Instructor (Enterprise advisor) approval is required for ENT1960, ENT3980 and ENT4961. Student must be in good academic standing (i.e. not on academic probation) to be registered for project credit on this team.

Velovations (L31) –Advisor: Mr. Steve Lehmann, MEEM 608, sdlehman@mtu.edu

<http://velovations.enterprise.mtu.edu>

Velovations works on bicycle related projects to develop new products and processes. Focus on product development from customer need, through product/process design, testing, manufacturing, supply chain management, marketing, and distribution.

Registration: Instructor (Enterprise advisor) approval. Submit a signed Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval form to register for each project semester course (except ENT4950, see ENT 4950 INSTRUCTIONS on page 6). Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit on this team.

Add'l Enterprise teams (Home Department) – Verify that ME project work is/will be available

- Alternative Energy Enterprise - AEE (Chemical Engineering, L23)
- Efficiency Through Engineering and Construction (ETEC, School of Technology, L14)
- General and Expedition Adventure Research (GEAR, Engineering Fundamentals, L34)
- Green Campus (Civil & Environmental Engineering, L30)
- Humane Design Interface Enterprise (HIDE, Computer Science, L19)
- Open Source Hardware (Materials Science and Engineering, L33)
- Wireless Communications (WCE, Electrical & Computer Engineering, L03)

Other Enterprise teams may have acceptable capstone project work for ME students, but students must verify this prior to starting ENT3950 with the Enterprise advisor. Consultation with the ME-EM department for evaluation of example possible capstone projects (ENT4950/4960) is highly recommended before adding ENT3950.

Team web pages available through <http://www.mtu.edu/enterprise/>

Declaring the Enterprise Concentration

Students must declare the BSME-Enterprise Concentration (EMEE), visit <https://www.mtu.edu/registrar/students/major-degree/curriculum/index.html> for instructions. This will ensure that the BSME-Enterprise Concentration degree audit is used to verify graduation requirements. Declaration of the concentration is appropriate when the student has completed one or more project semesters with an Enterprise team, intends to complete the concentration requirements, and before enrollment in ENT4950.

Project Credit Courses

Getting Started

- **ENT 1960** – Project work (first semester of team-specific Enterprise participation) – 1 credit. Intended for second semester of the first year. **Only applies to the BSME degree as a free elective.** Student may be required to meet team-specific criteria prior to enrollment.

Project semesters not required for BSME Enterprise concentration (> 4-semester min. commitment to team)

- **ENT 2950** – Project work – 1 credit. Intended for first semester of the second year and/or when a student has six semesters remaining until graduation (when enrolled in Mechanical Engineering Practice I, MEEM2901). May be used as an Enterprise module. Student may be required to meet team-specific criteria prior to enrollment.
- **ENT 2960** – Project work – 1 credit. Intended for second semester of the second year and/or when a student has five semesters remaining until graduation (when enrolled in Mechanical Engineering Practice II, MEEM2911). May be used as an Enterprise module. Student may be required to meet team-specific criteria prior to enrollment.
- **ENT 3980** – Project work – 1 credit. Pre-capstone project semester. Intended for students that have completed ENT3950 and ENT3960 with the same Enterprise team, but lack the required pre-reqs to enroll in ENT 4950. May be used as an Enterprise module. Student may be required to meet team-specific criteria prior to enrollment. Repeatable.
- **ENT 4961** – Project work – 1 credit. Post-capstone project semester. Intended for students that have completed ENT 4950 and ENT 4960 with the same Enterprise team. May be used as an Enterprise module. Student may be required to meet team-specific criteria prior to enrollment.

Project semesters required for the BSME-Enterprise Concentration (all 4 must be with the same Enterprise team)

- **ENT 3950** – Project work – 1 credit. Intended for first semester of the third year and/or when a student has four semesters remaining until graduation (when enrolled in Mechanical Engineering Practice III, MEEM3901). Student may be required to meet team-specific criteria prior to enrollment.
- **ENT 3960** – Project work – 1 credit. To be taken after ENT 3950 during the second semester of third year and/or with three semesters remaining until graduation (when enrolled in Mechanical Engineering Practice IV, MEEM3911). **Students should also be set up for other capstone design readiness pre-reqs required for ENT4950 (see below and Pink flow chart).** Student may be required to meet team-specific criteria prior to enrollment.
- **ENT 4950 INSTRUCTIONS**– Capstone Project work – 2 credits. **The following are required *prior* to be registered in ENT 4950.**
 1. **Satisfy pre-requisite requirements:**
 - **2014 or later flowchart: MA3710, MEEM3201 (concurrent pre-requisite), MEEM3750 (concurrent pre-requisite), MEEM3911, and ENT3950/ENT3960 in same Enterprise.**
 2. **FULLY APPROVED Verification of Senior Design Objectives through Enterprise Experience form (see form and detailed instructions in appendix).**Student may also be required to meet team-specific criteria prior to enrollment.
- **ENT 4960** – Capstone Project work – 2 credits. The above ENT4950 project submission should also define this course content as the second capstone project semester, although separate Enterprise advisor approval may be required for ENT4960 registration. Student may be required to meet team-specific criteria prior to enrollment.
 1. **Satisfy pre-requisite requirements:**
 - **2014 or later flowchart: MA3710, MEEM3201, MEEM3750, MEEM3911, and ENT3950/ENT3960 in same Enterprise (MEEM3201 and MEEM 3750 cannot be concurrent).**
 2. **A FULLY APPROVED Verification of Senior Design Objectives through Enterprise Experience form (see form and detailed instructions in appendix) is needed for ENT4960 only IF THE INITIAL VERIFICATION OF SENIOR DESIGN OBJECTIVES WAS FOR A SINGLE SEMESTER PROJECT.**

NOTES:

- **The four required project semesters on the same enterprise team are not necessarily required to be completed in consecutive semesters.** Any semesters of non-participation due to co-op, study abroad, etc. should be coordinated by the student with the Enterprise advisor. Summer project work is acceptable with Enterprise Advisor approval.
- Amended Verification of Senior Design Objectives through Enterprise Experience forms should be prepared and submitted to the ME Advising Center as appropriate if significant changes to the approved scope or deliverables of the capstone project are made during either senior capstone design project semester. These changes will also require ME-EM department review and approval. The final Verification of Senior Design Objectives through Enterprise Experience form on file at the conclusion of the senior design project semesters must represent the project and deliverables as completed by the student.
- All Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval forms required for registration into a given project semester must be fully and accurately completed by the student (M number, name, course number, CRN and lab section number for specific team section for requested semester, Enterprise name, and semester) before submission to the ME Advising Center for registration. An Enterprise advisor may send an ME academic advisor an email to approve enrollment in place of the signed enrollment form as long as the appropriate student and section information is included.
- Certain Enterprises may require good academic standing for enrollment, as noted above. Academic advisors will confirm academic standing before registration in project semester courses where necessary.

Enterprise Modules

- 1-2 credits each (mostly 1 credit each)
- 3 total credits required
- Specific modules may be restricted by class standing, may require instructor approval for registration, may have pre-requisites, and/or may be offered in only one semester per academic year or not at all. Please see Banweb for course descriptions and any restrictions.
- See notes on BSME-Enterprise Concentration pink flowchart reverse side/page 2 for approved modules for ME majors.
- A total of 2 credits of UN3002 and/or UN3003 (co-op credits) may be used as Enterprise modules for ME majors.

This set of guidelines should answer many student questions regarding participation in the Enterprise program and incorporating that participation into the BSME curriculum. Students must take responsibility for being proactive and having a good understanding of their current status, progress, and overall academic plan towards graduation. The ME academic advisors are available for assistance.

Ryan Towles
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204A (203) R.L. Smith Building (MEEM)
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Appendix:

Pg. 9-10: ENT4950 Registration Permission Form

Pg. 11: Abstract Template for Verification of Senior Design Objectives through Enterprise Experience

Pg. 12: ME Enterprise Enrollment Form for Enterprise Team Project Semester Registration

Pg. 13-15: Changing a Concentration/Declaring an Enterprise



ENT4950 Registration Permission Form

Verification of Senior Design Objectives through Enterprise Experience

Major: _____

Date: _____

Part A: Student completes Part A and submits to Academic Advisor for verification and approval.

<p><i>To be completed by student.</i> List completed and planned project work semesters, and if applicable, approved modules for senior design credit:</p>			Student Name: ID#: M Primary Major: Double Major/Degree: Email: Enterprise Team: Enterprise Advisor: Check if applicable: <input checked="" type="checkbox"/> ENT Concentration <input type="checkbox"/> Enterprise Minor																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Course</th> <th style="text-align: center;">Semester/Year</th> <th style="text-align: center;">CRN Section</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">ENT</td><td></td><td></td></tr> <tr><td style="text-align: center;">ENT</td><td></td><td></td></tr> <tr><td style="text-align: center;">ENT 3950</td><td></td><td></td></tr> <tr><td style="text-align: center;">ENT 3960</td><td></td><td></td></tr> <tr><td style="text-align: center;">ENT 4950</td><td></td><td></td></tr> <tr><td style="text-align: center;">ENT 4960</td><td></td><td></td></tr> </tbody> </table>	Course	Semester/Year	CRN Section	ENT			ENT			ENT 3950			ENT 3960			ENT 4950			ENT 4960			<p><i>To be completed by Academic Advisor.</i></p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> EMEE Declared? <input type="checkbox"/> ENT 3950 (Same Team) <input type="checkbox"/> ENT 3960 (Same Team) Senior Design Ready (Advisor Initials): <input type="checkbox"/> MEEM 3911 <input type="checkbox"/> MEEM 3201 (C) <input type="checkbox"/> MA 3710 <input type="checkbox"/> MEEM 3750 (C) Student in Good Academic Standing: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <i>Good Academic Standing required for enrollment in Formula SAE, Clean Snowmobile Challenge, Boardsport Technologies, Baja SAE, SENSE, and Supermileage Systems, Velovations.</i>	
Course	Semester/Year	CRN Section																					
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Part B: To be completed by student and enterprise advisor.

Form must be approved by your academic department prior to enrolling in ENT4950.

Project Title: _____

Abstract: (provided by student) Outline the project scope and deliverables assigned to this student using the **Enterprise Project Summary** template. Verify which template to use with your departmental academic advisor.

ABET Student Outcomes Check all that apply (completed by enterprise advisor):

- 3 (a) An ability to apply knowledge of mathematics, science and engineering.
- 3 (b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- 3 (c) An ability to design a system, component, or process to meet desired needs, within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- 3 (d) An ability to function on multi-disciplinary teams.
- 3 (e) An ability to identify, formulate and solve engineering problems.
- 3 (f) An understanding of professional and ethical responsibility.
- 3 (g) An ability to communicate effectively.
- 3 (h) An understanding of the impact of engineering solutions in a global, economic, environmental and societal context.
- 3 (i) A recognition of the need for, and an ability to engage in life-long learning.
- 3 (j) A knowledge of contemporary issues.
- 3 (k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- Program-specific criteria (for academic department use only)

Approved by: _____
Enterprise Faculty Advisor Date

Approved by: _____
Academic Department Date

Approved by: _____
2nd Major/Deg Academic Department Date

Mechanical Engineering – Verification of Senior Design Objectives through Enterprise Experience (ENT 4950 Registration Permission Form)

The Verification of Senior Design Objectives through Enterprise Experience form must be completed by each BSME-Enterprise concentration (EMEE) student prior to registering for ENT4950. The form is not complete until approved by the ME-EM department. The purpose of this process is to ensure that the student's participation in the Enterprise program represents a culminating design experience as required by ABET (equivalent to ME-EM Senior Capstone Design). The procedure to be followed by ME students is provided below.

Students should consult with their Enterprise team advisor when defining their capstone-equivalent project. Completed forms must be approved by both the Enterprise team advisor and the ME-EM Associate Chair for Undergraduate Studies prior to course enrollment. After the Enterprise team advisor has signed the form, the student must submit the form to the ME Advising Center (2nd floor MEEM) for verification of pre-requisites by an academic advisor. The advisor will then submit the form to the ME-EM Associate Chair for Undergraduate Studies for review. The student will be enrolled in ENT 4950 when the form is returned with the Associate Chair's approval. Dual degree students need departmental approval from both applicable departments. **Department approval must come from student's major department, not the department housing the enterprise team.**

The following steps are required prior to enrollment in ENT4950.

1. Complete Verification of Senior Design Objectives through Enterprise Experience form (Part A and the project title in Part B).
2. The applicable ABET outcomes addressed by the project must be checked off by the Enterprise advisor.
3. To be approved, the form must have an attached abstract/project brief that follows the current, required template for ME students. The project defined in this document should encompass both semesters of the project (ENT 4950 and 4960). **Students working on the same project may submit the same project brief but must submit individual forms. In these cases all the forms should be attached to the common brief as a single submission.**
4. Forms must be signed by the Enterprise advisor prior to submission to an academic advisor.
5. The academic advisor will verify the following senior design readiness pre-requisite requirements are satisfied. The student should not check these off.
 - MA3710 (MA2710 or MA2720 are also acceptable), MEEM3201 (concurrent pre-requisite), MEEM3750 (concurrent pre-requisite), MEEM3911, and ENT3950/ENT3960 in same Enterprise. These are the same pre-reqs required for MEEM4901.
 - At least two semesters of previous ENT project credit are required for ENT4950 readiness. These prior semesters must be on the same Enterprise team as planned for ENT4950/4960. Typically these are ENT3950 and ENT3960 (4 total semesters minimum on the same Enterprise team including the capstone project semesters).
6. The academic advisor will forward the completed form to the Associate Chair for final approval.
7. When the department-approved form is received back, an academic advisor will enroll the student in ENT4950 and notify the student via email. Students will not be enrolled in ENT4950 prior to the completion of this process.

The approved form and brief will be retained on file electronically in the ME Advising Center and will also be submitted to the Enterprise program office. It is recommended that this form be completed during the semester prior to taking ENT4950 in order to facilitate the registration process. The latest the form should be submitted is the end of the first week of classes of the semester in which ENT4950 is to be completed. **Forms will not be accepted after 5:00pm on the Friday of the 3rd week of the planned enrollment semester. This is a hard deadline. Students will not be added to ENT 4950 or 4960 if their project is submitted after this date and time.**

All that is typically required for ENT4960 registration for the second semester of the capstone-equivalent project is a signed Enterprise Enrollment (instructor) Approval form or equivalent (email). **However if there are any significant changes to the project definition, or if the original submission did not cover the second semester of the project, the above department approval process will be required for ENT4960 as well. PLEASE NOTE: MEEM 3201 AND MEEM 3750 ARE PREREQUISITES FOR ENT4960 (NOT ALLOWED CONCURRENTLY).** Students enrolled in MEEM 3201 and/or MEEM 3750 concurrently with ENT 4950 may not continue to ENT 4960 if either course is failed (also applies to MEEM 4911).

Recognizing that it may not be possible to accurately and precisely predict the design project progress/outcome in the above timeframe (i.e., the design project scope and/or deliverables may change over the course of the two project semesters), amended Verification of Senior Design Objectives through Enterprise Experience forms must be prepared and submitted through the above process again, if necessary due to significant changes in the project. The final form on file at the conclusion of the Enterprise project course sequence must represent the project and deliverables as completed by the student.

Questions can be directed to Ryan or Tricia in the ME Advising Center (204/205 MEEM, inside the ELC).

Abstract Template for Verification of Senior Design Objectives through Enterprise Experience

- This format must be followed for ME students submitting the above project form for approval, regardless of Enterprise team.
- This template is available for download from the ME Advising page under forms and worksheets at: <http://www.mtu.edu/mechanical/undergraduate/advising/docs/ent4950-abstract-template.docx>

Michigan Tech Enterprise Project Brief for MEEM Cap:

Topic

Project Topic Here

Objective:

One sentence project objective

Background

concise background of problem domain ...

What is driving the need...?

Include photo

Project Scope

basic project scope here, maybe bullets of goals, specifics, etc.

rough definition of design space...

desired skill sets on team – curricula involved, grad student support needed?..

describe focus of team

Project Goals

- bullet 1 with sub-bullets:
 - desired outcome
 - design for X
 - performance goals
 - etc...
- some analysis deliverables along with design prototype, etc....
- goal 3
- goal 4
- etc.....
-

Sponsor Can Provide:

- any special information, background, hardware, specialized testing eqpt
- anything in existence that may support project goals
- bullet 2
- bullet 3
- etc....

Timing

Project Start: Thursday of Week 1 (Semester I)

Project Completion: Finals of Week (Semester II)

Michigan Tech Enterprise Project Brief for MEEM Capstone

Preliminary project milestones for ENT4950	
Week 1	Begin semester
Week 2	Initial contact with advisor and sponsor
Week 6	Draft project plan complete
Week 7	Project plan approved
Week 11	Mid-semester design review, concepts review
Week 12	Concept selection complete
Exam week	Panel Review

Preliminary project milestones for ENT4960	
Week 1 - Monday	Begin semester
Week 4	Alpha proto near completion, begin evaluation
Week 8	Alpha proto complete, some testing and revision
Week 14	Final documentation and presentation

ME Enterprise Enrollment Form for Enterprise Team Project Semester Registration

- Fill out completely with M number, course number, CRN and lab section number, Enterprise name, semester, and Enterprise advisor signature.
- May be replaced with an email from the Enterprise faculty advisor that includes information all the information on the form.
- Academic advisors will confirm academic standing before registration in project semester courses, when required.

This form cannot be used for ENT4950 enrollment. See page 6

Michigan Tech Mechanical Engineering Undergraduate Enterprise Enrollment (Enterprise Advisor) Approval

Personal Information

M Number		Name (please print)		
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Course Information

Semester / Year		Course Number (ENT XXXX)	
CRN # (5-digit)		Section Number (LXX)	
Enterprise Name			

Reference ME Enterprise Enrollment Guidelines for correct course number to be enrolled.

Good Academic Standing required for enrollment in Formula SAE, Clean Snowmobile Challenge, BoardSport Technologies, Baja SAE, SENSE, and Supermileage Systems.

Enterprise Advisor Approval Signature

Date

Return this form to the ME Advising Center by Friday of 1st week (late-add form required after this date).
Academic Advisors will enroll the above student with this signed approval form.

Student in Good Academic Standing: YES NO N/A _____(Initials, Academic Advisor)

[How to Declare an Enterprise Concentration \(EMEE\)](#)

Any minor or concentrations add or change requests will become effective the current semester, regardless of when submitted.

Curriculum add or change requests require advisor approval. Please contact the advisor of the major/minor/concentration you are adding **PRIOR TO** using this request system. Dropping a double major, second degree, minor or concentration does not require advisor approval.

- 1: Go to the [Current Students](#) tab of [MyMichiganTech](#) and select [Request to change major/minor/concentration](#) under **Academic Programs and Advisors**:

The screenshot shows the MyMichiganTech student portal. The top navigation bar includes 'Home Community' and various service links. The 'Current Students' tab is highlighted. The main content area is divided into several sections: 'Announcements', 'My Status', 'Quicklinks', 'Personal Information', and 'Academic Programs and Advisors'. The 'My Status' section displays student information such as 'M number', 'Status: Active student', and 'Class: Senior'. The 'Academic Programs and Advisors' section lists programs like 'BS, Management' and 'BS, Marketing'. A red circle highlights the link 'Request to change major/minor/concentration' in the 'Academic Programs and Advisors' section.

You will be brought to the curriculum change portlet home page. This page lists your current degree information and any recent curriculum change requests.

The curriculum change portlet home page allows you to select Update Major and use it to update/add a concentration

Update Major – may be used to update your major, concentration, and/or minor

Your current degree information

Any recent curriculum change requests

The screenshot shows the MyMichiganTech interface. At the top right, there are links for Gmail, Calendar, Change Password, and Sign Out. Below this is a navigation bar with 'Home Community' and various user options. A yellow banner contains 'Update Major' and 'Update Minor' buttons. The main content area is divided into two sections: 'Current Academic Programs' and 'Request History'. The 'Current Academic Programs' section shows 'Primary Degree - BS' with 'Major - Management' and 'Major - Marketing'. The 'Request History' section has a table with columns for Action, Degree, Result, and Decision Comments. A 'Close' button is at the bottom right.

Help text is available by clicking on the blue question marks. A box with help text will appear:

The screenshot shows the same MyMichiganTech interface as above, but with a help text popup window open. The popup window is titled 'Help - Google Chrome' and contains the following text: 'Summary of your recent requests. If a request is Pending, the advisor decision has not yet been made and you will not be able to make additional requests. If a request is Approved Pending Update, the advisor has approved the request, but the Registrar's Office is processing your student record curriculum change.' There is a 'Close' button at the bottom of the popup.

Update Major – Adding Additional Concentrations

To update your concentration, use the 'Update Major' option. You will be brought to the **Update Major Request** screen. Use the **Add a Concentration** Button:

- 1.) Select the Add a Concentration Button
- 2.) A **New Concentration** pulldown will appear – Select **Engineering Enterprise**
- 3.) Click **Submit**

The screenshot shows the 'Update Major Request' form. The 'Select Major' dropdown is set to 'Primary Degree (BS) - Mathematics'. Below it are 'Add Major' and 'Change Major' buttons. A 'Drop Major' checkbox is present. The 'Current Concentration' dropdown is set to 'Business Analytics'. The 'New Concentration' dropdown is highlighted with a red circle and set to 'Applied/Computational'. A red arrow points from a text box '2.) Select the new concentration from the pulldown menu' to this dropdown. Below the 'New Concentration' dropdown is the 'Add a Concentration' button, which is also highlighted with a red circle. A red arrow points from a text box '1.) Select Add a Concentration' to this button.

The screenshot shows the 'Update Major Request' form after several steps. The 'Select Major' dropdown is now 'Primary Degree (BS) - Mechanical Engineering'. The 'Current Concentration' dropdown is 'Engineering Enterprise'. The 'Add a Concentration' button is visible. Below this is the 'Update Minor Request' section with an 'Add a Minor' button. At the bottom, there is a 'Request Notes' text area containing the word 'test'. The 'Submit' button is highlighted with a red circle. A red arrow points from a text box '3.) Click Submit' to this button.