UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, January 16, 2024

Attending: Achilleas Anastasopoulos, Robert Bordley, Yavuz Bozer, Laura Burdick, Chris Fidkowski, Fei Gao, Saadet Albayrak Guralp, Vineet Kamat, Amir Kamil, Leena Lalwani, Ryan Latimer, Xiaogan Liang, Frank Marsik, Radoslaw Michalowski, Mika Panagou, Rachel Patterson, Anchal Sareen, Rachael Schmedlen, Ben Spector, Roxanne Walker

Support Staff: Mercedes Carmona, Betsy Dodge, Matthew Faunce

Call to Order: 1:35 PM

Adjourned: 2:46 PM

Agenda:

1. Approval of 12.05.2023 Meeting Minutes - Page 2 - **APPROVED**
2. CSE DS-Eng Program Modification Proposal – Action Item - Page 5 – **APPROVED**
    a. The current Data Science major is missing an introductory Data Science course for students to become more familiar with Data Science as well as not seeing statistics content until taking STATS 412. To combat these issues, DATASCI 101 (STATS 206) has been developed and is strongly encouraged for students to take. For students that have already taken a statistics course before discovering Data Science, there will still be acceptance of other introductory level statistics courses.
    b. Another change will be splitting the two course "advanced technical elective" requirement into one course of "advanced technical elective" and one course of "advanced statistical analysis electric" (STATS 306, 315, 415, 426, 449, 451, 470, 480, 485, and some 500 level options which will be accessible only to some advanced students). Statistical analysis courses will continue to appear on the technical elective and application elective lists, which will remain unchanged. This change will make sure that one advanced statistical analysis course is taken and to help balance the interdisciplinary major between its CS and statistics components; it was previously the case that one could potentially graduate without taking any course other than STATS 413 from the statistics department. Most DS students already take multiple advanced statistics courses, but the recent restrictions on declaring CS make it timely to prevent a DS major from skewing excessively toward CS.
        i. A follow up question was asked if a student can take both classes at the same time. If a student chooses to, they will have a path to take both classes simultaneously.
    c. Program proposal effective for Fall 2024 with changes applying only to students matriculating for Fall 2024 or later. Any student in the program before Fall 2024 will be grandfathered into the previous requirements. Overall program credits changing from 128 to 132.
3. CSE CS-Eng Program Modification Proposal – Action Item - Page 9 – **APPROVED**
    a. Modification of reducing the number of required Upper Level CS (ULCS) Technical Electives from 16 credits to 15 credits and increasing the number of General Electives from 15 credits to 16 credits. This change will make it easier for students to register for courses needed to complete the major and increase the set of courses that satisfy the ULCS Requirements.
        i. Every course that satisfies the ULCS Requirements is a 4-credit course as students take 4 courses for 4 credits to achieve the 16 credits requirement.
        ii. Exceptions, sent by the student and approved by the department, are allowed for students for 3-credit courses for study-abroad courses through IPE (i.e., Computer Science and Tech Career Accelerator in Prague).

iii. By adjusting the ULCS Technical Electives credit total to 15, this will make it easier for the department and students regarding exceptions as the department has seen numerous done throughout the program for the credit requirement.
    1. The overall program credits will stay the same at 128 credits as rearranging the credit totals will allow for less exceptions needed for both the department and students within the program.

b. Program proposal effective for Fall 2024 and is "backwards compatible" meaning a student who meets the current program requirements would also meet the new program requirements.

4. HLC Annual Audit Questions 3, & 4 for the CoE Curriculum Committee – Informative Item – Page 12 - **PENDING**
    a. How can we change our current credit hour policy to include online modules? How can we set a boundary for the credit hours, and no one can abuse? I.e., Record all lectures and just let the students view when they can to complete the course.
        i. NERS: Depends on CoE Policy, if this is allowed for online classes then it would be allowed for all classes.
        ii. MECHENG: Office of Provost has definition of credit hours. Such activity should be faculty lead and there should be interaction with the faculty and not just for the student to take the course online.
        iii. EECS: What steps or processes does a course need to go through to be able to be online? ADUE needs to approve our department's courses. Is that the same for all departments/College of Engineering?
            1. Graduate Education: ADUE is the department that online courses need to go through.
            2. BIOMEDE: Fill out a form from the Dean's office, but the form has since gone away. You do need approval; seems to me the university wants the students on campus and interacting in person instead of a student completing the course whenever they want and having distractions therefore not fully paying attention/giving 100% effort. Students love this course, ENGR 101/110, but is a course that you need to be there for, and a remote option wouldn't be the same.
    b. CLIMATE & SPACE: The course contains weekly discussion and a 1-hour engagement of Office Hours for one of the 15 modules. Each module takes 45 or so minutes, which adds up to the contact hours needed and is engagement. With the policy, saying 50 hours and a student goes and completes whenever they choose, isn't adding up to the weekly contact hours if a student is to do all course work in one sitting.
    c. ENGR: Credit hour = some sort of engagement. Not a problem with zero engagement. If we can provide an engagement component or examples, then this is something that can be moved forward, i.e., Office hours, the discussions. If we can define that and how much can contribute to contact hours, that is what is needed for this course.
    d. EECS: Federal definition of engagement with a course instructor. What this course is doing, qualifies under this definition. As long as hybrid or online requires approval from one of the assistant deans, then there should be no issue. Office hours or Piazza should not count towards contact hours, but rather required interactive modules.
    e. MECHENG: Piazza and office hours could be using hours, but what is performed during those activities is what should be focused on.
    f. EECS: Led by an instructor. Office hours should not count towards contact/credit hours if this is a student spending an hour doing homework while the instructor is present. The instructor needs to be interactive and making engagement.
    g. MECHENG: Academic lead or faculty member should say that.
    h. NAVARCH: In Person, Lectures, online discussion (this should exclude email exchanges) should count towards contact hours. There is no real time interaction with the instructor via online.
    i. Graduate Education: Flip classroom model. Have students watch videos ahead of time and come to class with questions as this follow up should count towards contact hours. Digital co-existence between instructor and student, such as within the same zoom can count more versus answering individual student inquires through email and/or Piazza.
    j. NAVARCH: Specific time set aside to ask questions, but that is referred to as office hours.
    k. CHE: Office hours aren't specified as a mandatory for students to attend versus other courses that do make this a requirement.
        i. IOE: Agreed as our department also has courses that make office hours a course requirement.
        ii. CLIMATE & SPACE: Keep in mind that ENGR 101/110 does require that 1 of the 15 modules as a mandatory office hour session to be attended by the student.
        iii. That's the exception. Syllabus doesn't make office hours required/mandatory.
    l. 1 lecture hour with the professor, 2 hours independent study = 1 credit hours. Still a blurred boundary to defining credit hours.

m. Graduate Student Representative: A lot of classes just have the videos uploaded to Canvas and don't make the lecture mandatory, even though this is a contact hour. This should also be considered.
    i. MECHENG: ENGR 101/110 has material created by the instructor and is a difference. Faculty led material should be consider as contact hours.
    ii. EECS: Students don't attend lectures if they are not required to. Some courses have 30% attendance for their lectures. Recordings are offered to students that do not attend lecture; therefore, a student is not required to attend and can complete later on their own time.
    iii. MECHENG: If I refuse to do this and provide recordings, then there will be pushback and the feedback will show from students. I don't think we can fix this issue and need to revert the policy.
    iv. CHE: It is up to the student when to complete the lecture. So, how do we define any contact hours? I.e., 2 students attending lecture when there are over 100 students registered for the course. Does this truly still count for a contact hour for those that attend lecture as it is not the entire class roster attending?
    v. NAVARCH: How many hours is the instructor offering as the effort to prepare the material for the entire course should also be counted towards office hours.
n. Members are to email Xiaogan with any feedback on the policy and discussions will continue at the next meeting on 1.30.2024.

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	Is Course on LSA Course Guide?	APPROVED	NOTES & REVISIONS	TABLED
14	BIOMEDE	211	MOD	Change in Enforced Prerequisite and Contact Hours for HLC Audit.	FT 2024	C-	YES	CONDITIONAL APPROVAL	Change the Course Components and Contact Hours.	
17	BIOMEDE	221	MOD	Change in Full Term Credit Hours, Course Credit Type, and Enforced Prerequisites	FT 2024	C-	YES	CONDITIONAL APPROVAL	Change the Course Components and Contact Hours.	
20	CSE	585	NEW		FT 2024	C	NO	APPROVED		
39	EECS	388	MOD	Change in Course Description and Advisory Prerequisite.	FT 2024	C	YES	APPROVED		
42	EECS	491	MOD	Change in Course Description and Enforced Prerequisite.	FT 2024	C	YES	CONDITIONAL APPROVAL	Change to Course Description	
45	ENGR	161	NEW		FT 2024	NO	NO	CONDITIONAL APPROVAL	Change to Course Description and Credit Exclusion.	
56	MECHENG	305	MOD	Change in Advisory and Enforced Prerequisites.	FT 2024	NO	YES	CONDITIONAL APPROVAL	Change to Course Description.	

UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, December 5, 2023

Attending: Jack Baker, Robert Bordley, Yavuz Bozer, Chris Fidkowski, Fei Gao, Saadet Albayrak Guralp, Amir Kamil, Leena Lalwani, Xiaogan Liang, Emmanuelle Marquis, Frank Marsik, Radoslaw Michalowski, Mika Panagou, Eric Rutherford, Anchal Sareen, Ben Spector

Support Staff: Mercedes Carmona, Betsy Dodge, Matthew Faunce

Call to Order: 1:35 PM

Adjourned: 2:21 PM

Agenda:

1. Approval of 11.21.2023 Meeting Minutes - Page 2 - **APPROVED**
2. HLC Annual Audit Questions 1, 3, & 4 for the CoE Curriculum Committee – Informative Item – Page 5 - **PENDING**
    a. Question 1 - How should departments handle courses that are taught in combination with other institutions? How should departments handle it when the course is taught at UM? Do courses that are a teaching collaborative need to follow CoE Policy for the Assignment of Credit Hours?
        i. The HLC Working Group sent the ROB Department an email requesting clarification and information about the question. No follow up has been given yet, so discussion will continue at the next CoE CC Meeting once a response is given.
    b. Question 3 - Do labs need to be scheduled in a formal CoE Computer Lab space when the work can be done online? - **PENDING**
        i. Combined discussion with Question 4 listed below.
    c. Question 4 - Are the activities associated with the online, self-paced, asynchronous Canvas modules used in ENGR 101 and 110 and other departmental courses acceptable as CoE contact hours? - **PENDING**
        i. ENGR/ADUE Representative – Rachael Schemedlen – reached out to Laura Alford, an instructor of ENGR 101 online modules, who gave examples of the "help videos" created for ENGR 101. This was screenshared by the CoE CC Chair during the meeting and summarized below.
            1. Per Laura, office hours are offered Sunday – Friday each week students, so many hours are offered. Piazza is used for async help and students post a lot. The turnaround time for questions asked on Piazza is generally less than an hour, unless posted late at night or the weekend. Question responses are after 30 minutes to give the other students a chance to answer, but if no one chimes in, then an ENGR staff member will respond. Questions are always endorsed or clarified upon answering. Office hours type help is built into the async instructions, such as walkthrough videos if a student gets stuck as a ENGR staff member goes through the exercise so students can follow along and check to see what went wrong. Feedback is given as well as advice on wrong answers, which is the same responses given if a student came to office hours.
                a. Homework Club on Sundays was run through the ECAS, which is staffed by an ENGR 101 GSI and ECAS SI for students to do their async assignments together while an instructor is on standby to assist any student. These sessions were poorly attended, with a 5 or so students a week out of 700 enrolled for the course overall, so this has been discontinued.
        ii. MECHENG: This information was sent to other colleagues for discussion and feedback. Most agreed that this type of module is helpful for students and can benefit students greatly.
            1. Suggestion of possibly changing the wording to the CoE Contact Hours policy to allow this type of learning to count towards contact hours OR a change to the course so that this can pass the HLC audit.
            2. Overall question of, what type of activity can be included in the academic engagement?

iii. If such learning would be allowed for the official credit hours, how would this look or reflect?
    1. ISD: Points out issue of constructing a website that is effective. A system/website would need to be created that stays consistent.
    2. MECHENG: Need to define the boundary and situation for what type of activity is allowed and be careful when doing so. Just watching the video and not fully participating should not be allowed. Instructor needs to lay down ground rules/guidelines as to how this is allowed. Understandable that emergencies and such occur that this type of learning would be beneficial to use, but this is to not be abused and allowed just for anyone to complete.
    3. CLIMATE & SPACE & Instructor of 110: More than creating a video. For example, students are required to perform and participate in 15 video modules and more than just videos are included in that. Before a module begins, a Pre-Survey pops up so that a student documents the learning they have gained prior to completing the module at hand. A Post Survey also occurs at the end of the module for a Reflection, which is a required 200–300-word count response. Students are engaging in both online videos and content. Piazza is also used, and questions are asked to instructors. The learning is more than simply watching a video, as pre and post work is required for each module to be completed.

iv. IOE member brings up, does email count as academic engagement or not? I receive a lot more emails than office hours. Significant portion of student engagement happens in email rather than in person. Is this acceptable or how would this be defined as this is not stated in the policy.
    a. EECS - CSE: Instructor acting under academic matters, is what this should count under.
    b. CLIMATE & SPACE: ENGN 110 Office Hour sessions are a requirement for the course due to size of class. Hold 2 hours of office hours each week. If we are to provide specific evidence for a class, this can be provided, Instructor-student contact hours.
    c. IOE: Do we define this on our own or how do we go about this?
    d. MECHENG: Use Piazza and encourage students to use that as this is more efficient than answering the same question many other students have as well. Piazza allows you to share the response and not feel shame for asking a question and/or show to other students.
    e. IOE: Due to the competitive nature of the course I instruct, I strictly tell students not to ask questions to the entire class, hence why more emails are relevant to me vs other instructors.
    f. MECHENG: This should be academic engagement. Rather in Piazza or email exchange.
    g. IOE: Not every email is an academic interaction, but a good 70-80% emails exchanged are.
    h. ISD: We may have a lot of emails, but this may fluctuate. How do you measure emails as contact hours? Is there a way to do this? What about a private email vs a group email?
    i. MECHENG: Not sure as email is 1 to 1. Lecture, how do we define the contact hour? Mandatory office hour that requests a student to attend. No idea for the email as to how that would translate to a credit hour. Student as an individual can benefit from this. Should count towards a credit hour.

v. Feedback will be sent to Rachael and continue departmental discussion to think of a solution. Suggestion of re-wording our current credit policy that could be done early next semester.

3. Next CoE Curriculum Committee Meeting
    a. The 1.2.2024 meeting will be **cancelled** due to the extra holiday week being added for students and staff. Attendance would more than likely be low so, in the best interest of all members, this meeting will be cancelled.
    b. **The 1.16.2024 meeting will be the first meeting for Winter 2024.** This will be in person at the Lurie Engineering Center's GM Conference Room on the 4th floor, same time 1:30PM to 3:00PM.

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	Is Course on LSA Course Guide?	APPROVED	NOTES & REVISIONS	TABLED
7	IOE	366	MOD	Change in Enforced Prerequisite.	FT 2024	C-	YES	APPROVED		
10	IOE	373	MOD	Change in Full Term Credit Hours, Course Credit Type, and Enforced Prerequisites	FT 2024	C-	YES	APPROVED	For Enforced Prerequisites, remove ENGR 104, EECS 100 and CMPTRSC 100 or 183 and add ROB 102 and EECS 180. For Course Credit Type, remove both groups of graduate students.	

MICHIGAN ENGINEERING
COMPUTER SCIENCE AND ENGINEERING
UNIVERSITY OF MICHIGAN

Dr. Laura Burdick
Lecturer III
585-797-5289 | lburdick@umich.edu

December 1, 2023

Dear CoE Curriculum Committee,

I am writing on behalf of the Computer Science and Engineering (CSE) division to request a change to the program requirements for the Data Science major, to be effective in Fall 2024. Proposed changes are enumerated below. All proposals have been approved by the undergraduate data science program committee (UG-DSPC, approved April 14, 2023) and by the CSE faculty (April 21, 2023).

1. Resolve the treatment of introductory data science. Right now, the data science major is missing a course that students can take early on to understand what data science is like. With the current schedule, it is possible that students do not see statistics content until taking STATS 412, which can be taken as late as a student's fourth semester (STATS 412 has a Calculus III prerequisite). We have now developed an introductory data science course - DATASCI 101 (STATS 206). We are strongly encouraging students to take DATASCI 101. However, to provide flexibility for students who took a statistics course before discovering that they wanted to do data science, we are also accepting some other introductory level statistics courses.

The current DS-Eng Program Core requirements are:

- EECS 203 (4 credits): Discrete Mathematics. *Acceptable alternative: Math 465 plus one additional credit of Advanced Technical Elective*
- EECS 280 (4 credits): Programming and Elementary Data Structures
- EECS 281 (4 credits): Data Structures and Algorithms
- STATS 412 (3 credits): Introduction to Probability and Statistics (or an acceptable alternative)
- STATS/DATASCI 413 (4 credits): Applied Regression Analysis

The proposed DS-Eng Program Core requirements are (changes are highlighted):

- DATASCI 101 (strongly recommended), STATS 250, STATS 280, IOE 265, or ECON 451 (3-4 credits): Introductory data science
- EECS 203 (4 credits): Discrete Mathematics. *Acceptable alternative: Math 465 plus one additional credit of Advanced Technical Elective*
- EECS 280 (4 credits): Programming and Elementary Data Structures
- EECS 281 (4 credits): Data Structures and Algorithms
- STATS 412 (3 credits): Introduction to Probability and Statistics (or an acceptable alternative)
- STATS/DATASCI 413 (4 credits): Applied Regression Analysis

2. Require an advanced statistical analysis course. We propose to split the two course "advanced technical elective" requirement into one course of "advanced technical elective" and one course of "advanced statistical analysis elective" (STATS 306, 315, 415, 426, 449, 451, 470, 480, 485, and some 500 level options which will be accessible only to some advanced students). Statistical analysis courses will continue to appear on the technical elective and application elective lists, which will remain unchanged. This change will make sure that one advanced statistical analysis course is taken. That will help balance the interdisciplinary major between its CS and statistics components; it was previously the case that one could potentially graduate without taking any course other than STATS 413 from the statistics department. Most DS students already take multiple advanced statistics courses, but the recent restrictions on declaring CS make it timely to prevent a DS major from skewing excessively toward CS.

The current sample schedule for the major is as follows:

Data Science in Engineering	Total	1	2	3	4	5	6	7	8
Subjects Required by all Programs (55 credits)									
Mathematics 115, 116, and (214 or 217)	**12**	**4**	**4**		**4**				
Mathematics 215	**4**			**4**					
Engineering 100, Introduction to Engineering	**4**		**4**						
Engineering 101, Introduction to Computers	**4**	**4**							
Chemistry 125/126 and 130, or Chemistry 210 and 211	**5**	**5**							
Physics 140 and Lab 141	**5**			**5**					
Physics 240 and Lab 241	**5**				**5**				
Intellectual Breadth	**16**	**4**			**4**	**4**	**4**		
Program Core (30 credits)									
Discrete Mathematics: EECS 203 or MATH 465	**4**		**4**						
EECS 280, Programming and Elementary Data Structures	**4**		**4**						
EECS 281, Data Structures and Algorithms	**4**			**4**					
STATS 412, Introduction to Probability & Statistics	**3**				**3**				
STATS/DATASCI 413, Applied Regression Analysis	**4**					**4**			
Databases and Applications: EECS 484 or EECS 485	**4**						**4**		
Machine Learning/Data Mining: EECS 445 or STATS/DATASCI 415	**4**					**4**			
Data Science Applications elective (see online list)	**3**								**3**
Advanced Technical Electives and Capstone (12 credits)									
Advanced Technical Electives in Data Science. 300-level or higher from online list of approved courses, or with advisor approval prior to taking the course.	**8**						**4**		**4**
Capstone Experience Course	**4**							**4**	
Other Requirements									
Flexible Technical Electives. 200-level or higher from a pre-approved list of courses, or with advisor approval prior to taking the courses.	**11**					**4**		**4**	**3**
TCHNCLCM 300	**1**						**1**		
EECS 496 (or ENGR 499-002, or COMPFOR 111 through WN25, or approved Special Topics sections)	**2**							**2**	
TCHNCLCM 497, TCHNCLCM 499, STATS 404, or STATS 485	**2**							**2**	

General Electives (15 credits) – See note above	**15**			**3**			**3**	**3**	**6**
Total	**128**	**17**	**16**	**16**	**16**	**16**	**16**	**15**	**16**

Here is our proposed sample schedule (changes are highlighted):

Data Science in Engineering	Total	1	2	3	4	5	6	7	8
Subjects Required by all Programs (55 credits)									
Mathematics 115, 116, and (214 or 217)	**12**	**4**	**4**		**4**				
Mathematics 215	**4**			**4**					
Engineering 100, Introduction to Engineering	**4**		**4**						
Engineering 101, Introduction to Computers	**4**	**4**							
Chemistry 125/126 and 130, or Chemistry 210 and 211	**5**			**5**					
Physics 140 and Lab 141	**5**			**5**					
Physics 240 and Lab 241	**5**				**5**				
Intellectual Breadth	**16**	**4**			**4**	**4**	**4**		
Program Core (30 credits)									
Introductory Data Science: DATASCI 101 (strongly recommended), STATS 250, STATS 280, IOE 265, or ECON 451	**3-4**	**4**							
Discrete Mathematics: EECS 203 or MATH 465	**4**		**4**						
EECS 280, Programming and Elementary Data Structures	**4**		**4**						
EECS 281, Data Structures and Algorithms	**4**			**4**					
Statistical Theory: STATS 412, STATS/MATH 425, or STATS 426	**3**				**3**				
STATS/DATASCI 413, Applied Regression Analysis	**4**					**4**			
Databases and Applications: EECS 484 or EECS 485	**4**						**4**		
Machine Learning/Data Mining: EECS 445 or STATS/DATASCI 415	**4**					**4**			
Data Science Applications elective (see online list)	**3**								**3**
Advanced Electives and Capstone (12 credits)									
Advanced Technical Elective (see online list)	**4**						**4**		
Advanced Statistical Analysis Elective (see online list)	**4**								**4**
Capstone Experience Course	**4**							**4**	
Other Requirements									
Flexible Technical Electives. 200-level or higher from a pre-approved list of courses, or with advisor approval prior to taking the courses.	**11**					**4**		**4**	**3**
TCHNCLCM 300	**1**						**1**		
EECS 496 (or ENGR 499-002, or COMPFOR 111 through WN25, or approved Special Topics sections)	**2**							**2**	
TCHNCLCM 497, TCHNCLCM 499, STATS 404, or STATS 485	**2**								**2**
General Electives (15 credits) – See note above	**15**						**3**	**6**	**6**
Total	**132**	**16**	**16**	**18**	**16**	**16**	**16**	**16**	**18**

Notes on sample schedule:

- Students must complete additional application electives, advanced technical electives, or advanced statistical analysis electives, as needed to satisfy the required 46 credits for the major.
- A course taken for capstone credit cannot also count for an advanced technical elective or advanced statistical analysis elective.

These changes will be effective in Fall 2024 and will only apply to students matriculating Fall 2024 or later. Students who have matriculated before Fall 2024 will be grandfathered into the previous requirements.

Thank you for considering these changes. Please direct any questions to me and to Julie Tashjian (jbtash@umich.edu), who oversees the DS-Eng undergraduate advising office.

Sincerely,

Laura Burdick

Co-Chair of the Data Science Undergraduate Program Committee
Lecturer III, Computer Science and Engineering
University of Michigan
lburdick@umich.edu

COLLEGE OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF MICHIGAN

AMIR KAMIL

UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
COMPUTER SCIENCE AND ENGINEERING

2260 HAYWARD STREET
ANN ARBOR, MI 48109-2121

December 11, 2023

Dear CoE Curriculum Committee:

I am writing on behalf of the Computer Science and Engineering (CSE) division to request a change to the program requirements for the Computer Science major, to be effective in Fall 2024. This change consists of reducing the number of required Upper Level CS (ULCS) Technical Electives from 16 credits to 15 credits, and increasing the number of General Electives from 15 credits to 16 credits. This modification will allow us to increase the set of courses that satisfy the ULCS requirements, which in turn will make it easier for students to get into the courses they need to complete the major.

Currently, every course that satisfies the ULCS requirements is a 4-credit course, so that students must take four such courses to reach the 16 credits required. However, we do allow students to substitute one such course with a 3-credit course by exception. The exceptions include study-abroad courses through IPE (e.g. the Computer Science and Tech Career Accelerator in Prague), where the CS courses are 3 credits each, and 500-level courses such as EECS 542, EECS 545, and EECS 593 that are also 3 credits. By reducing the total number of ULCS credits required to 15, students will be able to take one such course without asking for an exception first. We believe that this will be a better experience for students, and it will make these courses more widely available to our students.

The current Computer Science program requirements include the following elective categories:

- 26 credits of Technical Electives, of which 16 credits must be Upper Level CS (ULCS) Technical Electives
- 4 credits of a CS Major Design Experience
- 15 credits of General Electives

The proposed elective requirements are as follows:

- 25 credits of Technical Electives, of which 15 credits must be Upper Level CS (ULCS) Technical Electives
- 4 credits of a CS Major Design Experience
- 16 credits of General Electives

The current sample schedule for the major is as follows:

	Total Credits	Terms							
		1	2	3	4	5	6	7	8
Subjects Required by all Programs (55 hours)									
Mathematics 115, 116, and 214	**12**	**4**	**4**		**4**				
Mathematics 215 or 216	**4**					**4**			
Engineering 100, Introduction to Engineering	**4**		**4**						

Engineering 101, Introduction to Computers	**4**	**4**							
Chemistry [125/126 and 130] or Chemistry [210 and 211]	**5**	**5**							
Physics 140 and Lab 141	**5**		**5**						
Physics 240 and Lab 241	**5**			**5**					
Intellectual Breadth	**16**	**4**	**4**		**4**	**4**			
Program Subjects (26 hours)									
EECS 203, Discrete Mathematics (or MATH 465/565)	**4**			**4**					
EECS 280, Programming and Elementary Data Structures	**4**			**4**					
EECS 281, Data Structures and Algorithms	**4**				**4**				
EECS 370, Introduction to Computer Organization	**4**					**4**			
STATS 250 or STATS 206 or STATS 280 or STATS 412 or STATS 426 or EECS 301/401 or TO 301 or IOE 265	**3**						**3**		
EECS 376, Foundations of Computer Science	**4**						**4**		
TCHNCLCM 300	**1**						**1**		
EECS 496 (or ENGR 499-002, or COMPFOR 111, or CSE 543, or approved Special Topics sections)	**2**							**2**	
Major Design Experience (6 hours)									
Approved CS MDE course	**4**							**4**	
TCHNCLCM 497	**2**							**2**	
Technical Electives (26 hours)									
Upper Level CS Technical Electives	**16**						**4**	**4**	**8**
Flexible Technical Electives	**10**				**4**	**4**			**2**
General Electives (165 hours)	**15**			**3**			**4**	**4**	**4**
Total	**128**	**17**	**17**	**16**	**16**	**16**	**16**	**16**	**14**

The proposed sample schedule moves one credit from "Upper Level CS Technical Electives" in the last term to "General Electives" (changes are highlighted):

	Total Credits	**Terms**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Subjects Required by all Programs (55 hours)									
Mathematics 115, 116, and 214	**12**	**4**	**4**		**4**				
Mathematics 215 or 216	**4**					**4**			
Engineering 100, Introduction to Engineering	**4**		**4**						
Engineering 101, Introduction to Computers	**4**	**4**							
Chemistry [125/126 and 130] or Chemistry [210 and 211]	**5**	**5**							
Physics 140 and Lab 141	**5**		**5**						
Physics 240 and Lab 241	**5**			**5**					

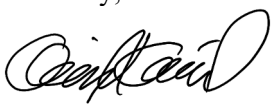
COLLEGE OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF MICHIGAN

Intellectual Breadth	**16**	**4**	**4**		**4**	**4**			
Program Subjects (26 hours)									
EECS 203, Discrete Mathematics (or MATH 465/565)	**4**			**4**					
EECS 280, Programming and Elementary Data Structures	**4**			**4**					
EECS 281, Data Structures and Algorithms	**4**				**4**				
EECS 370, Introduction to Computer Organization	**4**					**4**			
STATS 250 or STATS 206 or STATS 280 or STATS 412 or STATS 426 or EECS 301/401 or TO 301 or IOE 265	**3**						**3**		
EECS 376, Foundations of Computer Science	**4**						**4**		
TCHNCLCM 300	**1**						**1**		
EECS 496 (or ENGR 499-002, or COMPFOR 111, or CSE 543, or approved Special Topics sections)	**2**							**2**	
Major Design Experience (6 hours)									
Approved CS MDE course	**4**							**4**	
TCHNCLCM 497	**2**							**2**	
Technical Electives (25 hours)									
Upper Level CS Technical Electives	**15**						**4**	**4**	**7**
Flexible Technical Electives	**10**				**4**	**4**			**2**
General Electives (16 hours)	**16**			**3**			**4**	**4**	**5**
Total	**128**	**17**	**17**	**16**	**16**	**16**	**16**	**16**	**14**

The proposed change is "backwards compatible" – a student who meets the current program requirements would also meet the new program requirements. Thus, we plan to apply the new requirements to all students, including those who declared the CS major prior to Fall 2024.

Thank you for considering these changes. Please direct any questions to me and to Julie Tashjian (jbtash@umich.edu), who oversees the CS undergraduate advising office.

Sincerely,



Amir Kamil
Chair of the Computer Science Undergraduate Program Committee
Lecturer IV, Computer Science and Engineering
University of Michigan
akamil@umich.edu

HLC Annual Audit Questions for the CoE Curriculum Committee

1. **How should departments handle courses that are taught in combination with other institutions? How should departments handle it when the course is taught at UM? "Do courses that are a teaching collaborative need to follow CoE Policy for the Assignment of Credit Hours? Examples: ROB 498 and 599 (Robotics)**

ROB 498.004/ROB 599.010 was offered as part of our distributed teaching collaborative and was a course offered between U-M and FAMU. We aligned our course to the FAMU scheduling as their instructor was teaching the course. They plan to run this in WN 24 ROB 498.015/ROB 599.015

2. **When was the lab policy established? (IOE)**

   The Current CoE Policy for the Assignment of Credit Hours was approved October 13, 2020.

3. **Do labs need to be scheduled in a formal CoE Computer Lab space when the work can be done online? (EECS)**

Atul Prakash: I do think the definition of a lab course and the way contact hours are measured is not ideal for software courses in which the lab work can be done virtually at any time and any place by the students. I don't think it is ideal even for hardware courses in which students are able to use a virtual or portable kit and thus a physical lab is less critical. I would recommend another way to designate a course as a lab in CoE so that the courses can get sufficient SCH credit for supporting the teaching staff. A possible way to think about it is if the students are building real or virtual artifacts with software and hardware that requires technical support.

Question for CCC discussion: Does the CCC agree with the use of virtual technical support? How would that look, would students receive immediate feedback?

4. **Are the activities associated with the online, self-paced, asynchronous Canvas modules used in ENGR 101 and 110 and other departmental courses acceptable as CoE contact hours?** These course use contact hours as follows, per feedback from Rachael Schmedlen

The following feedback to define contact hours was gathered from Christne Gerdes, one of the Office of the Provost's identified curriculum specialists for HLC project, regarding guidance on using online self-paced, asynchronous Canvas modules as contact hours:

The Office of the Provost Guidance on Defining the Academic Credit Hour states: Faculty and instructors — with oversight and input from faculty-led curriculum committees — should determine the activities that would appropriately be viewed as faculty-led engagement within the context of a course and academic program.

Contact hours are defined as time spent by students engaged with the course instructor. This is academic engagement. Hybrid and online courses require an equivalent amount of instruction and student work as required by in-person courses.

Engagement with the course instructor/academic engagement is defined by federal guidance, and to be considered a contact hour, the activity in question must follow the regulations under letter (a):

(a) Participation in an interactive tutorial, webinar, or other interactive computer-assisted instruction

If it meets the standard of (a), as per CoE Curriculum Committee determination, then it is a contact hour. Letter (b) listed below would not follow the determination for the CoE contact hour:

(b) Logging into an online class or tutorial without any further participation

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148
ro.curriculum@umich.edu
ro.umich.edu

Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☐ New Course
- ☑ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2024-01-03
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Biomedical Engineering Subject: BIOMEDE Catalog: 211	Dept (Home): Biomedical Engineering Subject: BIOMEDE Catalog: 211
☐	☐ Course is Cross-Listed with Other Departments	☐ Course is Cross-Listed with Other Departments
	Department / Subject / Catalog Number	Department / Subject / Catalog Number
☐	Course Title (full title) Circuits and Systems for Biomedical Engineering	Course Title (full title) Circuits and Systems for Biomedical Engineering
☐	Abbreviated Title (20 char) Circuits and Systems	Abbreviated Title (20 char) Circuits and Systems
☐	Course Description (Please limit to 80 words and attach separate sheet if necessary) Students learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory is motivated by examples from biomedical engineering. Topics covered include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques are developed.	
☐	Full Term Credit Hours Undergraduate Min: 4 Graduate Min: Undergraduate Max: 4 Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☐	Course Credit Type Undergraduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Biomedical Engineering Catalog: 211

☐

Grading Basis
- ☑ Graded (A – E)
- ☐ Credit/No Credit
- ☐ Satisfactory/Unsatisfactory
- ☐ Pass/Fail
- ☐ Business Administration

Grading
- ☐ Not for Credit
- ☐ Not for Degree Credit
- ☐ Degree Credit Only

Add Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

Drop Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

	CURRENT LISTING	REQUESTED LISTING
☐	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
☑	Enforced Prerequisite (254 char) (MATH 216 or 256 or 286) and (PHYSICS 240 or 260); (C- or better) Minimum grade requirement: C-	Enforced Prerequisite (254 char) [MATH 216 or 256 or 286] and [PHYSICS 240 or 260]; NO OPT P/F Minimum grade requirement: C-
☐	Credit Exclusions	Credit Exclusions

☐

Course Components	Graded Component
☑ Lecture	☑
☐ Seminar	☐
☐ Recitation	☐
☑ Lab	☐
☐ Discussion	☐
☐ Independent Study	☐

Terms Typically Offered
- ☑ Fall
- ☑ Winter
- ☐ Spring
- ☐ Summer
- ☐ Spring/Summer

Cognizant Faculty Member Name: Kathleen Panagis Cognizant Faculty Member Title: Lecturer III

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Rachel Patterson Email: rjpatt@umich.edu Phone: 3-5290

CoE Curriculum Committee Representative: Print: Cameron Louttit Date: 1/4/2024

CoE Curriculum Committee Chair: Print: Date:

Home Department Chair: Ariella Shikanov Print: Ariella Shikanov Date: 01/04/2024

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description Circuits and Systems for Biomedical Engineering --- Students learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory is motivated by examples from biomedical engineering. Topics covered Include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques are developed.	Course Description Students learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory is motivated by examples from biomedical engineering. Topics covered include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques are developed.
Class Length Full term	Class Length Full term
Contact hours (lecture): 3	Contact hours (lecture): 3
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab) 2	Contact hours (lab) 2

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:
BIOMEDE 211 is a required course for all students in the biomedical engineering undergraduate program.

Special resources of facilities required for this course:

Supporting statement:
Adjusting contact hours per request of the Registrar

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
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Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☐ New Course
- ☑ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2024-01-03
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Biomedical Engineering Subject: BIOMEDE Catalog: 221	Dept (Home): Biomedical Engineering Subject: BIOMEDE Catalog: 221
☐	☐ Course is Cross-Listed with Other Departments	☐ Course is Cross-Listed with Other Departments
	Department / Subject / Catalog Number	Department / Subject / Catalog Number
☐		
☐	Course Title (full title) Biophysical Chemistry and Thermodynamics	Course Title (full title) Biophysical Chemistry and Thermodynamics
☐	Abbreviated Title (20 char) Biophy Chemistry	Abbreviated Title (20 char) Biophy Chemistry
☐	Course Description (Please limit to 80 words and attach separate sheet if necessary) The physico-chemical concepts and processes relevant to life. The emphasis lies on the molecular level. Topics: Biomimetics; Energy and Driving Forces; Biochemical Equilibria; Aqueous Solutions; Molecular Self-Assembly; Bio-electrochemistry; Biopolymers; Molecular Recognition and Binding Equilibria in Biology.	
☐	Full Term Credit Hours Undergraduate Min: 4 Graduate Min: Undergraduate Max: 4 Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☐	Course Credit Type Undergraduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Biomedical Engineering Catalog: 221

☐

Grading Basis
- ☑ Graded (A – E)
- ☐ Credit/No Credit
- ☐ Satisfactory/Unsatisfactory
- ☐ Pass/Fail
- ☐ Business Administration

Grading
- ☐ Not for Credit
- ☐ Not for Degree Credit
- ☐ Degree Credit Only

Add Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

Drop Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

	CURRENT LISTING	REQUESTED LISTING
☐	Advisory Prerequisite (254 char) Bio 172 or 195	Advisory Prerequisite (254 char) Bio 172 or 195
☑	Enforced Prerequisite (254 char) (CHEM 130 or 210) and (MATH 116 or 156 or 186 or 121); (C- or better) Minimum grade requirement: C-	Enforced Prerequisite (254 char) (CHEM 130 OR CHEM 210) and [MATH 116 or 156 or 186 or 121]; NO OPT P/F Minimum grade requirement: C-
☐	Credit Exclusions	Credit Exclusions

☐

Course Components / Graded Component
- ☑ Lecture / ☑
- ☐ Seminar / ☐
- ☐ Recitation / ☐
- ☑ Lab / ☐
- ☐ Discussion / ☐
- ☐ Independent Study / ☐

Terms Typically Offered
- ☑ Fall
- ☑ Winter
- ☐ Spring
- ☐ Summer
- ☐ Spring/Summer

Cognizant Faculty Member Name: Melissa Wrobel Cognizant Faculty Member Title: Lecturer IV

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Rachel Patterson Email: rjpatt@umich.edu Phone: 3-5290

CoE Curriculum Committee Representative: Print: Cameron Louttit Date: 1/4/2024

CoE Curriculum Committee Chair: Print: Date:

Home Department Chair: Ariella Shikanov Print: Ariella Shikanov Date: 01/04/2024

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description Biophysical Chemistry and Thermodynamics --- The physico-chemical concepts and processes relevant to life. The emphasis lies on the molecular level. Topics: Biomimetics; Energy and Driving Forces; Biochemical Equilibria; Aqueous Solutions; Molecular Self-Assembly; Bio-electrochemistry; Biopolymers; Molecular Recognition and Binding Equilibria in Biology.	Course Description The physico-chemical concepts and processes relevant to life. The emphasis lies on the molecular level. Topics: Biomimetics; Energy and Driving Forces; Biochemical Equilibria; Aqueous Solutions; Molecular Self-Assembly; Bio-electrochemistry; Biopolymers; Molecular Recognition and Binding Equilibria in Biology.
Class Length Full term	Class Length Full term
Contact hours (lecture): 4	Contact hours (lecture): 3
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab) 1	Contact hours (lab) 2

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:
BIOMEDE 221 is a required course for all students in the biomedical engineering undergraduate program.

Special resources of facilities required for this course:

Supporting statement:
Fixing contact hours per request of Registrar

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
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Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☑ New Course
- ☐ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2023-12-15
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☑	Dept (Home): Subject: Catalog:	Dept (Home): Computer Science and Engineering Subject: CSE Catalog: 585
☐	☐ Course is Cross-Listed with Other Departments	☐ Course is Cross-Listed with Other Departments
	Department / Subject / Catalog Number	Department / Subject / Catalog Number
☑	Course Title (full title)	Course Title (full title) Advanced Scalable Systems
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Adv Scalable Systems
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Advanced topics and research issues in cloud computing that deal with massive computation, data, and user base. Topics include challenges faced when designing, developing, and deploying web-scale distributed systems for emerging systems for Big Data and AI/ML workloads running in the cloud, observed through diverse perspectives such as operating systems, networking, distributed systems, compiler and programming language, database, security/privacy, etc.	
☑	Full Term Credit Hours Undergraduate Min: Graduate Min: 4 Undergraduate Max: Graduate Max: 4	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☑	Course Credit Type Rackham Graduate Student, Non-Rackham Graduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Catalog:

☑	Grading Basis ☑ Graded (A – E) ☐ Credit/No Credit ☐ Satisfactory/Unsatisfactory ☐ Pass/Fail ☐ Business Administration Grading ☐ Not for Credit ☐ Not for Degree Credit ☐ Degree Credit Only Add Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent Drop Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent

	CURRENT LISTING	REQUESTED LISTING
☑	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char) Students are expected to have systems programming skills and must have taken at least one undergraduate-level systems-related course
☑	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) EECS 482 or 483 or 484 or 485 or 489 or 491; (C or better, No OP/F) or Graduate Standing in CSE Minimum grade requirement: C
☐	Credit Exclusions	Credit Exclusions
☑	Course Components ☑ Lecture ☐ Seminar ☐ Recitation ☐ Lab ☑ Discussion ☐ Independent Study Graded Component ☑ ☐ ☐ ☐ ☐ ☐ Terms Typically Offered ☑ Fall ☑ Winter ☐ Spring ☐ Summer ☐ Spring/Summer	

Cognizant Faculty Member Name: Mosharaf Chowdhury Cognizant Faculty Member Title:

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person:Punam Vyas Email:vyas@umich.edu Phone: 647-1754

CoE Curriculum Committee Representative: Amir Kamil — Print: Amir Kamil — Date:12/15/23

CoE Curriculum Committee Chair: — Print: — Date:

Home Department Chair: Emily Mower Provost — Print: Emily Provost — Date:12/15/23

Cross-Listed Department Chair: — Print: — Date:

Cross-Listed Department Chair: — Print: — Date:

Cross-Listed Department Chair: — Print: — Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	**Requested:**
Course Description	Course Description Advanced topics and research issues in cloud computing that deal with massive computation, data, and user base. Topics include challenges faced when designing, developing, and deploying web-scale distributed systems for emerging systems for Big Data and AI/ML workloads running in the cloud, observed through diverse perspectives such as operating systems, networking, distributed systems, compiler and programming language, database, security/privacy, etc.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 3
Contact hours (recitation)	Contact hours (recitation) 1
Contact hours (lab)	Contact hours (lab)

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:

Special resources of facilities required for this course:

Supporting statement:
Over the past decade, systems that enable large-scale Big Data and AI/ML processing in the cloud have proliferated as the driving force behind most of the Internet. While CSE Michigan has strong software systems courses, there is no dedicated course that covers the practical challenges that appear in these emerging cloud technologies. This course will prepare our students to be ready for what to expect when they join the workforce.

Unlike other courses, this course doesn't stem from classical sub-areas in software systems (e.g., operating systems, networking, databases etc.). Instead, it takes a holistic and applied approach where background knowledge from many disciplines must be combined not for the disciplines' sake but for building cloud-scale systems to effectively make sense of large volumes of data. As such, the prerequisite(s) for this course are chosen to allow students from diverse systems backgrounds.

Previous offerings as special topics

Variations of this course have so far been offered by Prof. Mosharaf Chowdhury four times since Fall 2017, with a fifth offering scheduled for Winter 2024.

- Winter 2024: Systems for GenAI
  - https://github.com/mosharaf/eecs598/tree/w24-genai
  - 49 students (tentative)
- Winter 2021: Systems for AI
  - https://github.com/mosharaf/eecs598/tree/w21-ai
  - 34 students
- Winter 2020: Systems for AI
  - https://github.com/mosharaf/eecs598/tree/w20-ai
  - 18 students
- Winter 2019: Big Data Systems and Applications
  - https://github.com/mosharaf/eecs598/tree/w19-bigdata-ai
  - 15 students
- Fall 2017: Big Data Systems and Applications
  - https://github.com/mosharaf/eecs598/tree/f17-bigdata
  - 34 students

Course evaluations

Term	**Enrollment**	**Q1**	**Q2**	**Q4**
Winter 2021	34	4.3	4.7	4.4
Winter 2020	18	4.7	4.8	4.7
Winter 2019	15	4.5	4.8	4.5
Fall 2017	34	4.7	4.8	4.7

EECS 598: Systems for AI (W'21)

Administrivia

- Catalog Number: 29495
- Lectures/Discussion: Live Online, MW: 1:30 PM – 3:00 PM
- Projects/Makeup: Live Online, F 2:00 PM – 3:00 PM
- Counts as: Software Breadth and Depth (PhD); Technical Elective and 500-Level (MS/E)

Team

Member (uniqname)	Role	Office Hours
Mosharaf Chowdhury (mosharaf)	Faculty	4820 BBB. **By appointments only.**
Sanjay Singapuram (singam)	GSI	11 AM - 12 PM every Thu

Piazza

ALL communication regarding this course must be via Piazza. This includes questions, discussions, announcements, as well as private messages.

Presentation slides and paper summaries should be emailed to eecs598-bigdata-staff@umich.edu.

Course Description

This class will introduce you to the key concepts and the state-of-the-art in practical, scalable, and fault-tolerant software systems for AI and encourage you to think about either building new tools or how to apply an existing one in your own research.

Since datacenters and cloud computing form the backbone of modern computing, we will start with an overview of the two. We will then take a deep dive into systems for big data and AI landscapes, focusing on different types of problems. Our topics will include: backgrounds on datacenters and edge; systems for deep learning, machine learning, and reinforcement learning; runtime execution and compilers for AI; distributed and federated learning systems; serving systems and inference; scheduling and resource management in AI clusters; etc. We will cover topics from top conferences in systems, networking, and databases venues.

Note that this course is **NOT focused on AI methods**. Instead, we will *focus on how one can build practical software systems* so that existing AI methods can be used in practice.

Prerequisites

Students are expected to have good programming skills and must have taken *at least one* undergraduate-level systems-related course (from operating systems/EECS482, databases/EECS484, distributed systems/EECS491, and networking/EECS489).

Textbook

This course has no textbooks. We will read recent papers from top venues to understand trends in big data systems and their applications.

Tentative Schedule and Reading List

Date	Readings	Presenter	Summary
	Introduction		
Jan 20	Analysis of Large-Scale Multi-Tenant GPU Clusters for DNN Training Workloads	Mosharaf	
	TFX: A TensorFlow-Based Production-Scale Machine Learning Platform		

Date	Readings	Presenter	Summary
	Applied Machine Learning at Facebook: A Datacenter Infrastructure Perspective		
	Machine Learning at Facebook: Understanding Inference at the Edge		
	Background		
Jan 25	The Datacenter as a Computer (Chapters 1 and 2)	Mosharaf	Tianyi-Lingyun-Haojie
	Jupiter Rising: A Decade of Clos Topologies and Centralized Control in Google's Datacenter Network		
Feb 1	Resilient Distributed Datasets: A Fault-Tolerant Abstraction for In-Memory Cluster Computing	Mosharaf	
	Flat Datacenter Storage		
	Frameworks		
Feb 3	TensorFlow: A System for Large-Scale Machine Learning	Abzaliev-Saisamrit	
	Dynamic Control Flow in Large-Scale Machine Learning		
Feb 8	Ray: A Distributed Framework for Emerging AI Applications	Joshua-Shucheng-Han	Yiran-Jonah-WeiChung
	Lineage Stash: Fault Tolerance Off the Critical Path		
	Distributed and Federated Learning		
Feb 10	Scaling Distributed Machine Learning with the Parameter Server	Christopher-Joe-Roland	Jie-Yin-Jinyang
	Project Adam: Building an Efficient and Scalable Deep Learning Training System		

Date	Readings	Presenter	Summary
Feb 15	PipeDream: Generalized Pipeline Parallelism for DNN Training	Yabin-Haofeng-Hanchi	Abzaliev-Saisamrit
	A Unified Architecture for Accelerating Distributed DNN Training in Heterogeneous GPU/CPU Clusters		
Feb 17	Gaia: Geo-Distributed Machine Learning Approaching LAN Speeds	Jie-Yin-Jinyang	Christopher-Joe-Roland
	Towards Federated Learning at Scale: System Design		
	Runtime and Compiler Optimizations		
Feb 22	Ansor: Generating High-Performance Tensor Programs for Deep Learning	Tianyi-Lingyun-Haojie	Yabin-Haofeng-Hanchi
	TASO: Optimizing Deep Learning Computation with Automated Generation of Graph Substitutions		
Mar 1	Rammer: Enabling Holistic Deep Learning Compiler Optimizations with rTasks	Qiyue-Tianrong	Anshul-Drake
	A Tensor Compiler for Unified Machine Learning Prediction Serving		
Mar 8	**Mid-Semester Presentations**		
Mar 10	**Mid-Semester Presentations**		
	Serving Systems and Inference		
Mar 12	Serving DNNs like Clockwork: Performance Predictability from the Bottom Up	Anshul-Drake	Wenyuan-Ruiyang-Shuowei

Date	Readings	Presenter	Summary
	Clipper: A Low-Latency Online Prediction Serving System		
Mar 17	Focus: Querying Large Video Datasets with Low Latency and Low Cost	Yiran-Jonah-WeiChung	Wenqi-Jianbin-Shi
	Nexus: A GPU Cluster Engine for Accelerating DNN-Based Video Analysis		
	Hyperparameter Tuning		
Mar 22	A System for Massively Parallel Hyperparameter Tuning	Muhammed	Jiachen-Qinye-Yibo
	BOHB: Robust and Efficient Hyperparameter Optimization at Scale		
Mar 24	Retiarii: A Deep Learning Exploratory-Training Framework	Jiachen-Qinye-Yibo	Tianyi-Lingyun-Haojie
	Fluid: Resource-Aware Hyperparameter Tuning Engine		
	Scheduling and Resource Management		
Mar 29	Tiresias: A GPU Cluster Manager for Distributed Deep Learning	Wenyuan-Ruiyang-Shuowei	Joshua-Shucheng-Han
	HiveD: Sharing a GPU Cluster for Deep Learning with Guarantees		
Mar 31	AntMan: Dynamic Scaling on GPU Clusters for Deep Learning	Wenqi-Jianbin-Shi	Muhammed
	PipeSwitch: Fast Pipelined Context Switching for Deep Learning Applications		
	Emerging Hardware		

Date	Readings	Presenter	Summary
Apr 5	In-Datacenter Performance Analysis of a Tensor Processing Unit	Mosharaf	Qiyue-Tianrong
	Serving DNNs in Real Time at Datacenter Scale with Project Brainwave		
Apr 7	**Wrap Up**	Mosharaf	
Apr 19	**Final Presentations**		
Apr 21	**Final Presentations**		

Policies

Honor Code

The Engineering Honor Code applies to all activities related to this course.

Lecture Recordings

Course lectures will be audio/video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded.

Students may not record or distribute any class activity without written permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.

Groups

All activities of this course will be performed in **groups of 2-3 students**.

Declare your group's membership and paper preferences by February 1, 2021. After this date, we will form groups from the remaining students.

Paper Presentation

The course will be conducted as a seminar. Only one group will synchronously present in each class. Each group will be assigned to present a paper at least once throughout the semester. Presentations should last **at most 40 minutes** without interruption. However, presenters should expect questions and interruptions throughout. In the presentation, you should:

- Motivate the paper and provide background.
- Present the high level idea, approach, and/or insight (using examples, whenever appropriate).
- Discuss technical details so that one can understand the key details without carefully reading it.
- Explain the difference between this paper and related work.
- Raise questions throughout the presentation to generate discussion.

The slides for a presentation must be emailed to the instructor team at least 24 hours prior to the corresponding class. You should use this template for making your slides in powerpoint.

Paper Summaries

Each group will also be assigned to write one or more paper summaries. The paper summary assigned to a group may not be the same paper they have presented.

A paper summary must address the following four questions in sufficient details (2-3 pages):

- What is the problem addressed by the paper, and why is this problem important?
- What is the hypothesis of the work?
- What is the proposed solution, and what key insight guides their solution?
- What is one (or more) drawback or limitation of the proposal, and how will you improve it?

The paper summary of a paper must be emailed to the instructor team within 24 hours after its presentation. **Late reviews will not be counted.** You should use this template for writing your summary. Allocate enough time for your reading, discuss as a group, write the summary carefully, and finally, include key observations from the class discussion.

Because you do not have to write summaries/reviews for each paper, you cannot avoid reading a paper. Everyone is expected to have read all the papers. Being able to critically judge others' work is crucial for your understanding.

Participation

You are expected to attend **all** lectures (you may skip up to 4 lectures due to legitimate[31] reasons), and more importantly, participate in class discussions. Although the lectures will be recorded, given the discussion-based nature of this course, participation is required both for your own understanding and to improve the overall quality of the course.

A key part of participation will be in the form of discussion in piazza. The group in charge of the summary should initiate the discussion and the rest should participate. Not everyone must have add something every day, but it is expected that everyone has something to say over the semester.

Project

You will have to complete substantive work an instructor-approved problem and have original contribution. Surveys are not permitted as projects; instead, each project must contain a survey of background and related work. You must meet the following milestones (unless otherwise specified in future announcements) to ensure a high-quality project at the end of the semester:

- Form a group of 2-3 members by **February 1**.
- Turn in a 2-page draft proposal (including references) by **February 10**. Remember to include the names and Michigan email addresses of the group members. Schedule a 15-minute meeting to pitch your idea and to get early feedback.
- Keep revising your initial idea and incorporate instructor feedback. However, your project proposal must be finalized and approved on or before **February 17**.
- Each group must present mid-semester progress during class hours on **March 8 and March 10**.
- Each group must turn in an 8-page final report and your code via email **on or before 11:59PM EST on April 27.** The report must be submitted as a PDF file, with formatting similar to that of the papers you've read in the class. The self-contained (i.e., include ALL dependencies) code must be submitted as a zip file. Each zip file containing the code must include a README file with a step-by-step guide on how to compile and run the provided code.

Tentative Grading

	Weight
Paper Summary	20%
Paper Presentation	20%
Participation	10%

32

	Weight
Assignment	10%
Project	40%

University of Michigan
Winter 2021 Instructor Report Without Comments
EECS 598-009: Special Topics
N M Mosharaf Chowdhury

17 out of 34 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	8	7	2	0	0	0	4.4	4.6	4.6
My interest in the subject has increased because of this course. (Q1632)	8	5	3	1	0	0	4.4	4.3	4.5
I knew what was expected of me in this course.(Q1633)	8	6	3	0	0	0	4.4	4.6	4.5
Overall, this was an excellent course.(Q1)	7	7	2	1	0	0	4.3	4.4	4.5
I had a strong desire to take this course.(Q4)	8	5	4	0	0	0	4.4	4.1	4.5
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier). (Q891)	3	3	10	0	0	0	3.3	2.9	2.9
How did you participate in this course? (SA=Attended most synchronously, A=Attended most asynchronously, N=Attended most in person, D=Attended some in person and some online) (Q1854)	14	3	0	0	0	0	4.9	4.8	4.7

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Overall, N M Mosharaf Chowdhury was an excellent teacher. (Q2)	11	4	2	0	0	0	4.7	4.7	4.7
N M Mosharaf Chowdhury seemed well prepared for class meetings.(Q230)	12	4	1	0	0	0	4.8	4.8	4.8
N M Mosharaf Chowdhury explained material clearly.(Q199)	11	4	2	0	0	0	4.7	4.7	4.7
N M Mosharaf Chowdhury treated students with respect. (Q217)	14	2	1	0	0	0	4.9	4.9	4.9

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median
Prerequisites provided adequate preparation for this course. (Q61)	11	3	3	0	0	0	4.7	4.4
The textbook made a valuable contribution to the course. (Q64)	7	2	5	0	0	3	4.5	3.8
I felt included and valued when working with other students. (Q253)	11	4	2	0	0	0	4.7	4.5
I felt comfortable asking questions in class. (Q521)	11	5	1	0	0	0	4.7	4.2
I developed confidence in my abilities as an engineer. (Q1769)	11	4	2	0	0	0	4.7	4.1
I developed the ability to solve real world engineering problems. (Q1770)	9	6	2	0	0	0	4.6	4.1

The medians are calculated from Winter 2021 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are graduate level with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2020 Instructor Report Without Comments
EECS 598-009: Special Topics
N M Mosharaf Chowdhury

10 out of 17 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	7	3	0	0	0	0	4.8	4.5	4.7
My interest in the subject has increased because of this course. (Q1632)	6	3	1	0	0	0	4.7	4.2	4.5
I knew what was expected of me in this course.(Q1633)	7	2	1	0	0	0	4.8	4.5	4.5
Overall, this was an excellent course.(Q1)	6	3	1	0	0	0	4.7	4.3	4.6
I had a strong desire to take this course.(Q4)	6	3	0	1	0	0	4.7	4.1	4.5
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier).	3	2	4	1	0	0	3.5	3.0	3.0
How did the unexpected change to remote course format affect your learning experience in this course this term? (SA=Very Positively Affected, A=Somewhat Positively Affected, N=No Effect, D=Somewhat Negatively Affected, SD=Very Negatively Affected)	4	0	2	4	0	0	3.0	2.4	2.5

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Overall, N M Mosharaf Chowdhury was an excellent teacher. (Q2)	7	2	1	0	0	0	4.8	4.6	4.7
N M Mosharaf Chowdhury seemed well prepared for class meetings.(Q230)	7	2	1	0	0	0	4.8	4.8	4.8
N M Mosharaf Chowdhury explained material clearly.(Q199)	8	1	0	0	0	1	4.9	4.7	4.7
N M Mosharaf Chowdhury treated students with respect. (Q217)	9	1	0	0	0	0	4.9	4.8	4.9

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median
Prerequisites provided adequate preparation for this course. (Q61)	5	3	0	1	0	1	4.6	4.3
The textbook made a valuable contribution to the course. (Q64)	3	0	1	0	0	5	4.8	3.6
I felt included and valued when working with other students. (Q253)	5	3	2	0	0	0	4.5	4.6
I felt comfortable asking questions in class. (Q521)	6	1	3	0	0	0	4.7	4.2
I developed confidence in my abilities as an engineer. (Q1769)	5	3	1	0	0	1	4.6	4.1
I developed the ability to solve real world engineering problems. (Q1770)	4	4	1	1	0	0	4.3	4.1

The medians are calculated from Winter 2020 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are graduate level with enrollment of 16 to 74 in College of Engineering.

Responses to the University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	3	1	0	0	0	0	4.8	4.5	4.7
My interest in the subject has increased because of this course. (Q1632)	2	2	0	0	0	0	4.5	4.2	4.6
I knew what was expected of me in this course.(Q1633)	2	2	0	0	0	0	4.5	4.5	4.5
Overall, this was an excellent course.(Q1)	2	2	0	0	0	0	4.5	4.2	4.5
I had a strong desire to take this course.(Q4)	2	1	1	0	0	0	4.5	4.0	4.5
As compared with other courses of equal credit, the workload for this course was... (SA=Much Lighter to SD=Much Heavier)	0	1	3	0	0	0	3.2	3.0	3.0

Responses to the University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median	School/College Median
Overall, N M Mosharaf Chowdhury was an excellent teacher.	3	1	0	0	0	0	4.8	4.5	4.7
N M Mosharaf Chowdhury seemed well prepared for class meetings.	3	1	0	0	0	0	4.8	4.8	4.8
N M Mosharaf Chowdhury explained material clearly.	2	2	0	0	0	0	4.5	4.6	4.7
N M Mosharaf Chowdhury treated students with respect.	4	0	0	0	0	0	5.0	4.8	4.9

Responses to additional questions about the course:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median
Prerequisites provided adequate preparation for this course. (Q61)	2	1	0	0	0	1	4.8	4.3
The textbook made a valuable contribution to the course. (Q340)	1	2	0	0	0	1	4.3	3.6
I developed confidence in my abilities as an engineer.	2	2	0	0	0	0	4.5	4.0
I developed the ability to solve real world engineering problems.	3	1	0	0	0	0	4.8	4.0

The medians are calculated from Winter 2019 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are graduate level with enrollment of 1 to 15 in College of Engineering.

University of Michigan
Office of the Registrar - Evaluations
ro.umich.edu/evals/

Fall 2017 Final
22 students responded out of the total enrolled 34

Instructor Report

2017-11-30 - 2017-12-13 Report ID: MSR04732

Instructor: Chowdhury,N M Mosharaf Kabir
EECS 598 001

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
4	I had a strong desire to take this course.	13	5	3	0	0	0	4.69	3.70	4.17	4.63	4.29	4.57	4.75
891	As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier).	5	7	7	2	0	0	3.71	2.80	3.10	3.40			
1631	This course advanced my understanding of the subject matter.	13	7	1	0	0	0	4.69	4.10	4.42	4.73			
1632	My interest in the subject has increased because of this course.	14	4	2	1	0	0	4.75	3.75	4.17	4.63			
1633	I knew what was expected of me in this course. (SA=Almost Always, A=Frequently, N=Sometimes, D=Occasionally, SD=Hardly Ever).	10	7	4	0	0	0	4.43	4.00	4.36	4.68			
230	The instructor seemed well prepared for class meetings. (SA=Almost Always, A=Frequently, N=Sometimes, D=Occasionally, SD=Hardly Ever)	14	6	1	0	0	0	4.75	4.52	4.81	4.93			
199	The instructor explained material clearly. (SA=Almost Always, A=Frequently, N=Sometimes, D=Occasionally, SD=Hardly Ever)	14	6	1	0	0	0	4.75	4.25	4.67	4.88			
217	The instructor treated students with respect.	18	3	0	0	0	0	4.92	4.69	4.87	4.95			
1	Overall, this was an excellent course.	13	6	2	0	0	0	4.69	3.87	4.30	4.70	4.20	4.53	4.75
2	Overall, the instructor was an excellent teacher.	15	6	0	0	0	0	4.80	4.33	4.75	4.90	4.50	4.71	4.83
3	I learned a great deal from this course.	13	7	0	1	0	0	4.69	4.00	4.38	4.70	4.29	4.60	4.76
61	Prerequisites provided adequate preparation for this course.	7	8	6	0	0	0	4.06	4.00	4.25	4.53			
140	I deepened my interest in the subject matter of this course.	13	5	2	1	0	0	4.69	3.88	4.25	4.63			
201	The instructor gave clear explanations.	15	5	1	0	0	0	4.80	4.22	4.64	4.83			
203	The instructor stressed important points in lectures/discussions.	15	6	0	0	0	0	4.80	4.33	4.70	4.88			
207	The instructor appeared to have a thorough knowledge of the subject.	19	2	0	0	0	0	4.95	4.67	4.86	4.94			
216	The instructor acknowledged all questions insofar as possible.	16	5	0	0	0	0	4.84	4.45	4.75	4.88			
218	The instructor encouraged constructive criticism.	17	3	1	0	0	0	4.88	4.33	4.69	4.83			
228	The instructor followed an outline closely.	17	3	1	0	0	0	4.88	4.15	4.55	4.75			
229	The instructor used class time well.	16	3	2	0	0	0	4.84	4.23	4.65	4.83			
232	Work requirements and grading system were clear from the beginning.	9	9	3	0	0	0	4.33	4.00	4.33	4.67			
239	The amount of work required was appropriate for the credit received.	10	8	3	0	0	0	4.44	3.89	4.17	4.50			
240	The amount of material covered in the course was reasonable.	11	8	1	1	0	0	4.55	4.00	4.25	4.58			
318	Writing assignments seemed carefully chosen.	11	8	2	0	0	0	4.55	3.80	4.13	4.56			
340	The textbook made a valuable contribution to the course.	8	5	4	0	0	4	4.40	3.19	3.93	4.38			
356	Examinations covered the important aspects of the course.	7	3	4	1	0	6	4.33	4.08	4.35	4.67			
365	Grades were assigned fairly and impartially.	8	11	1	0	0	1	4.32	4.00	4.33	4.67			
366	The grading system was clearly explained.	10	10	1	0	0	0	4.45	4.00	4.42	4.70			

* The quartiles are calculated from Fall 2017 data. The university-wide quartiles are based on all UM classes in which an item was used. The school/college quartiles in this report are based on graduate level students in College of Engineering.
** SA - Strongly Agree, A - Agree, N - Neutral, D - Disagree, SD - Strongly Disagree, NA - Not Applicable.

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148
ro.curriculum@umich.edu
ro.umich.edu

Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☐ New Course
- ☑ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2023-12-12
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Elec Engin & Computer Sci Subject: EECS Catalog: 388	Dept (Home): Elec Engin & Computer Sci Subject: EECS Catalog: 388
☐	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number
☐	Course Title (full title) Introduction to Computer Security	Course Title (full title) Introduction to Computer Security
☐	Abbreviated Title (20 char) Intro Comp Security	Abbreviated Title (20 char) Intro Comp Security
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Introduction to the principles and practices of computer security as applied to software, host systems, and networks. Covers the foundations of building, using, and managing secure systems. Topics include standard cryptographic functions and protocols, threats and defenses for real-world systems, incident response, and computer forensics.	
☐	Full Term Credit Hours Undergraduate Min: 4 Graduate Min: Undergraduate Max: 4 Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☐	Course Credit Type Undergraduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Elec Engin & Computer Sci Catalog: 388

☐

Grading Basis
- ☑ Graded (A – E)
- ☐ Credit/No Credit
- ☐ Satisfactory/Unsatisfactory
- ☐ Pass/Fail
- ☐ Business Administration

Grading
- ☐ Not for Credit
- ☐ Not for Degree Credit
- ☐ Degree Credit Only

Add Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

Drop Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

	CURRENT LISTING	REQUESTED LISTING
☑	Advisory Prerequisite (254 char) EECS 370 (C or better) or equivalent	Advisory Prerequisite (254 char) EECS 201 and 370
☐	Enforced Prerequisite (254 char) EECS 281; (C or better, No OP/F). Enrollment in one minor elective allowed for Computer Science Minors. Minimum grade requirement: C	Enforced Prerequisite (254 char) EECS 281; (C or better, No OP/F). Enrollment in one minor elective allowed for Computer Science Minors. Minimum grade requirement: C
☐	Credit Exclusions	Credit Exclusions

☐

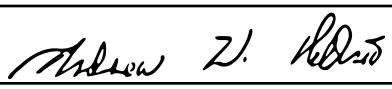
Course Components / Graded Component
- ☑ Lecture / ☑
- ☐ Seminar / ☐
- ☐ Recitation / ☐
- ☑ Lab / ☐
- ☐ Discussion / ☐
- ☐ Independent Study / ☐

Terms Typically Offered
- ☑ Fall
- ☑ Winter
- ☐ Spring
- ☐ Summer
- ☐ Spring/Summer

Cognizant Faculty Member Name: J. Alex Halderman Cognizant Faculty Member Title:

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Punam Vyas Email: vyas@umich.edu Phone: 647-1754

CoE Curriculum Committee Representative:		Print: Amir Kamil	Date: 12/17/23
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Andrew DeOrio	Date: 12/18/23
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description This course introduces the principles and practices of computer security as applied to software, host systems, and networks. It covers the foundations of building, using, and managing secure systems. Topics include standard cryptographic functions and protocols, threats and defenses for real-world systems, incident response, and computer forensics. There will be homework exercises, programming projects, and a final exam.	Course Description Introduction to the principles and practices of computer security as applied to software, host systems, and networks. Covers the foundations of building, using, and managing secure systems. Topics include standard cryptographic functions and protocols, threats and defenses for real-world systems, incident response, and computer forensics.
Class Length Full term	Class Length Full term
Contact hours (lecture): 3	Contact hours (lecture): 3
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab) 2	Contact hours (lab) 2

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:

Special resources of facilities required for this course:

Supporting statement:
Course projects in EECS 388 assume a working knowledge of the UNIX shell and Git, and they are easier with a working knowledge of Python. Although many students acquire these skills on their own by the time they take the course, those who haven't will find the material taught in EECS 201 valuable.

We are also cleaning up the course description, which was previously inconsistent between the CARF and the course catalog/CoE bulletin.

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Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☐ New Course
- ☑ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2023-11-29
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Elec Engin & Computer Sci Subject: EECS Catalog: 491	Dept (Home): Elec Engin & Computer Sci Subject: EECS Catalog: 491
☐	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number
☐	Course Title (full title) Introduction to Distributed Systems	Course Title (full title) Introduction to Distributed Systems
☐	Abbreviated Title (20 char) Intro Distrib Sys	Abbreviated Title (20 char) Intro Distrib Sys
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Design and implementation of scalable, performant, and reliable distributed systems. Covers abstractions for simplifying development of distributed systems, techniques used to implement these abstractions, and case studies on the use of these techniques in real-world systems. Topics such as replicated state machines, reasoning about time in distributed systems, replication, concurrency control, data consistency models, techniques for scaling, and multi-tenancy.	
☐	Full Term Credit Hours Undergraduate Min: 4 Graduate Min: 4 Undergraduate Max: 4 Graduate Max: 4	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☐	Course Credit Type Undergraduate Student, Rackham Graduate Student, Non-Rackham Graduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Elec Engin & Computer Sci Catalog: 491

☐

Grading Basis
- ☑ Graded (A – E)
- ☐ Credit/No Credit
- ☐ Satisfactory/Unsatisfactory
- ☐ Pass/Fail
- ☐ Business Administration

Grading
- ☐ Not for Credit
- ☐ Not for Degree Credit
- ☐ Degree Credit Only

Add Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

Drop Consent
- ☐ Department Consent
- ☐ Instructor Consent
- ☑ No Consent

	CURRENT LISTING	**REQUESTED LISTING**
☐	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
☑	Enforced Prerequisite (254 char) EECS 482; (C or better, No OP/F) or Graduate Standing in CSE Minimum grade requirement: C	Enforced Prerequisite (254 char) EECS 281; (C or better, No OP/F) or Graduate Standing in CSE. Enrollment in one minor elective allowed for Computer Science Minors. Minimum grade requirement: C
☐	Credit Exclusions	Credit Exclusions

☐

Course Components
- ☑ Lecture
- ☐ Seminar
- ☐ Recitation
- ☐ Lab
- ☑ Discussion
- ☐ Independent Study

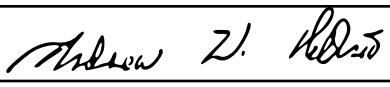
Graded Component
- ☑
- ☐
- ☐
- ☐
- ☐
- ☐

Terms Typically Offered
- ☑ Fall
- ☑ Winter
- ☐ Spring
- ☐ Summer
- ☐ Spring/Summer

Cognizant Faculty Member Name: Brian Noble Cognizant Faculty Member Title:

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Punam Vyas Email: vyas@umich.edu Phone: 647-1754

CoE Curriculum Committee Representative:		Print: Amir Kamil	Date: 12/17/23
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Andrew DeOrio	Date: 12/18/23
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	**Requested:**
Course Description Distributed systems offer higher performance, greater fault-tolerance, and better scalability than single-computer systems, but are challenging to develop. Topics covered: abstractions for simplifying development of distributed systems, techniques used to implement these abstractions, and case studies on the use of these techniques in real-world systems.	Course Description Design and implementation of scalable, performant, and reliable distributed systems. Covers abstractions for simplifying development of distributed systems, techniques used to implement these abstractions, and case studies on the use of these techniques in real-world systems. Topics such as replicated state machines, reasoning about time in distributed systems, replication, concurrency control, data consistency models, techniques for scaling, and multi-tenancy.
Class Length Full term	Class Length Full term
Contact hours (lecture): 3	Contact hours (lecture): 3
Contact hours (recitation) 1	Contact hours (recitation) 1
Contact hours (lab)	Contact hours (lab)

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:

Special resources of facilities required for this course:

Supporting statement:
EECS 491 currently has a long prerequisite chain – it requires EECS 482, which in turn requires both EECS 281 and EECS 370. This makes the course inaccessible to most undergraduate students. The dependence on EECS 482 is very minor, consisting of only a handful of topics. Some of these are at a lower level of abstraction than necessary for this course. We are planning to adjust EECS 491 to cover these topics at this higher level of abstraction directly rather than requiring EECS 482.

We are also tweaking the course description to make it more descriptive and more in line with CoE practices.

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148

Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☑ New Course
- ☐ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2023-12-07
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☑	Dept (Home): Subject: Catalog:	Dept (Home): Engineering Subject: ENGR Catalog: 161
☐	☐ Course is Cross-Listed with Other Departments	☐ Course is Cross-Listed with Other Departments
	Department / Subject / Catalog Number	Department / Subject / Catalog Number
☐		
☑	Course Title (full title)	Course Title (full title) MATLAB Applications for Engineers
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) MATLAB
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) MatLab Applications for Engineers is a 2 credit hour course that introduces the methods for taking complex engineering problems and turning them into models that can be solved on a computer. The development of the models, data analysis, and plotting will be conducted in MatLab in a project-based format. The course is designed for non-computer science majors who have passed AP computer science but lack experience in computer modeling and the use of MatLab.	
☑	Full Term Credit Hours Undergraduate Min: 2 Graduate Min: Undergraduate Max: 2 Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☑	Course Credit Type Undergraduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject:	Catalog:

☑	Grading Basis ☑ Graded (A – E) ☐ Credit/No Credit ☐ Satisfactory/Unsatisfactory ☐ Pass/Fail ☐ Business Administration Grading ☐ Not for Credit ☐ Not for Degree Credit ☐ Degree Credit Only	Add Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent	Drop Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent

	CURRENT LISTING	**REQUESTED LISTING**
☑	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char) High school physics or concurrent enrolment in PHYS 140 or its equivalent Ability to program in any language at the AP computer science level.
☐	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) Minimum grade requirement:
☐	Credit Exclusions	Credit Exclusions

☑	Course Components ☑ Lecture ☐ Seminar ☐ Recitation ☐ Lab ☐ Discussion ☐ Independent Study	Graded Component ☑ ☐ ☐ ☐ ☐ ☐	Terms Typically Offered ☑ Fall ☑ Winter ☐ Spring ☐ Summer ☐ Spring/Summer

Cognizant Faculty Member Name: Ben Torralva	Cognizant Faculty Member Title:

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Ryan Latimer Email: rlatimer@umich.edu Phone: 734-647-9039

CoE Curriculum Committee Representative: Rachael Schmedlen	Print: Rachael Schmedlen	Date: 12/15/23
CoE Curriculum Committee Chair:	Print:	Date:
Home Department Chair: Kevin Pipe	Print: Kevin Pipe	Date: 12/15/23
Cross-Listed Department Chair:	Print:	Date:

Cross-Listed Department Chair:	Print:	Date:

Cross-Listed Department Chair:	Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	**Requested:**
Course Description	Course Description MatLab Applications for Engineers is a 2 credit hour course that introduces the methods for taking complex engineering problems and turning them into models that can be solved on a computer. The development of the models, data analysis, and plotting will be conducted in MatLab in a project-based format. The course is designed for non-computer science majors who have passed AP computer science but lack experience in computer modeling and the use of MatLab.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 2
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab)	Contact hours (lab)

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:

Special resources of facilities required for this course:

Supporting statement:
We have successfully offered “MATLAB Applications for Engineers” under ENGR 190 (Selected Topics) six times with great success. After receiving positive student feedback over the past few years it was offered, we are ready to make this course a permanent offering going forward.

ENGR 190-002: MATLAB Applications for Engineers

Fall 2023

Instructor Dr. Ben Torralva, bentorra@umich.edu
Meeting times Tuesday 3:30 - 5:30, Room 108 FXB
Office hours After class and by appointment via Zoom

Course Overview

MatLab Applications for Engineers (ENGR 190-002) is a 2 credit hour course that introduces the methods for taking complex engineering problems and turning them into models that can be solved on a computer. The development of the models, data analysis, and plotting will be conducted in MatLab in a project-based format. The course is designed for non-computer science majors who have passed AP computer science but lack experience in computer modeling and the use of MatLab. Credit can NOT be received for ENGR 101 and ENGR 190-002. The prerequisite for the course is the ability to program in any language at the AP computer science level. High school physics or concurrent enrolment in PHYS 140 or its equivalent is strongly recommended.

Course Objectives

The course aims to introduce computer modeling and MatLab as tools for attacking engineering problems while also developing sound problem-solving and programming practices. Upon completion of the course, students will have mastered (at a level appropriate for the course) the following topics:

1. Mastery of the basic operations in MatLab including vector and matrix operations
2. Generate publication-quality computer plots of one and two-dimensional data using curves, surfaces, and contours
3. Perform basic data analysis
4. Implement and understand the basic theory behind common numerical algorithms
5. Understand how to use the appropriate algorithm for a particular problem
6. Numerically solve ordinary and partial differential equations (A course in differential equations is NOT a prerequisite for this course)
7. Solve systems of linear equations
8. Demonstrate the fundamental concepts of programming and computer modeling

Text

Stormy Attaway, *MATLAB: A Practical Introduction to Programming and Problem Solving*, **5th edition**, Elsevier, 2019.

The full text is available through the library.

Course materials

Course materials, including assignments and lecture notes, will be posted to Canvas.

Software

MatLab will be used for all assignments and projects. There are multiple ways available for you to access MatLab. To avoid connectivity issues, you can install MatLab on your own computer. Directions for downloading and activating MatLab are available at this link. MatLab can be accessed on the web at (https://matlab.mathworks.com). You can also access MatLab on the CAEN computers.

Grading

Participation	10%
Homeworks	20%
Projects	70%

Tentative Schedule (See canvas for reading assignments, links and details)

Week	Topic	Project
1 (8/28)	Intro to MatLab, script files and plotting	Plotting and basic data analysis
2 (9/5)	Matlab mlx-files, data arrays and sound programing practices	Fibiancci sequence and curve fitting
3 (9/12)	A numerical approach to Taylor's series	Constructing and testing a program: Radioactive decay
4 (9/19)	Linear differential equations Euler Method; Error analysis	Molecular vibrations
5 (9/26)	Conservations laws Symplectic Euler Method.	Mars' orbit
6 (10/3)	Root finding; Optimization; contour and mesh plotting	Local minima in 1 and 2-dimensions; 2-D plotting
7 (10/10)	Systems of linear equations I	Linear transformations; snakes and chickens; currents and voltages
8 (10/17)	Fall Break!	Fall Break!
9 (10/24)	Systems of linear equations II	Eigenvalues and earthquakes
10 (10/31)	Partial differential equations I	Electron accelerator chamber design: Laplace's equation
11 (11/7)	Partial differential equations II	Implicit methods: time-dependent heat transport
12 (11/14)	More time with PDEs	Extended team session
13 (11/21)	Introduction to Monte Carlo methods; random walks	Monte Carlo integration, random walks and the arrow of time
14 (11/28)	Artificial intelligence	Neural networks and the brain
15 (12/5)	Wrap up	Final team session

Course Policies

Due to the project nature and team aspects of the course. Class attendance and participation are required. All classes will be conducted in person. Access to MatLab during class sessions is required for the interactive aspects of the course.

Students Requiring Accommodation

Students who have documented disabilities and require accommodations should make an appointment to discuss their needs. Students with disabilities must contact the Services for Students with Disabilities (SSWD) Office before accommodations can be provided.

Honor Code

The Honor Code is strictly enforced. All work must be students own. Please contact me if you have any questions. To review the Honor Code refer to the Honor Council page on the Office of Retention and Academic Support Services website.

University of Michigan
Winter 2021 Instructor Report Without Comments
ENGR 190-002: Selected Topics
Ben Torralva

9 out of 22 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	3	6	0	0	0	0	4.3	4.6	4.4
My interest in the subject has increased because of this course. (Q1632)	2	6	0	1	0	0	4.1	4.3	4.0
I knew what was expected of me in this course.(Q1633)	3	3	3	0	0	0	4.0	4.6	4.3
Overall, this was an excellent course.(Q1)	2	7	0	0	0	0	4.1	4.4	4.1
I had a strong desire to take this course.(Q4)	3	1	4	1	0	0	3.4	4.1	3.9
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier). (Q891)	0	0	5	1	3	0	2.6	2.9	2.7
How did you participate in this course? (SA=Attended most synchronously, A=Attended most asynchronously, N=Attended most in person, D=Attended some in person and some online) (Q1854)	8	1	0	0	0	0	4.9	4.8	4.6

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Overall, Ben Torralva was an excellent teacher.(Q2)	3	5	1	0	0	0	4.2	4.7	4.6
Ben Torralva seemed well prepared for class meetings.(Q230)	7	1	1	0	0	0	4.9	4.8	4.7
Ben Torralva explained material clearly.(Q199)	4	1	4	0	0	0	4.0	4.7	4.6
Ben Torralva treated students with respect.(Q217)	7	2	0	0	0	0	4.9	4.9	4.8

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median
Examinations covered the important aspects of the course. (Q356)	1	0	0	0	0	8	5.0	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	University-Wide Median
Ben Torralva stressed important points in lectures/discussions. (Q203)	3	4	1	1	0	0	4.1	4.7
Ben Torralva appeared to have a thorough knowledge of the subject. (Q207)	5	4	0	0	0	0	4.6	4.8
Ben Torralva acknowledged all questions insofar as possible. (Q216)	6	3	0	0	0	0	4.8	4.8
Ben Torralva encouraged constructive criticism. (Q218)	7	2	0	0	0	0	4.9	4.6

The medians are calculated from Winter 2021 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are lower division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2022 Instructor Report Without Comments
ENGR 190-002: Selected Topics
Ben Torralva

9 out of 18 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	3	4	1	1	0	0	4.1	4.6	4.3
My interest in the subject has increased because of this course. (Q1632)	1	3	4	0	1	0	3.4	4.2	4.0
I knew what was expected of me in this course.(Q1633)	2	3	4	0	0	0	3.7	4.6	4.3
I had a strong desire to take this course.(Q4)	0	3	1	4	1	0	2.4	4.1	3.7
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier). (Q891)	0	1	0	4	4	0	1.6	3.0	2.7

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Ben Torralva seemed well prepared for class meetings.(Q230)	0	9	0	0	0	0	4.0	4.8	4.7
Ben Torralva explained material clearly.(Q199)	0	7	1	1	0	0	3.9	4.7	4.6
Ben Torralva treated students with respect.(Q217)	8	1	0	0	0	0	4.9	4.8	4.8

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	0	4	3	1	1	0	3.3
Examinations covered the important aspects of the course. (Q356)	0	0	2	0	0	7	3.0

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Ben Torralva was an excellent teacher. (Q2)	1	6	1	1	0	0	3.9
Ben Torralva stressed important points in lectures/discussions. (Q203)	1	7	0	1	0	0	4.0
Ben Torralva appeared to have a thorough knowledge of the subject. (Q207)	7	2	0	0	0	0	4.9
Ben Torralva acknowledged all questions insofar as possible. (Q216)	6	3	0	0	0	0	4.8
Ben Torralva encouraged constructive criticism. (Q218)	6	1	2	0	0	0	4.8

The medians are calculated from Winter 2022 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are lower division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENGR 190-002: Selected Topics
Ben Torralva

11 out of 19 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	School/College Median	Univ-Wide Median
This course advanced my understanding of the subject matter. (Q1631)	6	2	3	0	0	0	4.6	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	5	3	1	1	1	0	4.3	4.1	4.2
I knew what was expected of me in this course.(Q1633)	4	4	1	2	0	0	4.1	4.3	4.6
I had a strong desire to take this course.(Q4)	1	3	6	1	0	0	3.3	4.0	4.1
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier). (Q891)	0	1	2	2	6	0	1.4	2.8	3.0

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	School/College Median	Univ-Wide Median
Ben Torralva seemed well prepared for class meetings.(Q230)	6	3	1	1	0	0	4.6	4.7	4.8
Ben Torralva explained material clearly.(Q199)	2	4	0	5	0	0	3.6	4.6	4.7
Ben Torralva treated students with respect.(Q217)	10	1	0	0	0	0	5.0	4.8	4.8

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	3	3	3	1	1	0	3.7
Examinations covered the important aspects of the course. (Q356)	2	1	0	1	0	7	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Ben Torralva was an excellent teacher. (Q2)	3	3	2	1	1	0	3.8
Ben Torralva stressed important points in lectures/discussions. (Q203)	5	2	1	2	1	0	4.3
Ben Torralva appeared to have a thorough knowledge of the subject. (Q207)	9	2	0	0	0	0	4.9
Ben Torralva acknowledged all questions insofar as possible. (Q216)	7	3	0	1	0	0	4.7
Ben Torralva encouraged constructive criticism. (Q218)	6	4	0	0	0	0	4.7

The medians are calculated from Winter 2023 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are lower division with enrollment of 16 to 74 in College of Engineering.

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148
ro.curriculum@umich.edu
ro.umich.edu

Course Approval Request Form

Office of the Registrar, University of Michigan

☑ **CHECK APPROPRIATE BOXES FOR ALL CHANGES**

Action Requested
- ☐ New Course
- ☑ Modification of Existing Course
- ☐ Deletion of Existing Course

Date of Submission: 2023-09-14
Effective Term: Fall 2024

☑	Course Offered ☑ Indefinitely ☐ One term only	**RO USE ONLY** Date Received: Date Completed: Completed By:

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Mechanical Engineering Subject: MECHENG Catalog: 305	Dept (Home): Mechanical Engineering Subject: MECHENG Catalog: 305
☐	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number	☐ Course is Cross-Listed with Other Departments Department / Subject / Catalog Number
☐	Course Title (full title) Introduction to Finite Elements in Mechanical Engineering	Course Title (full title) Introduction to Finite Elements in Mechanical Engineering
☐	Abbreviated Title (20 char) Intro Finite Elemnt	Abbreviated Title (20 char) Intro Finite Elemnt
☐	Course Description (Please limit to 50 words and attach separate sheet if necessary) Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three-dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments.	
☐	Full Term Credit Hours Undergraduate Min: 3 Graduate Min: Undergraduate Max: 3 Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:
☐	Course Credit Type Undergraduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits:	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Mechanical Engineering Catalog: 305

☐	Grading Basis ☑ Graded (A – E) ☐ Credit/No Credit ☐ Satisfactory/Unsatisfactory ☐ Pass/Fail ☐ Business Administration Grading ☐ Not for Credit ☐ Not for Degree Credit ☐ Degree Credit Only	Add Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent	Drop Consent ☐ Department Consent ☐ Instructor Consent ☑ No Consent

	CURRENT LISTING	**REQUESTED LISTING**
☑	Advisory Prerequisite (254 char) MECHENG 311	Advisory Prerequisite (254 char)
☑	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) MECHENG 211 Minimum grade requirement:
☐	Credit Exclusions	Credit Exclusions

☐	Course Components ☑ Lecture ☐ Seminar ☐ Recitation ☑ Lab ☐ Discussion ☐ Independent Study	Graded Component ☑ ☐ ☐ ☐ ☐ ☐	Terms Typically Offered ☑ Fall ☑ Winter ☐ Spring ☐ Summer ☐ Spring/Summer

Cognizant Faculty Member Name: Greg Hulbert Cognizant Faculty Member Title:

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Email: Phone:

CoE Curriculum Committee Representative: Xiaogan Liang Print: Xiaogan Liang Date: 12/12/2023

CoE Curriculum Committee Chair: Print: Date:

Home Department Chair: Print: Eric Johnsen Date: 12/12/2023

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

Cross-Listed Department Chair: Print: Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three-dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments.	Course Description Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three-dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments.
Class Length Full term	Class Length Full term
Contact hours (lecture): 2	Contact hours (lecture): 2
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab) 2	Contact hours (lab) 2

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:

Special resources of facilities required for this course:

Supporting statement:
We are updating an incorrect prereq for this class. Was Supposed to be listed as MECHENG 211 and the incorrect class was typed in as MECHENG 311. We are also changing the prereq from advisory to enforced because the material has evolved over time an enforced prerequisite better suits the needs of the class and the students