

Mechanical Engineering - Enterprise Enrollment Guidelines – February 2011

Enterprise project work (ENT3950/3960/4950/4960) and other Enterprise requirements (ENT2961-Teaming, ENT2962-Communication Contexts, and Enterprise modules) are required for students completing the BSME-Enterprise Concentration as shown on the **BSME-Enterprise Concentration flowchart**. Students may enroll in Enterprise project work (e.g., ENT2950) and participate on an Enterprise team prior to declaring the Enterprise Concentration. If the student decides not to pursue the Enterprise Concentration, any Enterprise project credits can be used as free electives in the BSME. ENT2961 and/or ENT2962 can be used as General Education HASS credit from the supplemental list provided that the three-credit supplemental maximum has not already been met. If the student chooses to pursue the Enterprise concentration, he/she must file a Curricular Add/Drop form with the ME Advising Center to add the Enterprise Concentration.

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 project work meets the capstone requirements dictated by the ME-EM department to satisfy ABET requirements.

The minimum Enterprise team participation for ME students completing the BSME-Enterprise Concentration is four project semesters (ENT 3950/3960/4950/4960) with the same Enterprise team. Three one-credit Enterprise modules are also required. ENT 2961 (Teaming) and ENT 2962 (Communication Contexts) are required and count for three credits of HASS General Education distribution. Students may substitute HU 3120 or CM 3410 for ENT2961/2 by contacting the ME Advising Center. HU3120 and CM3410 are also on the HASS supplemental list. Refer to the **BSME-Enterprise Concentration flowchart** for more details. All required forms and templates are shown in the appendix and are available on the wall outside the ME Advising Center (204/205 ME-EM) and at www.me.mtu.edu/advising.

ME-EM faculty advised or ME-focused Enterprises (i.e., should have projects available that meet ME Enterprise senior design criteria)

Aerospace (L21) – Advisor: Dr. Brad King, MEEM 1014, lbking@mtu.edu

<http://www.aerospace.mtu.edu/aeroweb/>

Invent and build spacecraft and gliders with an emphasis on systems engineering in the areas of avionics, propulsion, rocket design, and aerodynamics. Combination of competition and industry-sponsored projects.

Registration: Instructor Approval

SAE Mini-Baja (L06) – Advisor: Dr. Brett Hamlin, Dillman 104C, bhhamlin@mtu.edu

Design and fabricate an off-road vehicle for competition with a focus frame, chassis and suspension improvements. Competition based on performance, manufacturability, cost, and ergonomics.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join Baja and description of your intended contribution to the team) to the advisor. If approved by the Enterprise executive board, contact the instructor to sign the ME Enterprise enrollment form to register for each project semester course. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit.

Board Sport Technologies (BST, L11) – Advisor: Dr. Ibrahim Miskioglu, MEEM 1009, 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. Also design terrain park obstacles for board sports.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join BST and description of your intended contribution to the team) to the advisor. If approved by the Enterprise executive board, contact the instructor to sign the ME Enterprise enrollment form to register for each project semester course. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit.

SAE Clean Snowmobile Challenge (L07) – Advisor: Dr. Jason Blough, MEEM 1020A, jrblough@mtu.edu

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

Design and modify a snowmobile to achieve reduction in emissions and noise levels while maintaining high performance and fuel efficiency. Compete in both reduced and zero emission (all-electric) 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 advisor. If approved by the Enterprise executive board, contact the instructor to sign the ME Enterprise enrollment form to register for each project semester course. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit.

Eco-Car (Challenge-X, L04) – Advisor: Dr. Josh Loukus, MEEM 926, jeloukus@mtu.edu

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

Design and build a hybrid electric SUV for competition. Design objective is to modify powertrain to achieve 2/3 reduction in greenhouse gas emissions while preserving vehicle functionality, safety and performance. Competition involves modification of a donated production General Motors vehicle and focuses on maintaining vehicle marketability while achieving environmental impact goals.

Registration: Instructor Approval

Formula SAE Racing Team (L05) – Advisor: Dr. Jim DeClerck, MEEM 825, jdeclerck@mtu.edu

<http://www.fsae.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 both racing performance and design components.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join FSAE and description of your intended contribution to the team) to the advisor. If approved by the Enterprise executive board, contact the instructor to sign the ME Enterprise enrollment form to register for each project semester course. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit.

Velovations (L31) – Advisor: Dr. John Gershenson, MEEM 1022, jkgershe@mtu.edu

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

Collaborating with the bicycle industry working on sponsored projects to develop new products and processes. Focus on product development from customer need, through product/process design and testing, manufacturing, supply chain management, marketing, and distribution.

Registration: Instructor Approval

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

http://www.enterprise.mtu.edu/SSE/SSE_main/Supermileage_Team.html

Development and construction of a single-person, fuel-efficient vehicle for the SAE Supermileage competition, powered by a small four-cycle engine. Supermileage is a multidisciplinary student-led organization where team members gain valuable experience in leadership, project management, and vehicle development including body/chassis, powertrain, and electrical/controls. In 2009, our team placed 2nd with 1,140 mpg and the award for Best Design.

Registration: To join the Enterprise for the first time, submit a resume and a personal statement (why you want to join Supermileage and description of your intended contribution to the team) to the advisor. If approved by the Enterprise executive board, contact the instructor to sign the ME Enterprise enrollment form to register for each project semester course. Student must be in good academic standing (i.e., not on academic probation) to be registered for project credit.

Additional Enterprise teams (Home Department) – verify that ME project work is available

- Advanced Metalworks (Materials Science and Engineering)
- Alternative Fuels Group (Chemical Engineering)
- Blue Marble Security (Electrical & Computer Engineering)
- Consumer Product Manufacturing (Chemical Engineering)
- Integrated Microsystems (Electrical & Computer Engineering)
- International Business Ventures (Institute for Interdisciplinary Studies)
- Nanotechnology (Physics)
- FIRST Robotic Systems (School of Technology)
- Unmanned Vehicle Systems (Electrical & Computer Engineering)
- Wireless Communication (Electrical & Computer Engineering)

Other Enterprise teams may have acceptable 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 preapproval of possible projects is highly recommended.

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

Declaring an Enterprise Concentration

Students must declare the Enterprise Concentration (BSME Enterprise Concentration) in the ME Advising Center using the Curriculum Add/Drop form. This will ensure that the BSME Enterprise Concentration audit is used to verify graduation requirements. The original form will be filed with the Registrar and input into the student database. A copy will be retained in the student's file in the ME Advising Center and a copy can be given to the student. Curricular changes will be reflected in BanWeb for the current semester if the form is filed by Wednesday of week 2 of that semester, otherwise it will be reflected in the following semester. The change will be reflected immediately in the Degree Audit Reporting System (DARS).

Getting Started

- ENT 1950 – Orientation to Enterprise program - 1 credit. Intended for fall semester of the first year. Graded pass/fail. Only applies to BSME degree as free elective. Not team specific. Intended to gain exposure to Enterprise overall and several teams to aid in deciding which to consider joining.
- ENT 1960 – First semester of team-specific enterprise participation, 1 credit. Intended for second semester of the first year. Only applies to BSME degree as free elective. May be required to meet team-specific criteria prior to enrollment.

Project semesters not required for BSME Enterprise concentration (>2 year minimum 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. May be used as an Enterprise module. 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. May be used as an Enterprise module. May be required to meet team-specific criteria prior to enrollment.

Project semesters required for the BSME Enterprise concentration (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. May be required to meet team-specific criteria prior to enrollment.
- ENT 3960 – Project work - 1 credit. Intended for second semester of third and/or with three semesters remaining until graduation. Students must register for MEEM 3900 if not already completed, and register for or be set up for senior design readiness requirements required for ENT4950.
- ENT 4950 – Project work - 2 credits. The following are required prior to enrollment in ENT4950.
 1. **Approved Senior Design Objectives through Enterprise Experience form (see appendix)**
 2. **Instructor permission to enroll in ENT4950 (if applicable)**
 3. **Satisfy pre-requisite requirements: MEEM3900, MEEM3000 (concurrent pre-requisite), MEEM3502 (concurrent pre-requisite), ENT3960**
- ENT 4960 – Project work - 2 credits. The above project submission will also define the second senior design project semester, although faculty advisor approval may be required for ENT 4960 registration.
- **NOTES:**
 - The four required project semesters 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 faculty advisor.
 - Amended Verification of Senior Design Objectives forms should be prepared and submitted to the ME Advising Center as appropriate if major changes to the approved scope or deliverables of the project are made during either senior design project semester. These changes will also require ME-EM department review and approval. The final Verification of Senior Design Objectives form on file at the conclusion of the senior design project semesters must represent the project and deliverables as completed by the student.
 - All ME Enterprise enrollment forms required for Enterprise faculty advisor approval for registration into a given project semester must be fully and accurately completed by the student (M number, name, CRN and lab section number for specific team section for requested semester, course number, Enterprise name, and semester) before submission to the ME Advising Center for registration. An Enterprise advisor may send an ME advisor an email in place of the signed ME Enterprise enrollment form as long as the appropriate 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.

Enterprise Modules

- 1 credit each
- 3 credits required
- Modules may be restricted by class standing, may require instructor approval for registration, may have pre-requisites, and/or may only be offered in one semester per academic year. Please see the Undergraduate Catalog online (<http://www.mtu.edu/catalog/>) for course descriptions and these restrictions.
- See notes on BSME Enterprise Concentration flowchart for approved modules.

Required General Education (specific to Enterprise Concentration)

- Two required courses, ENT 2961 and ENT 2962 (total of 3 credits) can be double-listed for 3 credits of HASS General Education Distribution credit from the Supplemental list if maximum of 3 credits allowed from Supplemental list has not already been met.
 - ENT 2961 - Teaming in the Enterprise (2 credits)
 - Develops group problem-solving skills. Stresses interpersonal skills and skill assessment, communication, group process and teamwork, and action planning. Uses active, hands-on learning. Only offered fall semesters. May not have freshman class standing.
 - ENT 2962 - Communication Contexts (1 credit)
 - An introduction to the demands of technical and professional communication in workplace settings, through analyzing project design team experiences. Only offered spring semesters. May not have freshman class standing. UN 1002 or UN 1003 are required as pre-requisites.
- Students may consider substitution of HU 3120 or CM 3410 (3 credits each - HASS Supplemental list courses) for ENT 2961 and 2962. Students should register for one of these alternate courses and file a petition with the ME Advising Center.

This set of guidelines should answer many student questions regarding participation in the Enterprise Program and incorporating that participation into a BSME curriculum. Students must take responsibility for planning ahead and having a good understanding of both their current status and progress. The ME academic advisors are available for assistance.

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906.487.2564

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Mechanical Engineering-Engineering Mechanics
205A (203) R.L. Smith ME-EM Bldg. (MEEM)
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906.487.2564



Verification of Senior Design Objectives through Enterprise Experience

Major: _____ Date: _____

Part A: To be completed by student. List completed and planned project work semesters, and if applicable, approved modules for senior design credit:

Table with 2 columns: Course, Semester/Year. Rows include ENT, ENT 3950, ENT 3960, ENT 4950, ENT 4960.

Student: _____
ID#: M _____
Primary major: _____ 2nd major/deg: _____
e-mail: _____@mtu.edu

Enterprise Team: _____
Enterprise Advisor: _____
Check if applicable:
[] ENT concentration [] Enterprise Minor

Part B. To be completed by student and enterprise advisor. Return signed form to the IIS Enterprise Office (722 M&M)

Project Title: _____

Abstract: Outline the project scope and deliverables assigned to this student (attach additional pages as needed).

ABET Criteria Check whether student will:

- 3 (a) Apply knowledge of mathematics, science and engineering.
3 (b) Design and conduct experiments, as well as to analyze and interpret data.
3 (c) Design a system, component, or process to meet desired needs.
3 (d) Function on multi-disciplinary team(s) as demonstrated by the execution of a team project that is too large, complex, or diverse for a single person.
3 (e) Identify, formulate and solve engineering problems.
3 (f) Demonstrate understanding of professional and ethical responsibility.
3 (g) Communicate effectively.
3 (h) Gain understanding of the impact of engineering solutions in a global, economic, environmental and societal context.
3 (i) Recognize the need for, and an ability to engage in life-long learning.
3 (j) Gain knowledge of contemporary issues.
3 (k) Use the techniques, skills and modern engineering tools necessary for the practice of engineering.
Program specific criteria (please describe on back of this form)

Approved by: _____
Enterprise Faculty Advisor Date

Approved by: _____
Academic Department Date [] Senior Design Ready (Initial)

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

Return completed form to Enterprise Program Director, IIS, 722 M&M.

Enterprise Design Verification, Rev 2 Feb-09

Mechanical Engineering – Verification of Senior Design Objectives through Enterprise Experience

The Verification of Senior Design Objectives through Enterprise Experience form must be completed by each BSME – Enterprise concentration student prior to registering for ENT4950. The purpose is to ensure that the student's participation in the Enterprise program represents an equivalent design experience as required by ABET. The basic template to be followed by ME students is provided below.

Students should consult with their Enterprise team advisor when defining the capstone-equivalent project they will be participating in. The completed form must be approved by the Enterprise team advisor and the ME-EM Associate Chair for Undergraduate Studies. After the Enterprise team advisor has signed the form, the student must submit the form to the ME Advising Center for verification of pre-requisites. The advisor will submit the form to the ME-EM Associate Chair for Undergraduate Studies for review.

The following are required prior to enrollment in ENT4950.

- 1. Approved Verification of Senior Design Objectives through Enterprise Experience form**
- 2. Instructor permission to enroll in ENT4950 (if applicable)**
- 3. Satisfy pre-requisite requirements: MEEM3900, MEEM3000 (concurrent pre-requisite), MEEM3502 (concurrent pre-requisite)**

After the above items have been completed, the ME academic advisor will enroll the student in ENT4950. A copy of the approved form will be retained in the ME Advising Center and the original will 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 can be submitted is the end of the first week of classes of the semester in which ENT4950 is to be completed.

Recognizing that it may not be possible to fully identify the intended design project in this timeframe, or that design project scope and/or deliverables may change over the course of the semester, amended Verification of Senior Design Objectives through Enterprise Experience forms must be prepared and submitted to the ME-EM department. The final form on file with the Enterprise program office 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 the ME Advising Center in 204/205 ME-EM.

Abstract Template for Verification of Senior Design Objectives Form

- This format must be followed for ME students submitting the above project form for approval, regardless of Enterprise team.

Michigan Tech Enterprise Project Brief for MEEM Capstone

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 eqpmnt. etc.
- 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 faculty advisor signature.
- May be replaced with an email from Enterprise faculty advisor that includes information above.
- Academic advisors will confirm academic standing before registration in project semester courses, when required.

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, Mini (Blizzard) Baja, 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)

Use form to declare the Enterprise Concentration within the BSME curriculum (form is available in ME Advising Center)



Registrar's Office
487-2319

Undergraduate
Curriculum Add/Drop Form

Curriculum changes must be submitted to the Registrar's Office before Wednesday of the second week of instruction to be effective for that semester.
Curriculum changes received after that time will be effective for the following semester.
Changes to catalog year only will be effective for the current semester.

CURRENT INFORMATION:

Name (please print): _____ Student ID: M
Last First Middle

MTU Email _____@mtu.edu Phone number (optional): _____

Primary Major: _____ Concentration: _____

Minor: _____ Certificate: _____

Double Major: _____ Concentration: _____

Second Degree with Major/Concentration: _____

CHANGE CATALOG YEAR ONLY

New catalog year to use: 2006-07 2007-08 2008-09 2009-10 Other _____

For the current: Primary Major Double Major Minor Certificate Second Degree

Student Signature Date Academic Advisor (associated with the selected curriculum) Date

Print advisor name: _____

ADD OR **CHANGE** (to current information listed above)

Primary Major _____ Concentration _____
(within primary curriculum)

Minor _____ Certificate _____

Double Major* _____ Concentration _____
(within double major)

Second Degree* with Major/Concentration _____

*Note: A double major is not the same as a second degree. If you wish to pursue a second degree, you must complete a degree audit with the academic advisor in the second degree department

Catalog Year to use for new curriculum: 2006-07 2007-08 2008-09 2009-10 Other _____

Student Signature Date Academic Advisor (associated with the selected curriculum) Date

Print advisor name: _____

DROP (from current information listed above)

Primary Major _____ Concentration _____
(within primary curriculum)

Minor _____ Certificate _____

Double Major _____ Concentration _____
(within double major)

Second Degree with Major/Concentration _____

*Advisor signature is **not** required for dropped curriculum.*

Student Signature Date