Michigan Tech

Office Memo

Office of the Provost and
Senior Vice President for Academic Affairs

Phone: (906) 487-2440
Fax: (906) 487-2935

TO: Richard Koubek, President

FROM: Andrew Storer, Provost & Senior Vice President for Academic Affairs

DATE: December 3, 2025

SUBJECT: Senate Proposal 30-25

Attached is Senate proposal 30-25, "Proposal for a Graduate Certificate in Robust Embedded Software," and a memo stating the Senate passed this proposal at their November 13, 2025 meeting. I have reviewed this memo and recommend approving the proposal and sharing with the Senate that the administration appreciates the content relating to resource needs for this program and anticipates resource allocation to be consistent with existing resourcing plans (as indicated in the proposal) and the university budgeting process.

If you concur with my recommendation, advertising the new graduate certificate can begin since approvals from the Board, MASU, and in this case HLC are not required.

I concur____X____ do not concur_____ with the provost's recommendation as stated in this memo.

Richard Koubek, President

12/5/25

Date

DATE:	November 13, 2025
TO:	Richard Koubek, President
FROM:	Robert Hutchinson, University Senate President
SUBJECT:	Proposal 30-25
COPIES:	Andrew Storer, Provost & Senior VP for Academic Affairs

At its meeting on November 13, 2025, the University Senate approved Proposal 30-25, "Proposal for a Graduate Certificate in Robust Embedded Software." Feel free to contact me if you have any questions.

The University Senate of Michigan Technological University
Proposal 30-25

Proposal for a Graduate Certificate in
Robust Embedded Software

https://www.mtu.edu/senate/policies-procedures/list-policies/411.1/

Basic Program Information

Primary Contact: Ali Ebnenasir, aebnenas@mtu.edu , Department of Computer Science
Program/Degree type: Graduate Certificate
Program Title: Graduate Certificate in Robust Embedded Software
Planned Implementation Date: Fall 2026
Program location/modality: Online
Target student population: Working professionals in the embedded/cyber physical systems; Michigan Tech graduates in the following majors: Computer Science, Computer Engineering, Electrical Engineering and Mechanical Engineering.

General description and characteristics of program

This certificate includes three 3-credit courses that can be completed in 12 months. The courses are project-based where students will get hands-on experiences in the development of embedded software. Students can take at most two courses per semester due to prerequisite requirements and resource constraints. The target students are mainly online participants, but on-campus students can benefit from in-person access to the instructors in their office hours. Some of the contents of one of the courses is taken from CS4710, Model-Driven Software Development, but significant additional materials must be included to cover embedded software. The cost of delivery of this certificate is low, but there will be a start-up cost for course development. If enrollment grows over time, then we will expand the course offerings and will need more resources.

Rationale

Since the critical infrastructure of our society is monitored and controlled by computing devices embedded in larger systems (e.g., transportation systems, medical devices), the resilience and robustness of software that runs such embedded systems is of paramount importance. Due to high demand for embedded programmers, many graduates from disciplines other than Computer Science land in positions where they are expected to program embedded systems. We have a responsibility to train such professionals and equip them with the necessary skills for the development of high assurance embedded software.

In terms of job market potential, the projection of the U.S. Bureau of Labor Statistics (BLS) indicates that the overall employment of software engineers with expertise in robustness and

quality assurance expertise is expected to grow 25% from 2022 to 2032, which is much faster than the average for all occupations. The BLS reports that the median salary of embedded Software Engineers was about $127K in 2022. [Lightcast](#) reports that in 2022, there were 1,578,965 jobs for embedded software engineers in the US and 31% growth is expected until 2032.

This certificate provides an opportunity for Michigan Tech's engineering graduates as well as professionals who work in embedded systems industries (e.g., automotive, medical devices, etc.) in Michigan, its neighboring States and beyond to improve their software engineering and software quality assurance skills in a short period of time with the flexibility of working remotely.

Related programs: within Michigan Tech and at other institutions

The only courses related to embedded software at Michigan Tech include EE3171, Microcontroller Applications, and EE3173, Hardware/Software System Integration, which are mainly geared towards Electrical and Computer Engineering students, with little focus on software robustness or Software Engineering aspects of embedded programs. We have discussed the idea of this certificate with the instructor of these courses and he has agreed to teach one or two modules of one of the courses of this certificate. To the best of our knowledge, certificates and degrees on embedded software are scarce across the nation, despite the pressing need for embedded software workforce in the next decade (as stated in the rationale of this proposal). We have found a similar certificate presented by the [University of Washington](#). Moreover, [Lawrence Technological University](#) in Michigan offers an undergraduate degree for educating experts in Embedded Software, which further indicates the significance of this program for Michigan industries. There will be a dire need for embedded software workforce in the next decade (as stated in the rationale of this proposal), and we believe that Michigan Tech can play an important role in the training of such workforce in Michigan and beyond. Overall, a certificate in developing Robust Embedded Software (RES) is highly needed on-campus, in Michigan and across the nation.

Projected Enrollment

Projecting an accurate enrollment is difficult, but given the current vacuum on-campus and in the State of Michigan, we anticipate that in the first year, we will have around 10 students. There is a great potential to recruit students from neighboring states of Wisconsin and Minnesota, given their strong industrial prowess in the field of medical devices and avionics. We predict that the automotive industry in Michigan will also be interested in training their professional workforce through this certificate. Initially, we can accommodate 10 online students without additional teaching resources, but as the enrollment grows there will be a need for additional instructional resources. We would like to note that due to the hands-on nature of this certificate where students will work on design, verification, implementation and testing of embedded software, instructors will have to spend more than average time on course development and teaching.

Specialized Accreditation Requirements

There is no discipline-specific accreditation.

Professional Licensure Requirements

No licensure is required.

Curriculum Details

Students should successfully pass the following 3-credit courses:

- CS4xxx: Foundations of Embedded Software (FES)
- CS5xxx: Model-Driven Development and Verification of Embedded Software (MDDVES)
- CS5xxx: Testing and Quality Assurance of Embedded Software (TQAES)

Learning Goals

After taking this certificate, students will be able to *design, verify and test event-driven and concurrent embedded software in the context of a team using state-of-the-art methods and tools.*

Assessment Plan

We will annually assess the Graduate Learning Outcome (GLO) using the following assessment points:

Assessment Points for GLO	GLO addressed	Notes
Mastery of design, verification and testing knowledge and skills in individual assignments and projects	GLO	At most one 'AB' and the rest "A's" as excellent, At most one 'B' and no grade lower than 'B' as satisfactory, No grade higher than 'B' as marginal, All grades below 'B' as deficient.
Teamwork and communication skills in group projects.	GLO	Through peer evaluation forms, students evaluate the contributions of their teammate(s) as `satisfactory', `marginal' or `unsatisfactory'. Instructors take this feedback into consideration for the final grade of each individual in the related course.

Prerequisites: Ideally, we would like the students to take these courses in sequence, but FES and MDDVES can be taken concurrently, while TQAES must be the last course.

Model Schedule

We propose the following schedules for the online offering of this certificate. The courses of this certificate are offered in a semester-long term. Summer enrollments will depend upon the availability and interest of students and the instructors. The program will start in Fall 2026 and the sequencing of the course offering is as follows:

Fall Start Schedule		
Fall	Spring	Summer or Fall
Foundations of Embedded Software (online)	Model-Driven Development and Verification of Embedded Software (online)	Testing and Quality Assurance of Embedded Software (online)

Faculty Qualifications

Ali Ebnenasir is the faculty member in charge of the design and development of this certificate. Christopher Cischke from the Computer Engineering Department in the College of Engineering will help in teaching at least some modules of the FES course. Dr. Ebnenasir's research expertise focuses on robustness and dependability aspects of software systems, and he has designed CS4710 and has offered and improved it regularly in the past 12 years. Moreover, Dr. Wallace will participate in the development of the courses. His expertise span over Testing, Requirements Elicitation and Formal Methods.

- Ali Ebnenasir https://pages.mtu.edu/~aebnenas/
- Charles Wallace https://pages.mtu.edu/~wallace/
- Christopher Cischke https://pages.mtu.edu/~cmcischk/

All faculty members meet Michigan Tech's qualification standards for online/remote instruction.

Program-specific policies, regulations, and rules

There are no program-specific policies or rules.

Resources Needed

Library and other learning resources needed

- Instructional needs: This program can be managed initially with no additional instructional resources; however, as mentioned before, when the program grows beyond 10 students, there may be a need for additional instructional resources. Moreover, the development of new courses may require some sort of compensation.

- Hardware: In the first few years of this program, we will use simulators of embedded platforms/processors for actual programming and testing. As enrollment grows, this certificate program will need some embedded systems kits for students so they can experiment on the actual hardware platforms too. We will also use a few Arduino microcomputer boards that Dr. Ebnenasir procured for an IoT course that he designed and offered in Spring 2020, which can be used for some modules of this certificate, but not all. The cost of each embedded systems kit may vary between $300 to $800, depending on the brand and peripheral equipment. One source of funding for such costs will be a lab fee that we will include for related courses of this certificate.

Suitability of existing space, facilities, and equipment

Existing space, facilities and equipment are sufficient.

Program Costs (including development, marketing and maintenance)

The College of Computing may compensate the involved faculty members to develop the online courses. Using existing resources, the offering of the new courses of this certificate (after their development) can be done in an online fashion as long as online enrollment does not exceed 10 students per course. College of Computing marketing will help with the marketing of this program.

Curriculum Design

New Course Descriptions

There will be three new 3-credit courses that will be offered in a project-based fashion where the knowledge and skills acquired in this program are put into action. The course proposals are attached to this program proposal. Students will experience all stages of developing robust embedded software in the context of course projects, including design of functional and non-functional properties, design verification, implementation and testing. The title and descriptions of these courses are as follows:

- *Foundations of Embedded Software (FES)[1]*:
  - Provides an introduction to the architecture of microcontrollers, the embedded software stack (starting from firmware, hardware abstraction layer, real-time operating systems, device drivers and APIs), programming methods for embedded systems, and tool chains for programming and debugging of embedded software.
- *Model-Driven Development and Verification of Embedded Software (MDDVES)*:
  - Focuses on the use of methods and tools in the design, verification and validation (V&V) of hybrid computing software, where discrete computing meets the continuous physical world. Topics include hybrid programs and their requirements, modeling and simulation of embedded systems, timed temporal logic, model checking of timed properties, and use of model checkers such as UPPAAL, Romeo, BIP, DREAM and the IF toolset.
- *Testing and Quality Assurance of Embedded Software (TQAES)*:
  - Concentrates on topics such as testing of functional and non-functional concerns, test harness development, test automation, performance testing (e.g., worst case execution time), testing real-time properties and testing in the presence of faults. The main focus of this course will be on methods and tools for implementation testing, but requirements and design testing will also be discussed. Examples of such methods include hardware-in-the-loop testing, code coverage analysis, worst case execution time analysis, scheduling analysis and trace analysis.

Timeline of Course Development and Offering:
The three courses will be developed and offered in the following sequence:
- Fall 2026: Foundations of Embedded Software
- Spring 2027: Model-Driven Development and Verification of Embedded Software
- Fall 2027: Testing and Quality Assurance of Embedded Software

We will make sure that these courses will undergo the on-line course review process after they are developed and taught the first time.

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[1] This course is in general useful for CS and SE students. In particular, the following undergraduate courses can benefit from FES: Operating Systems (CS4411), Computer Security (CS4471), Trusted Software (CS4740), and Software Architecture (CS4740).

The University Senate of Michigan Technological University
Proposal 03-26 Assessment Plan
Graduate Student Learning Outcomes Assessment Plan
Proposed Graduate Certificate in Internal Combustion Engine Systems
(2025)

I.   Introduction

Student outcome assessment is part of Michigan Tech's commitment to continuous improvement of programs. Expected Student Outcomes are appropriate for the level of the degree or certificate awarded. For graduate certificates, the faculty set Graduate Learning Objectives (GLOs) and then annually assesses those Graduate Student Learning Outcomes against the Objectives.

Faculty submit an Annual Assessment Report to the Graduate School, indicating assessment results for the certificate and proposed actions for improvement.

This document describes the Graduate Student Outcomes Assessment Plan for the Graduate Certificate in Internal Combustion Engine Systems. This Certificate is available as part of a graduate degree or as a standalone certificate for non-degree-seeking students.

II.   Graduate Certificate *in Internal Combustion Engine Systems*

This Graduate Certificate in Internal Combustion Engine Systems provides advanced knowledge of the operating principles, design, calibration, and simulation of internal combustion engines. This certificate formally recognizes curricular breadth in advanced principles of i) thermodynamic systems, ii) testing and analysis, and iii) simulation tools.

A.   The Graduate Learning Objectives (GLOs) of the Certificate are:

Upon completion of the certificate, students will be able to:

1) Apply engineering principles of energy conversion, thermodynamics, and fluid mechanics to include thermochemistry and thermodynamics of reacting mixtures for the assessment of internal engine systems.
2) Analyze, evaluate, and specify engine subsystems to include turbocharged air-handling and fuel injection components by application of theory and established engineering correlations.
3) Demonstrate technical competencies in at least two of the following areas:
   i.   Design and plan testing in dynamometer-based engine testing and interpret performance and emissions data.
   ii.   Utilize cylinder pressure data and computed combustion metrics to quantify combustion characteristics, including heat release rates and mass fraction burned, for engine calibration and optimization.
   iii.   Calibrate engine controls for performance and emissions with constraints such as abnormal combustion and component limits.
   iv.   Create, simulate, and validate one-dimensional engine performance models

for system design and evaluation.

v. Assess engine and aftertreatment requirements and designs in relation to current and future US emissions regulations.

B. **Assessment Points for Measuring Certificate Graduate Student Learning Outcomes (GSLO)**

The assessment of the GSLO for the Graduate Certificate in Internal Combustion Engine Systems is based on 9 credits and encompasses two required three-credit courses and the selection of additional elective courses for three additional credits. The elective courses listed on the student's Degree Schedule – Graduate Certificate in Internal Combustion Engine Systems, as listed at (*will need to be added*).

https://www.mtu.edu/gradschool/policies-procedures/timelines/certificates/

When a student applies for the Certificate, they will list on the degree/audit schedule the required core, focus, and elective courses taken. The schedule is then submitted to Professor Jeffrey D. Naber in the MAE Department as the Graduate Advisor for the Certificate and then to the Graduate School for approval. The Graduate School verifies with the student's transcript that the courses were passed with a grade of B or better.

Assessment Points for Graduate Student Learning Outcomes (GSLO)	Certificate Graduate Learning Objectives addressed	Notes on Assessment

Grades in the two required core courses (Internal Combustion Engines II & Thermodynamics of Internal Combustion Engines).
 	
Grades in **Required** courses embodied in GLOs 1 & 2.
 	
Elective courses covered in GLO3.
	GLO1 GLO2	Data comes from required course grades;
		• Excellent: GPA; 3.75-4.0
		• Satisfactory: GPA; 3.25-3.749
		• Marginal: GPA; 3.0-3.249
		• Deficient: GPA; <3.0
		
		GPA:
		  Grade of A: 4.0
		  Grade of AB: 3.5
		  Grade of B: 3.0

Passing Elective Course(s) with three credit hours	GLO3	The student must pass elective courses with GPA≥3.0 to receive the certificate.
Final Engine Simulation Project in Internal Combustion Engines II course ME 5250	All	The final project requires students to assess, research, simulate, model, and calibrate the model for an internal combustion engine to match engine data and achieve the target performance. Teams will present their work to industry members and PhD students studying in the field. A rubric will be used to evaluate the presentations against the certificate's learning objectives.

Industry panel review of syllabus and other course material	All	An annual review will be conducted by a panel of industry representatives. Using a rubric, they will evaluate a subset of course syllabi and redacted final project reports from the ICE-II course to ensure alignment with the certificate's learning objectives.

III. Data Compilation Plan

GLO1 and GLO2: The MAE Director of Graduate Studies will compile metrics from student transcripts at the time of submission of the degree schedule or certificate audit form. A determination of whether the core and focus classes were excellent, satisfactory, marginal, or deficient will be made according to the GPA ranges in the table above.

GLO3: The program will have achieved this (and been assessed) by virtue of the certificate being awarded with elective courses completed in at minimum two of these areas.

All: Assessments from the industry representatives will be compiled and shared with the graduate school and industry representatives. A continuous improvement plan will be developed and implemented in the respective courses from this information

Michigan Tech

— Course Add Proposal —
PLEASE COMPLETE THIS FORM IN RED

A guide for completing this form is located at http://www.mtu.edu/registrar/faculty-staff/course-proposal/

1) Course Information

Is this a **half-semester course proposal?** ☐ Yes ☐ No

> **NOTE**: All half-semester courses must follow rules set in Faculty Senate Proposal 4-00. See Senate website for details:
> https://www.mtu.edu/senate/policies-procedures/proposals-year/2002-03/10-03.pdf

Course Prefix/Number *(i.e. MEEM 2110)*: _____

Course Title *(abbreviated; used on transcript - Up to **30** characters including spaces)*

[ ]

Alternative Title for Catalog *(Up to **100** characters including spaces)*

[ ]

2) Credits

Number of credits assigned to this course _____

OR

Range of credits if **variable** [ ] to [ ] *(Number of credits to be taken in a given semester)*

3) Schedule

Contact Hours per Week *(Lec & Rec: 1 credit =1 contact hour; Lab: 1 credit =1-3 contact hours. (i.e. a 3-credit course may be 2 contact hours of lecture or recitation and up to 3 contact hours of lab OR 1 contact hour of lecture or recitation and up to 6 contact hours of lab)*

[ ] Lecture [ ] Recitation [ ] Lab

OR

Research Course? ☐ Yes ☐ No

OR

Special Topics Course? ☐ Yes ☐ No

4) Additional Credits

May students receive **additional credits** by taking and passing this course <u>more than once</u>?

☐ No

☐ Yes, for a maximum of _____ credits. *(Must be a multiple of the course credits, i.e. Research or Special Topics)*

☐ Yes, for an unlimited number of credits. *(i.e. Music, Varsity sports, etc.)*

5) Pass/Fail

Will this course be offered as a **pass/fail option ONLY**? *(grade of S or E)* ☐ Yes ☐ No

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6) Cross/Dual Listed Course

Cross Listed: Is there an identical course offered in a different subject? ☐ Yes ☐ No

    If yes, what is the other subject and course number? _____

Dual Listed: Is there a course offered at a different level? ☐ Yes ☐ No

    If yes, what is the other course number? _____

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7) Equivalent Course: Does this course replace a dropped course with no change in course content for degree requirements, prerequisites, and repeating purposes? ☐ Yes ☐ No

    If yes, what is the subject and course number of the dropped course? _____

8) Corequisites and Prerequisites

Corequisites are courses that are **REQUIRED to be taken at the SAME TIME** as this course (courses MUST be offered during the same term):

```
Required corequisite course(s):

_____

_____
```

Prerequisites are courses that are **REQUIRED to be taken PRIOR** to enrollment in this course.
Select appropriate box and use parentheses where needed.

```
Required prerequisite course(s):
                 1_____

☐ And  ☐ Or  2_____

☐ And  ☐ Or  3_____

☐ And  ☐ Or  4_____

☐ And  ☐ Or  5_____

☐ And  ☐ Or  6_____
```

A **concurrent prerequisite** is a defined prerequisite course (from list above) that **MAY** be taken **EITHER** simultaneously in the same semester **OR** in a prior semester. Indicate below applicable courses.

```
Concurrent prerequisite course(s):

_____

_____

_____
```

9) Catalog Course Description

The traditional catalog style description for a course is limited to **350 characters including spaces**. If course is proposed as a half-semester course, please include that information in the description. **Please refer to the Course Proposal Guide for examples and suggestions on developing a course description.**

10) Registration Restrictions

- If permission is **always** **required** for registration purposes (a student cannot enter the course without department or instructor signature)**,** please select the appropriate permission.

  Do not select unless EVERY STUDENT must get "SIGNED INTO" the class.

  ☐ Department **OR** ☐ Instructor

- Students who register for this course may be restricted by their **College/School OR** their **Major**. Please indicate if any college or major restrictions should be applied to this course. If there are no restrictions please indicate in the check box provided.

  ☐ **No College/School Restrictions**   ☐ **No Major Restrictions**

Colleges/Schools who MAY NOT enroll (EXCLUDE)	Majors that MAY NOT enroll (EXCLUDE)
_____	_____
-OR-	-OR-
Colleges/Schools who MAY enroll (INCLUDE)	Majors that MAY enroll (INCLUDE)
_____	_____

-- Restrictions continued on next page --

- A restriction may also be placed on **Class Standing** (freshman, sophomore, junior, senior, graduate). Please indicate if any class restrictions should be applied to this course. If there are no restrictions please indicate in the check box provided.

☐ **No Class Restrictions**

Class of students who MAY NOT enroll (EXCLUDE)
_____
-OR-
Class of students who MAY enroll (INCLUDE)
_____

11) Semester(s) Offered

☐ Fall ☐ Spring ☐ Summer *(Check all that apply)*

OR ☐ On Demand

If offered in a specific semester, will the course be offered only in alternate years? ☐ Yes ☐ No

If yes, what will be the starting academic year? *(i.e. 2014-15 or 2015-16)*_____

12) Essential Education

Is this course being proposed for Essential Education? Yes ☐ No ☐

Essential Education proposal forms are available at: http://www.mtu.edu/registrar/faculty-staff/course-proposal/.

13) Course Computing Lab and Expendables Fees

DO NOT RECORD FEE INFORMATION HERE. Submit new course fee information on the New Course Fees Form available at: http://www.mtu.edu/registrar/faculty-staff/course-proposal/.

14) Course Learning Objectives (Required)

Upon successful completion of this course, students will be able to:

15) Degree Programs which this course will affect

List the degrees, minors, and certificates in which this course will be required or used as an elective: ***

> Degree Program(s):
>
> _____
>
> _____
>
> _____
>
> _____
>
> _____

*** Be sure to adjust the appropriate degree audits in sections 7 and 8 in your department's binder.

16) Course Rationale *(Required)*

17) Faculty Contact

Faculty proposing this course *(please print)*: Name _____

Email _____

DID YOU USE RED INK TO COMPLETE THIS FORM?

IF NOT, PLEASE HIGHLIGHT YOUR ANSWERS SO NOTHING IS MISSED IN PROCESSING.

![Michigan Tech logo] **Michigan Tech**

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>
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>
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>
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>
> ☐ And ☐ Or 6_____

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Is this a **half-semester course proposal?** ☐ Yes ☐ No

> **NOTE**: All half-semester courses must follow rules set in Faculty Senate Proposal 4-00. See Senate website for details: https://www.mtu.edu/senate/policies-procedures/proposals-year/2002-03/10-03.pdf

Course Prefix/Number *(i.e. MEEM 2110)*: _____

Course Title *(abbreviated; used on transcript - Up to **30** characters including spaces)*

[ ]

Alternative Title for Catalog *(Up to **100** characters including spaces)*

[ ]

2) Credits

Number of credits assigned to this course _____

OR

Range of credits if **variable** [ ] to [ ] *(Number of credits to be taken in a given semester)*

3) Schedule

Contact Hours per Week *(Lec & Rec: 1 credit =1 contact hour; Lab: 1 credit =1-3 contact hours. (i.e. a 3-credit course may be 2 contact hours of lecture or recitation and up to 3 contact hours of lab OR 1 contact hour of lecture or recitation and up to 6 contact hours of lab)*

[ ] Lecture　　[ ] Recitation　　[ ] Lab

OR

Research Course? ☐ Yes ☐ No

OR

Special Topics Course? ☐ Yes ☐ No

4) Additional Credits

May students receive **additional credits** by taking and passing this course <u>more than once</u>?

☐ No

☐ Yes, for a maximum of _____ credits. *(Must be a multiple of the course credits, i.e. Research or Special Topics)*

☐ Yes, for an unlimited number of credits. *(i.e. Music, Varsity sports, etc.)*

5) Pass/Fail

Will this course be offered as a **pass/fail option ONLY**? *(grade of S or E)* ☐ Yes ☐ No

6) Cross/Dual Listed Course

Cross Listed: Is there an identical course offered in a different subject? ☐ Yes ☐ No

    If yes, what is the other subject and course number? _____

Dual Listed: Is there a course offered at a different level? ☐ Yes ☐ No

    If yes, what is the other course number? _____

7) Equivalent Course: Does this course replace a dropped course with no change in course content for degree requirements, prerequisites, and repeating purposes? ☐ Yes ☐ No

    If yes, what is the subject and course number of the dropped course? _____

8) Corequisites and Prerequisites

Corequisites are courses that are **REQUIRED to be taken at the SAME TIME** as this course (courses MUST be offered during the same term):

Required corequisite course(s):

_____

_____

Prerequisites are courses that are **REQUIRED to be taken PRIOR** to enrollment in this course.
Select appropriate box and use parentheses where needed.

Required prerequisite course(s):

1_____

☐ And ☐ Or 2_____

☐ And ☐ Or 3_____

☐ And ☐ Or 4_____

☐ And ☐ Or 5_____

☐ And ☐ Or 6_____

A **concurrent prerequisite** is a defined prerequisite course (from list above) that **MAY** be taken **EITHER** simultaneously in the same semester **OR** in a prior semester. Indicate below applicable courses.

Concurrent prerequisite course(s):

_____

_____

_____

9) Catalog Course Description

The traditional catalog style description for a course is limited to **350 characters including spaces**. If course is proposed as a half-semester course, please include that information in the description. **Please refer to the Course Proposal Guide for examples and suggestions on developing a course description.**

10) Registration Restrictions

- If permission is <u>**always**</u> **required** for registration purposes (a student cannot enter the course without department or instructor signature)**,** please select the appropriate permission.

    Do not select unless EVERY STUDENT must get "SIGNED INTO" the class.

    ☐ Department **OR** ☐ Instructor

- Students who register for this course may be restricted by their **College/School OR** their **Major**. Please indicate if any college or major restrictions should be applied to this course. If there are no restrictions please indicate in the check box provided.

☐ **No College/School Restrictions**

☐ **No Major Restrictions**

Colleges/Schools who MAY NOT enroll (EXCLUDE)
_____
-OR-
Colleges/Schools who MAY enroll (INCLUDE)
_____

Majors that MAY NOT enroll (EXCLUDE)
_____
-OR-
Majors that MAY enroll (INCLUDE)
_____

-- Restrictions continued on next page --

- A restriction may also be placed on **Class Standing** (freshman, sophomore, junior, senior, graduate). Please indicate if any class restrictions should be applied to this course. If there are no restrictions please indicate in the check box provided.

☐ **No Class Restrictions**

> Class of students who MAY NOT enroll
> (EXCLUDE)
>
> _____
>
> -OR-
>
> Class of students who MAY enroll (INCLUDE)
>
> _____

11) Semester(s) Offered

☐ Fall   ☐ Spring   ☐ Summer   *(Check all that apply)*

OR   ☐   On Demand

If offered in a specific semester, will the course be offered only in alternate years?   ☐ Yes   ☐ No

If yes, what will be the starting academic year? *(i.e. 2014-15 or 2015-16)_____*

12) Essential Education

Is this course being proposed for Essential Education?   Yes ☐   No ☐

Essential Education proposal forms are available at: http://www.mtu.edu/registrar/faculty-staff/course-proposal/**.**

13) Course Computing Lab and Expendables Fees

DO NOT RECORD FEE INFORMATION HERE. Submit new course fee information on the New Course Fees Form available at: http://www.mtu.edu/registrar/faculty-staff/course-proposal/.

14) Course Learning Objectives (Required)

Upon successful completion of this course, students will be able to:

15) Degree Programs which this course will affect

List the degrees, minors, and certificates in which this course will be required or used as an elective: ***

```
                    Degree Program(s):

        _____

        _____

        _____

        _____

        _____
```

*** Be sure to adjust the appropriate degree audits in sections 7 and 8 in your department's binder.

16) Course Rationale *(Required)*

17) Faculty Contact

Faculty proposing this course *(please print)*: Name _____

Email _____

DID YOU USE RED INK TO COMPLETE THIS FORM?

IF NOT, PLEASE HIGHLIGHT YOUR ANSWERS SO NOTHING IS MISSED IN PROCESSING.