UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, January 28, 2025

Attending: Varun Agrawal, Achilleas Anastasopoulos, Yavuz Bozer, Xudong Fan, Chris Fidkowski, Anouck Girard, Saadet Albayrak Guralp, Christine Gordon, Robert Hovden, Amir Kamil, Leena Lalwani, Xiaogan Liang, Frank Marsik, Radoslaw Michalowski, Nolgie Oquendo-Colon, Yulin Pan, Eric Rutherford, Rachael Schmedlen, Stephanie Sheffield, Volker Sick, Won Sik Yang

Support Staff: Mercedes Carmona, Betsy Dodge, Matthew Faunce

Call to Order: 1:34 PM

Adjourned: 3:02 PM

Agenda:

1. Approval of 1.14.2025 Meeting Minutes – Page 3 – **APPROVED**

CARF SUMMARIES

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	Is Course on LSA Course Guide?	APPROVED	NOTES & REVISIONS	TABLED
6	CSE	594	NEW		FT 2025	NO	NO	APPROVED		
18	CSE	594	MOD	Changes to Advisory and Enforced Prerequisites.	WT 2026	C	NO	APPROVED		
21	ENTR	404	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description abbreviation of SEO to be listed out or revised, Course Title to be re-worked.	
38	ENTR	414	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description beginning of second sentence to be revised.	
51	ENTR	420	NEW		WT 2026	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description second sentence to be revised.	
65	ENTR	422	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description abbreviation of DEI be listed out or revised.	
97	ENTR	423	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description last sentence to be revised.	
111	IOE	430	MOD	Change to Enforced Prerequisite.	WT 2026	C-	YES	APPROVED		
114	IOE	437	MOD	Changes to Course Description and Advisory Prerequisite.	FT 2025	NO	YES	APPROVED		
117	IOE	524	NEW		FT 2025	NO	NO	CONDITIONAL APPROVAL	Suggestion for Course Description second sentence to be revised.	
136	ROB	201	NEW		FT 2025	C	NO	CONDITIONAL APPROVAL	Suggestion to revise Supporting Statement and Enforced Prerequisite to focus on linear algebra and adding No OP/F.	
153	ROB	430	NEW		WT 2026	C	NO			TABLED

UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, January 14, 2025

Attending: Varun Agrawal, Achilleas Anastasopoulos, Yavuz Bozer, Xudong Fan, Chris Fidkowski, Anouck Girard, Saadet Albayrak Guralp, Robert Hovden, Amir Kamil, Leena Lalwani, Xiaogan Liang, Radoslaw Michalowski, Nolgi Oquendo-Colon, Anchal Sareen, Rachael Schmedlen, Stephanie Sheffield, Won Sik Yang

Support Staff: Mercedes Carmona, Betsy Dodge, Matthew Faunce

Call to Order: 1:34 PM

Adjourned: 3:06 PM

Agenda:

1. Approval of 12.10.2024 Meeting Minutes – Page 4 - **APPROVED**
2. ECE PhD Program Modification – Action Item – Page 6 - **APPROVED**
    a. The ECE department requests a modification to the ECE PhD degree requirements to make ECE 590 a required course for Fall 2025. If the proposal is not approved for the term listed, then the change will be implemented for Winter 2026 and later. The requirement will not impact current students, only by incoming students, but current students will be encouraged to take the course as an elective if not taken yet. The course does not add any additional credits but replaces an optional 1 credit course of Satisfactory/Unsatisfactory coursework that had previously been permitted to meet the total credit requirement. This course has been offered for four years as EECS 598 and students learn about different resources available at the university as well as meet with leaders within CoE and Rackham. Ultimately, this course helps students build the foundation for their doctoral and better prepares the student for their degree program.
    b. EECS - CSE asks if a senior undergraduate student can take this course. CEE also questions if there should be any credit exclusion for the course.
        i. The course is currently only for Rackham and Non-Rackham Graduate students. The intention is for graduate students to take this course to better prepare the student for their graduate program studies. Some advising would help encourage students to take this course, if not a credit exclusion. If needed, a credit exclusion for the course should be discussed further with the department.
            1. EECS - CSE mentions that CSE 601 is a similar course compared to ECE 590, which has been very successful and eases students into their program.
    c. IOE inquires about the seminars as well as the course numbering being used for Special Topics within other departments.
        i. The seminar information is listed within the course syllabus, which lists the topic and speaker within the weekly topic schedule. There are many departments that are involved with this course that cover various topics the student may come across while completing their degree. Special Topic course numbers vary per department and there is not a specific numbering system used for engineering special topic courses.
    d. CoE CC members voted unanimously to approve this proposal. The proposal will appear at the next CoE Faculty meeting for Winter 2025.

CARF SUMMARIES

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	Is Course on LSA Course Guide?	APPROVED	NOTES & REVISIONS	TABLED
19	BIOMEDE	311	MOD	Changes to Enforced Prerequisite and Course Components.	FT 2025	C-	YES	APPROVED	Department needs to review Advisory Prerequisite as Linear Algebra is not a required course for BIOMEDE students.	
22	BIOMEDE	519	MOD	Changes to Enforced Prerequisite and Course Components.	FT 2025	NO	YES	CONDITIONAL APPROVED	Cross-listed with PHYSIOL 519. Department should review Course Description, Advisory Prerequisite (add topics), Course Credit Type to add Non-Rackham Graduate student.	
25	CSE	596	NEW		FT 2025	C	NO	APPROVED		
38	ECE	590	NEW		FT 2025	NO	NO	APPROVED		
47	EECS	390	MOD	Changes to Enforced Prerequisite and Terms Typically Offered.	FT 2025	C	YES	APPROVED		
50	EECS	408	NEW		FT 2025	NO	NO	APPROVED		
66	EECS	474	NEW		FT 2025	C	NO	APPROVED		
77	EECS	475	MOD	Changes to Course Credit Type, Advisory and Enforced Prerequisites, Course Components, and Terms Typically Offered.	FT 2025	C	YES	APPROVED		
80	EECS	477	MOD	Changes to Advisory and Enforced Prerequisites.	FT 2025	C	YES	APPROVED		
83	EECS	490	MOD	Change to Enforced Prerequisite.	FT 2025	C	YES	APPROVED		
86	ENGR	110	MOD	Changes to Course Description, Advisory and Enforced Prerequisites.	FT 2025	NO	YES	APPROVED	Suggestion for department to review Course Description for “near-peer”.	

90	**MECHENG**	**524**	**MOD**	Changes to Cross-listed Departments, Course Description, Full Term Credit Hours, Course Credit Type, and Advisory Prerequisite.	**FT 2025**	**NO**	**YES**		Adding Cross-Listing with BIOMEDE 524. Supporting Statement must include both reasons for cross-listing, plans for teaching/advising from both departments. Course Description needs to be reviewed for BIOMEDE Students.	**TABLED**
93	**ROB**	**415**	**NEW**		**FT 2025**	**C-**	**NO**	**CONDITIONAL APPROVAL**	Supporting statement should expand how and why this is helpful for students/program. Suggestion for department to review Course Credit Type to add Non-Rackham Graduate students.	
104	**ROB**	**416**	**NEW**		**FT 2025**	**C-**	**NO**	**CONDITIONAL APPROVED**	Department to review Course Credit Type to add Non-Rackham Graduate students and Course Description.	
115	**ROB**	**472**	**NEW**		**FT 2025**	**NO**	**NO**	**APPROVED**	Suggestion for department to review Course Credit Type to add Non-Rackham Graduate students.	
124	**ROB**	**516**	**NEW**		**FT 2025**	**C-**	**NO**	**CONDITIONAL APPROVED**	Department to review Course Title (adding Advanced), and Course Description.	
135	**ROB**	**560**	**MOD**	Changes to Cross-listed Departments.	**FT 2025**	**NO**	**YES**	**APPROVED**	Adding Cross-Listing with MECHENG 547. Suggestion for department to review Abbreviated Title, keep consistent with course title.	
139	**ROB**	**572**	**MOD**	Changes to Course Description and Credit Exclusions.	**FT 2025**	**NO**	**YES**	**APPROVED**	Cross-listed with NAVARCH 569. Suggestion for department to review Course Title (adding Advanced).	

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ro.curriculum@umich.edu
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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: 2025-01-15
Effective Term: Fall 2025

☑	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: 594		
☐	☐ 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) Human-AI Interaction & Systems		
☑	Abbreviated Title (20 char)			Abbreviated Title (20 char) Human-AI Interaction		
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.					
☑	Full Term Credit Hours Undergraduate Min: 4 Undergraduate Max: 4	Graduate Min: 4 Graduate Max: 4		Half Term Credit Hours Undergraduate Min: Undergraduate Max:	Graduate Min: 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: 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) (EECS 485 and EECS 493) or Graduate Standing in CSE
☐	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) Minimum grade requirement:
☐	Credit Exclusions	Credit Exclusions

☑

Course Components

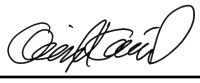
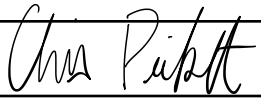
	Graded Component
☑ Lecture	☑
☐ Seminar	☐
☐ Recitation	☐
☐ Lab	☐
☑ Discussion	☐
☐ Independent Study	☐

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

Cognizant Faculty Member Name: Anhong Guo Cognizant Faculty Member Title:

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

Contact Person: Ariana Powell Email: powellar@umich.edu Phone:

CoE Curriculum Committee Representative:		Print: Amir Kamil	Date: 1/17/25
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Christopher Peikert	Date: 1/16/25
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 Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.
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:
Human intelligence and artificial intelligence (AI) are intertwined, co-evolving and complementary. The course teaches principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. The course lays a foundation for graduate students to dive deeper into HCI and
applied AI research and practice. It also gives graduate students exposure to human-centered principles and methods (e.g., human-AI guidelines, need finding, human-centered systems design, prototyping, system and user evaluation). This knowledge is critical for students who will become designers of
AI-infused technologies that involve or impact humans. The course has been offered two times and each time has had good enrollment from both PhD and Master's students (23 in Winter 2022 and 30 in Winter 2023). This course fills an important gap in the curriculum as it satisfies HCC graduate breadth requirement.

CSE 594 Human-AI Interaction & Systems

Instructor: Anhong Guo (anhong@umich.edu) https://guoanhong.com

Course Description:
Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.

Learning Objectives:

- **Understand and Articulate Human-AI Interaction Principles:** Students will be able to explain key concepts in human-AI interaction, including the roles of humans and AI in collaborative systems, and the ethical considerations involved in designing such systems.
- **Conduct User Research to Identify Real-World Needs:** Students will demonstrate the ability to apply user-centered design methods, including contextual inquiry, interviews, and observation to identify and analyze complex real-world problems or user needs that can be effectively addressed by human-AI systems, understanding the strengths and limitations of both human and AI capabilities.
- **Design and Develop Effective Human-AI Systems:** Students will demonstrate the ability to design and develop interactive systems that effectively combine human and AI capabilities, focusing on usability, efficiency, and ethical considerations.
- **Evaluate and Iterate on Human-AI Systems:** Students will evaluate the performance of human-AI systems using both qualitative and quantitative methods, and iteratively refine these systems based on user feedback and evaluation results.
- **Apply Crowdsourcing and Human Computation Techniques:** Students will utilize crowdsourcing and human computation techniques to collect data and solve complex problems, understanding the advantages and limitations of these approaches.
- **Critically Analyze AI Fairness and Ethics:** Students will critically assess the ethical implications of AI systems, including issues related to bias, fairness, and transparency, and propose solutions to mitigate potential harms.
- **Understand Current Research Trends in Human-AI Interaction:** Students will engage with current research trends in HCI and Human-AI Interaction, gaining insights into the latest advances, challenges, and methods in the field. They will apply this knowledge to inform their own design and development processes in the course.

Grading Policy:

- Class participation: 30%
    - Reading Reflection: 10%
    - In-Class Activities: 10%
    - Lead Reading Discussions: 10%
- Assignments: 30%
- Final project: 40%

    - Needfinding and Prototyping: 10%
    - Implementation: 20%
    - Evaluation and Presentation: 10%

Assignments:

- Assignment 1 (5%): Become a crowd worker, and earn $2
- Assignment 2 (12%): Develop a web interface to collect labeling data
    - Part 1: Develop a usable web interface for other students to label data efficiently and accurately (there'll be a in-class demo session)
    - Part 2: Deploy it on Amazon Mechanical Turk to collect more data points
- Assignment 3 (13%): Build on the web interface in Assignment 2 to integrate an AI component that can help the labeling task easier
    - Part 1: Develop a usable web interface for other students to label data efficiently and accurately (there'll be a in-class demo session)
    - Part 2: Deploy it on Amazon Mechanical Turk to collect more data points

Assignment Late Policy:

- Each student has a total of two (2) free late days to use on assignments throughout the semester. Each late day allows you to turn in a single homework assignment up to 24 hours past the initial deadline with no penalty.
- Once you have used all your free late days, late work will receive a penalty of 5% of the maximum score available for that assignment per day.

Final Project:

This course will include a significant project component that requires students with diverse backgrounds to form teams, and develop a usable interactive system that solves a concrete problem:

- Identify a problem or user need
- Understand how it's currently being solved
- Analyze how human or machine is good at solving this problem
- Design and develop a system that addresses this problem
- Evaluate it to see where the solution is better or worse for solving this problem
- Take what you learned and improve the system
- Evaluate it again
- Present your design process and findings

Required Skills:

This course requires knowledge of full-stack web or mobile development (e.g., HTML, CSS, Javascript, PHP, or web frameworks such as Django, React, Node.js, or mobile dev for iOS or Android) or substantial independent learning of these skills, as we won't cover them in the lectures.

Example Schedule of Topics:

Lecture 1: Introduction to Human-AI Interaction & Systems

Lecture 2: Practical Machine Learning

Lecture 3: Perspectives on Human-AI Interaction
Project brainstorming, exercise: think about a real-world problem, list how it's currently solved, how humans are solving it well or not well, how machines are solving it well or not well, etc.
Readings:

- Ben Schneiderman and Pattie Maes. Direct Manipulation vs. Interface Agents. Interactions 1997.
- Eric Horvitz. Principles of Mixed-Initiative Interaction. CHI 1999

Think about:

- Whether we should target the development of technology that replaces humans, or augments humans? What are the pros and cons of each?
- Is this an important distinction? How can humans and AI work together?

Lecture 4: Crowdsourcing Data Collection and Workflow
Readings:

- Jeffrey Bigham, Michael Bernstein, and Eytan Adar. Human-Computer Interaction and Collective Intelligence
- Bernstein, Michael S., Greg Little, Robert C. Miller, Björn Hartmann, Mark S. Ackerman, David R. Karger, David Crowell, and Katrina Panovich. "Soylent: a word processor with a crowd inside." UIST 2010.
- Optional:
    - Kotaro Hara, Abigail Adams, Kristy Milland, Saiph Savage, Chris Callison-Burch, and Jeffrey P. Bigham. A Data-Driven Analysis of Workers' Earnings on Amazon Mechanical Turk. CHI 2018.
    - Captcha if you can: how you've been training AI for years without realizing it | techradar
    - Alexis C. Madrigal. Why Google Maps Is Better Than Apple Maps. Atlanta

Think about:

- What is crowdsourcing, and how is it being used in building AI systems?
- For the problems/solutions identified in the "AI for the future" exercise, what are some interesting ways that data can be collected?

Lecture 5: Crowdsourcing Part 2
Think about:

- What makes crowdsourcing cheap and fast? Is cheaper crowdsourcing always better? What should we (task designers, researchers, or developers) be aware of when designing crowdsourcing tasks so that we do not underpay crowd workers?
- Is crowdsourcing good for every task? What types/properties of a task would benefit from crowdsourcing, and what would not? Are there concrete examples of tasks that you would use crowdsourcing? Are there concrete examples of tasks that you would not use crowdsourcing?

Lecture 6: Assignment 2 In-Class Demo Session

Lecture 7: Machine Learning + User Experience
Readings:

- Amershi, S., Weld, D., Vorvoreanu, M., Fourney, A., Nushi, B., Collisson, P., ... & Horvitz, E. (2019, May). Guidelines for human-AI interaction. In Proceedings of the 2019 chi conference on human factors in computing systems. (https://dl.acm.org/doi/abs/10.1145/3290605.3300233)
- Yang, Q., Steinfeld, A., Rosé, C., & Zimmerman, J. (2020, April). Re-examining whether, why, and how human-AI interaction is uniquely difficult to design. In Proceedings of the 2020 chi conference on human factors in computing systems(pp. 1-13). (https://dl.acm.org/doi/abs/10.1145/3313831.3376301)

Think about:

- Why is Machine Learning + UX Hard to design?
- Use the scenario in the AI for the Future Exercise, think about how some of the human-AI guidelines can be applied there?

Lecture 8: Interactive Machine Learning and Humans in the Loop
Readings:

- Fails, J. A., & Olsen Jr, D. R. (2003, January). Interactive machine learning. In Proceedings of the 8th international conference on Intelligent user interfaces (pp. 39-45).(https://dl.acm.org/doi/abs/10.1145/604045.604056)
- Amershi, S., Cakmak, M., Knox, W. B., & Kulesza, T. (2014). Power to the people: The role of humans in interactive machine learning. Ai Magazine, 35(4), 105-120. (https://ojs.aaai.org/index.php/aimagazine/article/view/2513)

Think about:

- What are the challenges when trying to put humans in the loop of AI?
- What are the kinds of roles humans can take in human-AI partnerships? How about the roles AI can take?

Lecture 9: Human-AI Teams and Collaboration
Readings:

- Gagan Bansal, Besmira Nushi, Ece Kamar, Daniel S. Weld, Walter S. Lasecki, and Eric Horvitz. 2019. "Updates in Human-AI Teams: Understanding and Addressing the Performance/Compatibility Tradeoff." Proceedings of the AAAI Conference on Artificial Intelligence 33, 01: 2429–2437.
- Zhou, Sharon, Melissa Valentine, and Michael S. Bernstein. "In search of the dream team: temporally constrained multi-armed bandits for identifying effective team structures." Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems. 2018.
- (Optional) Hoffman, Guy, and Cynthia Breazeal. "Collaboration in human-robot teams." AIAA 1st Intelligent Systems Technical Conference. 2004.

Think about:

- What is needed for effective human-AI teamwork?

- What is the role of AI in supporting teamwork?

Lecture 10: Final Project Idea Pitch

Lecture 11: Explainable AI
Think about:
- What are some of the challenges with existing Explainability methods?
- What needs to be explained?
- Who should we explain it to?

Lecture 12: Ethics and FAccT of AI Part 1
Readings:
- Joy Buolamwini and Timnit Gebru. 2018. Gender shades: Intersectional accuracy disparities in commercial gender classification. In Conference on Fairness, Accountability and Transparency (FAccT'18). Project Website.
- Tolga Bolukbasi, Kai-Wei Chang, James Y Zou, Venkatesh Saligrama, and Adam T Kalai. 2016. Man is to computer programmer as woman is to homemaker? debiasing word embeddings. Advances in neural information processing systems (NeurIPS'16).

Think about:
- Why is biased AI bad? What potential harm can it do?
- What are potential sources of AI bias? What are the ways to identify bias?
- If AI simply represents human bias that exists in the real-world, why is it problematic?

Lecture 13: Project Stage 2 Presentation
- Minimum requirement: Complete stage 2
- Students can present more if they already made more progress

Lecture 14: Ethics and FAccT of AI Part 2
Reading:
- Solon Barocas, Anhong Guo, Ece Kamar, Jacquelyn Krones, Meredith Ringel Morris, Jennifer Wortman Vaughan, Duncan Wadsworth, Hanna Wallach. Designing Disaggregated Evaluations of AI Systems: Choices, Considerations, and Tradeoffs. In Proceedings of the Fourth AAAI/ACM Conference on AI, Ethics, and Society (AIES 2021).
- Anhong Guo, Ece Kamar, Jennifer Wortman Vaughan, Hanna Wallach, Meredith Ringel Morris. Toward Fairness in AI for People with Disabilities: A Research Roadmap. In ACM ASSETS 2019 Workshop on AI Fairness for People with Disabilities (ASSETS 2019 AI Fairness Workshop).

Think about:
- What is a disaggregated evaluation, and who might perform these kinds of evaluations?
- What kinds of harm caused by unfair AI could be measured through quantitative benchmarking, and what requires qualitative investigations?

Lecture 15: Ethics and FAccT of AI Part 3

Lecture 16: Computer Vision for Human-AI Interaction

Lecture 17: Large Language Models for Human-AI Interaction
Readings:

1. Ouyang, Long, Jeff Wu, Xu Jiang, Diogo Almeida, Carroll L. Wainwright, Pamela Mishkin, Chong Zhang et al. "Training language models to follow instructions with human feedback." arXiv preprint arXiv:2203.02155 (2022).
    a. Questions:
        i. Do you think the way human feedback is collected can reflect "human values" as OpenAI expects?
        ii. The paper mentioned "InstructGPT shows small improvements in toxicity over GPT-3, but not bias." What do you think would be the reason behind it?
2. Wu, Tongshuang, Michael Terry, and Carrie Jun Cai. "Ai chains: Transparent and controllable human-ai interaction by chaining large language model prompts." In Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems, pp. 1-22. 2022.
    a. Questions:
        i. On what tasks would you think Chaining is useful/ not useful?
        ii. The work is done with GPT-3, which is a version of LLM that generally requires more prompt engineering. Do you think Chaining is still useful when we shift to more powerful models like ChatGPT?

Lecture 18: Final Project Stage 3 Demo Session

- In-class demo of your system
- Give feedback

Lecture 19: InfoViz and Data Visualization
Readings:

- Kay, Matthew, Tara Kola, Jessica R. Hullman, and Sean A. Munson. "When (ish) is my bus? user-centered visualizations of uncertainty in everyday, mobile predictive systems." In Proceedings of the 2016 chi conference on human factors in computing systems, pp. 5092-5103. 2016.
    - Questions:
        - What are the challenges and tradeoffs in visualizing uncertainty, discussed in this paper?
        - What are some real-world examples of visualizing uncertainty, and how they address the challenges and tradeoffs?
- Cai, Carrie J., Emily Reif, Narayan Hegde, Jason Hipp, Been Kim, Daniel Smilkov, Martin Wattenberg et al. "Human-centered tools for coping with imperfect algorithms during medical decision-making." In Proceedings of the 2019 chi conference on human factors in computing systems, pp. 1-14. 2019.
    - Questions:

    - For the three types of refinement tools, what are the analogous examples in text? Describe how that may be used in context.
    - How can these types of tools be used with generative AI such as Image Generation and ChatGPT?

Lecture 20: Human-AI Systems for Accessibility

Lecture 21: Guest Lecture on Privacy and Human-AI Interaction
Example Readings:

- Jin, Haojian. Modular Privacy Flows
- Jin, Haojian, Gram Liu, David Hwang, Swarun Kumar, Yuvraj Agarwal, and Jason I. Hong. "Peekaboo: A hub-based approach to enable transparency in data processing within smart homes." In 2022 IEEE Symposium on Security and Privacy (SP), pp. 303-320. IEEE, 2022.
- Discuss: What is Modular Privacy Flows, how does it compare with traditional approaches of data access control? To make this approach work, who are the stakeholders, what do they each need to do? What are the implications of this approach for AI-infused features?

Lecture 22: Guest Lecture on Intelligent Reading Interfaces

Lecture 23: Project Working Day

Lecture 24: Final Project Stage 3 Demo Session V2

- In-class demo of your system
- Give feedback

Lecture 25: Summary of topics and reflections for the future

Lecture 26: Final Project Presentations

University of Michigan
Winter 2022 Instructor Report Without Comments
EECS 598-003: Special Topics
Anhong Guo

20 out of 23 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	8	2	0	0	0	4.4	4.6	4.7
My interest in the subject has increased because of this course. (Q1632)	10	5	1	2	0	0	4.6	4.2	4.6
I knew what was expected of me in this course.(Q1633)	7	8	2	1	0	0	4.3	4.6	4.5
I had a strong desire to take this course.(Q4)	8	6	3	1	0	0	4.3	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)	1	3	13	1	0	0	3.1	3.0	3.0

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Anhong Guo seemed well prepared for class meetings.(Q230)	11	6	1	0	0	0	4.7	4.8	4.8
Anhong Guo explained material clearly.(Q199)	11	6	1	0	0	0	4.7	4.7	4.7
Anhong Guo treated students with respect.(Q217)	12	5	1	0	0	0	4.8	4.8	4.9

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	10	5	3	0	0	0	4.6
Prerequisites provided adequate preparation for this course. (Q61)	10	3	3	1	0	1	4.7
The textbook made a valuable contribution to the course. (Q64)	7	0	4	0	0	7	4.7
I felt included and valued when working with other students. (Q253)	14	2	1	0	1	0	4.9
I felt comfortable asking questions in class. (Q521)	15	3	0	0	0	0	4.9
I developed confidence in my abilities as an engineer. (Q1769)	8	4	4	1	0	0	4.4
I developed the ability to solve real world engineering problems. (Q1770)	9	9	0	0	0	0	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Anhong Guo was an excellent teacher. (Q2)	12	4	2	0	0	0	4.8

University of Michigan
Winter 2023 Instructor Report
EECS 498 006 - EECS 598 003
Anhong Guo

29 out of 30 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)	19	10	0	0	0	0	4.7	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	20	6	3	0	0	0	4.8	4.1	4.2
I knew what was expected of me in this course.(Q1633)	17	10	1	1	0	0	4.6	4.3	4.6
I had a strong desire to take this course.(Q4)	17	9	3	0	0	0	4.6	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)	3	8	17	0	1	0	3.3	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
Anhong Guo seemed well prepared for class meetings.(Q230)	24	5	0	0	0	0	4.9	4.7	4.8
Anhong Guo explained material clearly.(Q199)	21	8	0	0	0	0	4.8	4.6	4.7
Anhong Guo treated students with respect.(Q217)	25	4	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)	22	5	1	0	0	0	4.9
The textbook made a valuable contribution to the course. (Q64)	9	3	3	1	0	12	4.6
Prerequisites provided adequate preparation for this course. (Q61)	13	8	1	0	0	5	4.7
I felt comfortable asking questions in class. (Q521)	23	5	0	0	0	0	4.9
I developed confidence in my abilities as an engineer. (Q1769)	19	6	3	0	0	0	4.8
I developed the ability to solve real world engineering problems. (Q1770)	20	5	3	0	0	0	4.8
I felt included and valued when working with other students. (Q253)	22	6	0	0	0	0	4.9

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Anhong Guo was an excellent teacher. (Q2)	22	5	1	0	0	0	4.9

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: 2025-01-15
Effective Term: Winter 2026

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

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Computer Science and Engineering Subject: CSE Catalog: 594	Dept (Home): Computer Science and Engineering Subject: CSE Catalog: 594
☐	☐ 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) Human-AI Interaction & Systems	Course Title (full title) Human-AI Interaction & Systems
☐	Abbreviated Title (20 char) Human-AI Interaction	Abbreviated Title (20 char) Human-AI Interaction
☐	Course Description (Please limit to 80 words and attach separate sheet if necessary) Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.	
☐	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: Computer Science and Engineering Catalog: 594

☐

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 485 and EECS 493) or Graduate Standing in CSE	Advisory Prerequisite (254 char) EECS 485
☑	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) EECS 493 (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

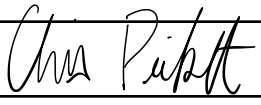
Graded Component
- ☑
- ☐
- ☐
- ☐
- ☐
- ☐

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

Cognizant Faculty Member Name: Anhong Guo Cognizant Faculty Member Title:

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

Contact Person: Ariana Powell Email: powellar@umich.edu Phone:

CoE Curriculum Committee Representative:		Print: Amir Kamil	Date: 1/17/25
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Christopher Peikert	Date: 1/16/25
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 Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.	Course Description Principles and methods of designing and evaluating human-AI interaction and systems that are useful, usable, and ethical. Topics include human-AI teaming and collaboration, crowdsourcing and human computation, explainable AI, fairness and auditing. Students will design, develop, and evaluate human-AI systems, addressing real-world needs and ethical considerations.
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:
We are moving EECS 493 to an enforced prerequisite for undergraduate students to ensure that they have sufficient preparation to take this course.

1210 LSA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148
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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: 2024-12-02
Effective Term: Fall 2025

☑	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): Entrepreneurship Subject: ENTR Catalog: 404
☐	☐ 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) Starting Your Side Hustle: E-Commerce Entrepreneurship
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) E-commerce E-ship
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Focus on the skills necessary to launch a successful e-commerce venture. Students work in teams to explore fundamentals for selling consumer products online, resulting in the creation of their own e-commerce site. Topics include basic business setup, market segmentation/forecasting, customer/competitor analysis, SEO strategy, sourcing/fulfillment planning, and social media strategy. Through case studies, speakers, individual, and group exercises, students are introduced to the online world (and pitfalls) of business, retail, and e-commerce.	
☑	Full Term Credit Hours Undergraduate Min: 2 Graduate Min: 2 Undergraduate Max: 2 Graduate Max: 2	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: 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)
☐	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: Rishi Narayan

Cognizant Faculty Member Title: LEC2

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

Contact Person: Christine Gordon Email: gordc@umich.edu Phone: 734.763.1021

CoE Curriculum Committee Representative:		Print:	Date:
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Volker Sick, CFE Faculty Director	Date: 8 Jan 2025
Cross-Listed Department Chair:	N/A	Print:	Date:
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description	Course Description Focus on the skills necessary to launch a successful e-commerce venture. Students work in teams to explore fundamentals for selling consumer products online, resulting in the creation of their own e-commerce site. Topics include basic business setup, market segmentation/forecasting, customer/competitor analysis, SEO strategy, sourcing/fulfillment planning, and social media strategy. Through case studies, speakers, individual, and group exercises, students are introduced to the online world (and pitfalls) of business, retail, and e-commerce.
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:
ENTR electives are trans-disciplinary, serving students across all engineering departments as well as students university-wide.

Effective 2018, ENTR counts for up to 4cr of undergraduate Professional or Creative Development Coursework (PCDC). This ENTR course is also recognized by the university-wide Entrepreneurship Minor Curriculum Committee as one of its approved electives.

As an ENTR 400 level offering, it is possible under Rackham requirements that the design of this course be approved by its Registrar to carry graduate credit. (https://rackham.umich.edu/academic-policies/section3/)

Special resources of facilities required for this course:
None

Supporting statement:
The CoE's Center for Entrepreneurship respectfully requests that Starting Your Side Hustle: E-Commerce Entrepreneurship be made a permanent course, ENTR 404. This course was piloted as ENTR 390 (Special Topics) Section .011; it has also been a Meet Together with ENTR 599.311 in order to include interested graduate level students.

We have seen consistently high enrollment and positive feedback from students semester after semester.

Thank you.

Semester/Instructor. Enrollment
Q1 “Overall this is an excellent course”
Q4 “I had a strong desire to take this course”

FA24/Narayan. 69 enrolled.
Q1 and Q4 End of Course data not yet available

WN24/Narayan. 62 enrolled.
Q1 (4.8)
Q4 (4.7)

FA23/Narayan. 64 enrolled.
Q1 (4.8)
Q4 (4.6)

WN23/Narayan. 66 enrolled.
Q1 (4.9)
Q4 (4.6)

FA22/Narayan. 64 enrolled.
Q1 (4.9)
Q4 (4.7)

WN22/Narayan. 68 enrolled.
Q1 (4.8)
Q4 (4.4)

FA21/Narayan. 86 enrolled.
Q1 (4.9)
Q4 (4.7)

SP21/Narayan. 21 enrolled.
Q1 (4.6)
Q4 (4.0)

WN21/Narayan. 85 enrolled.
Q1 (4.7)
Q4 (4.7)

FA20/Narayan. 57 enrolled.
Q1 (4.8)
Q4 (4.8)

WN20/Narayan. 36 enrolled.
Q1 (4.8)
Q4 (4.8)

FA19/Narayan. 46 enrolled.
Q1 (4.7)

Q4 (4.7)

WN19/Narayan. 50 enrolled.
Q1 (4.8)
Q4 (5.0)

FA18/Narayan. 46 enrolled.
Q1 (4.5)
Q4 (4.3)

WN18/Narayan. 47 enrolled.
Q1 (4.6)
Q4 (4.7)

FA17/Habeger. 18 enrolled.
Q1 (3.8)
Q4 (4.3)

WN17/Habeger. 28 enrolled.
Q1 (3.5)
Q4 (4.2)

FA16/Habeger. 28 enrolled.
Q1 (4.3)
Q4 (4.8)

WN16/Habeger. 26 enrolled.
Q1 (3.7)
Q4 (4.5)

COLLEGE OF ENGINEERING
CENTER FOR ENTREPRENEURSHIP
UNIVERSITY OF MICHIGAN

ENTR 390.011: E-Commerce Entrepreneurship ("Starting Your Side Hustle")
Fall 2024 | 2 Credit Hours
Tuesdays | 6:00pm-8:00pm
Course meeting location is listed in Wolverine Access

CFE Faculty: Rishi Narayan, M.S.E
E-Mail: narayanr@umich.edu
Instructional Aides: Sophia Severance, Tina Tran - 390attendance@umich.edu*
Office Hours: Tuesday 8-9 pm or by appointment
*Do NOT email the IA's individually, all correspondence should be to the above email address

---

Course Overview

The CFE identifies 6 behaviors of entrepreneurial mindset: opportunity identification, innovation, experimentation, relationship building, risk management and perseverance. With the increasing popularity of shows like Shark Tank and the ease of setting up an online business, people are more than ever interested in setting up their own online business. The e-Commerce Entrepreneurship course introduces students to the online world of business, retail, and commerce.

The class will equip students with the skills necessary to launch a successful venture focused in e-commerce, while addressing common challenges and pitfalls. In ENTR 390.011 you will learn the fundamentals for selling consumer products online, resulting in the creation of your own e-commerce site. Topics include: Basic Business Setup, Market Segmentation, Forecasting, Customer Analysis, Competitor Analysis, Email Marketing, Social Media Marketing, Pricing and Shipping.

Through readings, discussions, individual/group exercises, projects, presentations, flipped classroom, speakers, case studies, etc...this course will differentiate your educational experience. The Mission of the CFE is to unlock the full entrepreneurial potential at the University of Michigan by helping people to understand, experience, practice, and refine the skills needed to successfully translate their knowledge, ideas, leadership, creativity, and enthusiasm into lasting value in the world.

Entrepreneurship is about creating value for yourself and others. It involves applying learned professional skills along with interpersonal skills like creativity, persistence, and leadership. The CFE identifies 6 behaviors of Entrepreneurial Mindset: opportunity identification, innovation, experimentation, relationship building, risk management and perseverance. Beyond EM, the CFE values Maximum Positive Impact · Inclusion and Service · Accountability · Collaboration, Organization, Teamwork · Innovation and Continuous Improvement.

In this elective course you will...

- eCommerce Business Plan
- Sourcing Plan
- Fulfillment Plan
- completed website w/product photos
- marketing plan / assets
- social media account(s)
- SEO strategy
- Marketing campaign strategy

Entrepreneurship is about creating value for yourself and others. It involves applying learned professional skills along with interpersonal skills like creativity, persistence, and leadership. The CFE identifies 6 behaviors of Entrepreneurial Mindset: opportunity identification, innovation, experimentation, relationship building, risk management and perseverance. Beyond EM, the CFE values Maximum Positive Impact • Inclusion and Service • Accountability • Collaboration, Organization, Teamwork • Innovation and Continuous Improvement. ***Welcome to this course!***

Course Delivery

There will be in-person, synchronous (real-time) instruction on the scheduled meeting day/time listed for this course. This modality was published in U-M's course catalog when you enrolled. Higher ed guidelines: for every 1 contact hour anticipate 2-3 hrs of curricular engagement, including in-class lecture + in-class exercises + outside of class work.

>> Enrolled students are expected to attend in-person and engage in activities during class-time. Attendance may be taken. Please review your *entire* semester schedule: any unique overlap with the meeting pattern or deliverables of this class (religious observations, required course special exams, representing U-M in an official capacity, etc) must be presented to course faculty by U-M's Drop/Add date, so that reasonable accommodation can be discussed in advance. <<

If you have an emergency or become ill, please notify course faculty as soon as possible to determine if arrangements or accommodation can be made for an emergently missed class. (Consult with SSD for any ongoing accommodation needs).

Please note 1) class may feature group discourse and 2) class may be recorded via Lecture Capture; recordings may be linked in our course Canvas site.

*Students are prohibited from recording/distributing 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. If you do not wish to be recorded, please contact the instructor the first week of class (or as soon as you enroll in the course, whichever is latest) to discuss alternative arrangements, since ENTR lectures may be audio/video recorded and made available to other students in this course. Additional information regarding course recordings and privacy concerns can be found on the *UM ITS Recording and Privacy Concerns webpage* and *VP Public Affairs website/resources*.

Course Materials

There is no required textbook, however, throughout the semester, students will reference "Disciplined Entrepreneurship" by Bill Aulet, as well as the accompanying workbook. Various articles and podcasts will also be assigned throughout the semester.

Assessable Learning Outcomes

ENTR course projects offer exploratory learning, in order to benefit the student's development of entrepreneurial mindset. By the end of this course, students will leave the course with the ability to start their own e-commerce venture, and a working understanding of the following topics:

Estimating Startup Costs
Business Case Studies
Website Development / SEO
Presentation Style
Product Photos/Videos
Investigating Trends
Fulfillment / Logistics
Small Business Accounting
Advertising Streams
Social Media
Crowdfunding

Final Project

During the second half of the semester, the students will work individually or form into small groups and develop their own turnkey, e-commerce business. Each project will also include a required report as well as a presentation about their business and functioning website during the final class period having created the following:

- e-Commerce Business Plan
- Sourcing Plan
- Fulfillment Plan
- Completed Website w/ Product Photos
- Marketing Plan / Assets
- Social Media Account (s)
- SEO Strategy
- Marketing Campaign Strategy

Evaluation and Grading

Assignment	Points or Percentage
Class Attendance / Participation	20 pts / 10%
In Class Quizzes: 12 Quizzes, Drop 2 Lowest Scores	20 pts / 10%
Homework Assignments	80 pts / 40%
Final Project	80 pts / 40%

Extra Credit	10 pts / 5%
TOTAL	**200 pts / 100%**

Regarding letter grades and GPA, note ENTR courses fall under the College of Engineering. CoE GPA information is found at: Grades and Scholastic Standing – Bulletin

Refer to standard % scale as an example of letter grades::grade point equivalent:

94-100%	A	87-89%	B+	77-79%	C+	67-69%	D+	59% and below	E
90-93%	A-	83-86%	B	73-86%	C	63-66%	D		
		80-82%	B-	70-72%	C-	60-62%	D-		

Course Outline (subject to situational change) Calendars | Office of the Registrar

No Classes held: Monday 2 September | Labor Day
Monday-Tuesday 14-15 October | Fall Break
Wednesday-Friday 27-29 | Thanksgiving Break
The Fall 2024 semester spans 13-14 weeks

** Students, please review **all** of your course syllabi for any overlap this semester (religious observations, rep'ing U-M in an official capacity, special exams, etc). A student request of faculty for reasonable accommodation must be made by U-M's FA24 Drop/Add Deadline MON 16 September).

Class *Date*	Topics or Objectives	Prework (Readings, videos, podcasts, etc)	Class Activities & Materials (Links to lecture slides, recordings, etc)	Assignments & Assessments
1 8/27/24	- Intro to Course - Entrepreneurship Overview - Disciplined Entrepreneurship		- "Three Ways to Start A New Venture" - Quiz 1 - Start thinking about potential new ventures	Quiz 1 (If missed in-class)
2 9/3/24	- Business Formation - IP & Execution - Tax & Employees - Market Analysis: D.E. Steps 1-3		- Guest Speaker: Joe Morrison - Quiz 2	Homework Assignment #1: Market Segmentation & Beachhead Market

3 9/10/24	- Budgeting & Forecasting Deep Dive - Customer Lifetime Value: D.E. Step 17	Homework Assignment #1: Market Segmentation & Beachhead Market	Quiz 3	
4 9/17/24	- Customer Acquisition Cost: D.E. Step 19 - Third Party Marketplaces - Ecommerce Platforms		- Guest Speaker: Mike Vichich - Quiz 4	Homework Assignment #2: Retail Arbitrage
5 9/24/24	Crowdfunding	Homework Assignment #2: Retail Arbitrage	Quiz 5	
6 10/1/24	Email Marketing		Quiz 6	- Group Info Assignment - Homework Assignment #3: “From Sock Puppet to Flop” OR “Airbnb - Joe Gebbia”
7 10/8/24	- Final Project Introduction - Idea Brainstorm	- Group Info Assignment - Homework Assignment #3: “From Sock Puppet to Flop” OR “Airbnb - Joe Gebbia”	- Guest Speaker: Melanie Lo - Wix - Quiz 7	
NO CLASS FALL BREAK				
8 10/22/24	Search Engine Optimization		Quiz 8	Project Assignment #1: Overview
9 10/29/24	Social Media for Ecommerce	Project Assignment #1: Overview	- Guest Speaker: Andrew Schaberg, Dappz Sports - Quiz 9	Project Assignment #2: Draft Forecast
10 11/5/24	Shipping	Project Assignment #2: Draft Forecast	Quiz 10	
11 11/12/24	Final project Review		- Guest Speaker: TBD - Quiz 11	

12 11/26/24	Pricing		- Guest Speaker: Kevin Brehmer, DCFC - Quiz 12	Extra Credit Homework Assignment
13 12/3/24	**Final Project Presentations**	Written Final Project DUE	Presentations (SLIDES SUBMITTED BEFORE 5PM)	

Policies

- U-M Statement of Student Rights and Responsibilities (oscr.umich.edu/statement)
- Services for Students with Disabilities (ssd.umich.edu)
- CoE Academic Rules, Rights and Responsibilities – Bulletin (bulletin.engin.umich.edu/rules)
- An important component of ENTR project-based courses, real-world impact. *Student projects must comply with Federal, State, and local government guidelines,* in addition to *U-M policy*. To paraphrase CoE project guidelines, important skills developed may include:
  - Preparation of written reports and oral presentations to communicate ideas to a broad audience
  - Problem solving and the creative design process
  - Teamwork and team management
  - Decision-making skills
  - Professional responsibility
  - Societal impact and sustainability
- Enrolled students with F-1 or J-1 VISAs are to work with U-M's International Center advisors (internationalcenter.umich.edu/) and adhere to stated policies. Note: Course projects are overseen/graded by faculty and may also involve mentoring by representatives from external organizations.

University Attendance Policy

A student is expected to attend every class and laboratory for which they have registered per its listed modality in U-M Wolverine Access/Course Catalog. Course modality ensures financial aid/VISA requirements are met. Per U-M's Registrar's Office, courses are not "hybrid at will." **It is the student's responsibility to be aware of the attendance policy for this course (details below).** The instructor makes the final decision to excuse or not to excuse excessive absences. An instructor is entitled to give a failing grade (E) for excessive absences or an Unofficial Drop (UE) for a student who stops attending class at some point during the semester. U-M's semester spans 14 weeks of class sessions. Please note U-M's registration and withdrawal deadlines.

All absences must be submitted in writing at least 24 hours prior to the start of class to "390attendance@umich.edu". 2 absences will be excused (and 2 lowest quizzes will be dropped).

Technology Use During Class

Except for an emergency, cell phones should not be in sight or used in class. Please put them away before class begins. Laptops, tablets, and other electronic devices should be used only in conjunction with exercises directly related to class activity. We recognize that laptops can be a useful way to take notes or even to search out additional information. However, inappropriate use—defined as use that inhibits the learning experience for you or for others in the room—is prohibited.

Culture of Care
"Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc. If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you." If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers the following resources:

- Student Crisis Line (734) 936-3333
- Counseling and Psychological Services: caps.umich.edu; (734) 764-8312
- Consultation, Assistance and Resources in Engineering: care.engin.umich.edu
- UHS Wellness Center, for informed well-being: uhs.umich.edu/wolverine-wellness
- Resources for Student Well-being: wellbeing.studentlife.umich.edu
- Maize & Blue Cupboard (grocery access): mbc.studentlife.umich.edu
- Sexual Assault Prevention and Awareness Center: sapac.umich.edu
- Reporting and Resources for Student Sexual Misconduct
- Office of Student Conflict Resolution: oscr.umich.edu
- CoE Office of Culture, Community and Equity: culture.engin.umich.edu

All College of Engineering, Center for Entrepreneurship (CFE ENTR) curricular experiences are committed to supporting U-M's policy of equal opportunity for all persons. The true asset of this course is the diversity all students bring to it. Please feel free to contact course faculty and/or the department/unit with any problems, concerns, or suggestions. Per CoE's Director of Engineering Research, Dr. C Finelli, "*Everyone is expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the course.*"

Services for Students with Disabilities: ssd.umich.edu
"The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact Services for Students with Disabilities (734-763-3000 or ssdoffice@umich.edu). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience."

Religious - Academic Conflicts provost.umich.edu/resources-policies/calendars/ and

provost.umich.edu
"Although the University of Michigan, as an institution, does not observe religious holidays, it has long been the University's policy that every reasonable effort should be made to help students avoid negative academic consequences when their religious obligations conflict with academic requirements. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities. **It is the obligation of students to provide faculty with reasonable notice of the dates of religious holidays on which they will be absent. Such notice must be given by the drop/add deadline of the given term.** Should disagreement arise over any aspect of this policy, the parties involved should first contact the Department Chair..." (skifstad@umich.edu) and/or the Engineering Support Office - ATTN Dr. Angela Farrehi (afarrehi@umich.edu -or- engin-support@umich.edu). ENTR classes are part of the College of Engineering.

Students Representing the University in an Official Capacity Off-Campus

"There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. **It is the obligation of students to provide faculty with reasonable written notice of the dates on which they will be absent.** Absence from classes while representing the University does not relieve students from responsibility for any part of the course missed during the period of absence. Within reason, an instructor should provide appropriate arrangements to the student for missed work, providing such accommodations does not place unreasonable burden on the instructor or fundamentally alter the integrity of the course. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the course."

Academic Misconduct

"The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. **The College of Engineering, which ENTR courses fall under, promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct.** All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education/Office of the Assistant Dean of Graduate and Professional Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see bulletin.engin.umich.edu/rules."

"Referencing and validating: you are taking full responsibility for AI-generated materials as if you had produced them yourself - ideas should be attributed and facts should be true. Any and all use of machines that emulate human capabilities (ChatGPT, Stable Diffusion, DALLE, etc.) to perform assignments or other works in the course should be disclosed (this includes all graded deliverables as well as other course works and activities). An explanatory

appendix is required for each and every unique usage to describe in clear steps how such a machine was used, including which machine, iteration, editing, etc." (Note, genai.umich.edu/guidance/students).

ENTR courses are interdisciplinary, serve students University-wide, *and are* recognized by the campus-wide Provost's initiative, U-M Minor in Entrepreneurship as well as CoE's Graduate Certificate in Innovation and Entrepreneurship.

Within U-M's College of Engineering, CFE ENTR electives are recognized as Intellectual Breadth >> Professional and creative development courses. ENTR courses offer a student the opportunity to build on non-engineering and non-technical courses to develop their creativity and professional capabilities. For some departments, ENTR is recognized as "flex tech" or a "technical elective."

U-M's CFE leads with Academic, Experiential, and Career-focused programming that provides:

- Facility with, and fluency in the Entrepreneurial Mindset
- Opportunity to practice and develop Entrepreneurial Skills
- Support for Entrepreneurial Activities
- Access to Entrepreneurial Career Opportunities

"Entrepreneurship Education is the Humanities of the 21st Century!" Dr. Thomas Zurbuchen, CFE's Co-Founder.

U-M CFE contact info: entrepreneurship@umich.edu || 734.763.1021
The CFE is open during normal business hours Monday - Friday.
The CFE is located on U-M's North Campus: 2281 Bonisteel Blvd, 3350 Duderstadt Center.

********** Go BLUE! **********

University of Michigan
Fall 2023 Instructor Report
ENTR 390 011 - ENTR 599 311
Rishi Narayan

17 out of 64 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)	12	3	2	0	0	0	4.8	4.5	4.5
My interest in the subject has increased because of this course. (Q1632)	12	3	1	1	0	0	4.8	4.2	4.2
I knew what was expected of me in this course.(Q1633)	10	6	1	0	0	0	4.7	4.4	4.5
I had a strong desire to take this course.(Q4)	9	7	0	0	0	0	4.6	4.1	4.0
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)	1	8	7	1	0	0	3.6	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
Rishi Narayan seemed well prepared for class meetings.(Q230)	14	3	0	0	0	0	4.9	4.7	4.8
Rishi Narayan explained material clearly.(Q199)	14	3	0	0	0	0	4.9	4.6	4.7
Rishi Narayan treated students with respect.(Q217)	14	3	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)	12	4	1	0	0	0	4.8
The material presented in this course is also presented in other courses. (Q741)	5	4	2	2	2	2	3.9
I developed skills to serve my professional goals. (Q570)	10	6	1	0	0	0	4.7

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Rishi Narayan was an excellent teacher. (Q2)	13	3	0	0	0	0	4.9

The medians are calculated from Fall 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2024 Instructor Report
ENTR 390 011 - ENTR 599 311
Rishi Narayan

18 out of 62 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)	10	7	1	0	0	0	4.6	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	10	7	1	0	0	0	4.6	4.2	4.2
I knew what was expected of me in this course.(Q1633)	10	6	2	0	0	0	4.6	4.4	4.6
I had a strong desire to take this course.(Q4)	11	7	0	0	0	0	4.7	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)	3	7	8	0	0	0	3.6	2.9	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
Rishi Narayan seemed well prepared for class meetings.(Q230)	16	2	0	0	0	0	4.9	4.7	4.8
Rishi Narayan explained material clearly.(Q199)	14	4	0	0	0	0	4.9	4.6	4.7
Rishi Narayan treated students with respect.(Q217)	14	4	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)	12	5	1	0	0	0	4.8
The material presented in this course is also presented in other courses. (Q741)	7	5	3	1	0	2	4.3
I developed skills to serve my professional goals. (Q570)	10	8	0	0	0	0	4.6

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Rishi Narayan was an excellent teacher. (Q2)	14	3	1	0	0	0	4.9

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENTR 390 011 - ENTR 599 311
Rishi Narayan

16 out of 66 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)	10	6	0	0	0	0	4.7	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	8	6	1	0	1	0	4.5	4.1	4.2
I knew what was expected of me in this course.(Q1633)	12	4	0	0	0	0	4.8	4.3	4.6
I had a strong desire to take this course.(Q4)	9	6	1	0	0	0	4.6	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)	1	6	8	1	0	0	3.4	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
Rishi Narayan seemed well prepared for class meetings.(Q230)	13	3	0	0	0	0	4.9	4.7	4.8
Rishi Narayan explained material clearly.(Q199)	13	3	0	0	0	0	4.9	4.6	4.7
Rishi Narayan treated students with respect.(Q217)	13	2	0	1	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)	13	2	0	1	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	4	5	4	2	0	1	3.8
I developed skills to serve my professional goals. (Q570)	8	8	0	0	0	0	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Rishi Narayan was an excellent teacher. (Q2)	11	4	1	0	0	0	4.8

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 upper 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: 2024-12-03
Effective Term: Fall 2025

☑	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): Entrepreneurship Subject: ENTR Catalog: 414
☐	☐ 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) Startup Sales
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Startup Sales
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Focus on the challenges startups face in understanding customer needs and developing effective sales strategies. Learn to qualify buyers, handle objections, and present unique differentiators using a structured framework. Through collaborative activities and diverse readings, students will gain essential tools to create a lean sales strategy that optimizes resources and enhances success rates in entrepreneurial ventures.	
☑	Full Term Credit Hours Undergraduate Min: 2 Graduate Min: 2 Undergraduate Max: 2 Graduate Max: 2	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: 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)
☐	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: Ted Dacko Cognizant Faculty Member Title: LEC2

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

Contact Person: Christine Gordon Email: gordc@umich.edu Phone: 734.763.1021

CoE Curriculum Committee Representative:	Print:	Date:
CoE Curriculum Committee Chair:	Print:	Date:
Home Department Chair:	Print: Volker Sick	Date: 8 Jan 2025
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 Focus on the challenges startups face in understanding customer needs and developing effective sales strategies. Learn to qualify buyers, handle objections, and present unique differentiators using a structured framework. Through collaborative activities and diverse readings, students will gain essential tools to create a lean sales strategy that optimizes resources and enhances success rates in entrepreneurial ventures.
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:
ENTR electives are multidisciplinary, serving students across all engineering departments as well as students university-wide.

Effective 2018, ENTR counts for up to 4cr of undergraduate Professional or Creative Development Coursework (PCDC). This course is also recognized by the university-wide Entrepreneurship Minor Curriculum Committee as one of its approved electives.

As an ENTR 400 level offering, it is possible under Rackham requirements that the design of this course be approved by its Registrar to carry graduate credit. (https://rackham.umich.edu/academic-policies/section3/)

Special resources of facilities required for this course:
None

Supporting statement:
The CoE's Center for Entrepreneurship respectfully requests that Startup Sales be made a permanent course, ENTR 414. This course was piloted as ENTR 390/599 (Special Topics) Section .055.

The University and the College of Engineering value "Creativity. Innovation. Daring." In support, the CFE piloted this niche sales class in order to support students' entrepreneurially minded pursuits. This 2-credit elective explores how to talk about and scale a venture given one's limited time and collateral. Critical thinking and opportunism are soon realized.

Topics Covered:
- Introduction to Sales
- Basic Sales Concepts
- Building a Formal Sales Process
- Storytelling in Sales
- How to Conduct a Sales Discovery Call
- Qualifying Buyers and Dealing With Objections
- The Challenger Sales Model
- Crossing the Chasm. Going from a Few Customers To Scale
- How To Build a Killer Sales Presentation
- Justifying Your Solution To Buyers
- Sales Operations..The Care and Feeding of the Sales Organization
- Building a Successful Partnership Program That Produces Revenue

Having this course converted from Special Topics to permanent serves the CoE well. We have seen consistent enrollment and positive feedback from enrolled students semester after semester. Thank you.

Semester/Instructor. Enrollment.
Q1 “Overall this is an excellent course”
Q4 “I had a strong desire to take this course”

WN24/Dacko. 30 enrolled.
Q1 (4.4)
Q2 (4.2)

FA23/Dacko, 26 enrolled.
Q1 (4.9)
Q2 (4.7)

WN23/Skifstad. 23 enrolled.
Q1 (4.0)
Q2 (4.2)

COLLEGE OF ENGINEERING
CENTER FOR ENTREPRENEURSHIP
UNIVERSITY OF MICHIGAN

ENTR 390/599.055: Startup Sales

Fall 2024 | 2 Credit Hours

Thursdays | 3:30pm-5:30pm

Course meeting location is listed in Wolverine Access

CFE Faculty: Ted Dacko
E-Mail: dacko@umich.edu

Peter Thiel, a co-founder of PayPal, Palantir Technologies, and Founders Fund, and the first outside investor in Facebook says in his book *Zero To One*,

Sell. Sell. Sell.

"If you've invented something new but you haven't invented an effective way to sell it, you have a bad business -- no matter how good the product."

This is so true. Building a product is easy. Selling the product, particularly a **B2B product**, is very difficult if you don't know the basics of sales.

To be successful in a B2B enterprise, entrepreneurs must acquire and retain customers by creating, delivering, and communicating superior customer value. This course is a hands-on, team- focused, interactive immersion into the challenges and opportunities startups face when trying to understand customer needs, deliver compelling messaging and positioning, develop sales strategy, nurture customer interest development, propose pricing and other areas. While building a great product is key to every Entrepreneur's journey, every startup needs to figure out how to grow their business - typically with little or no resources and in an ever-changing environment. In this course, you will gain an appreciation of the broad array of decisions facing entrepreneurial sales professionals, ranging from how to qualify a buyer so that you don't waste time, to how to handle objections to how to present your defensible differentiation and make that the potential buyer's decision criteria.. In class, we will consider and utilize a structured framework that will help us understand how to implement these concepts. Our readings, completed outside of class, will come from a number of different sources. By the end of the course, you will possess the tools necessary to build a "lean" sales strategy that maximizes resources and the probability to succeed.

COURSE DELIVERY: There will be in-person, real-time instruction on the scheduled meeting day/time listed for this course. *It is the expectation that enrolled students will engage in class during class-time.* Attendance will be taken. Classroom Lecture Capture will be activated and Zoom

recordings may also occur. ENTR faculty verify all class recordings are linked in the semester's course Canvas site.

Topics Covered

- Introduction to Sales
- Basic Sales Concepts
- Building a Formal Sales Process
- Storytelling in Sales
- How to Conduct a Sales Discovery Call
- Qualifying Buyers and Dealing With Objections
- The Challenger Sales Model
- Crossing the Chasm. Going from a Few Customers To Scale
- How To Build a Killer Sales Presentation
- Justifying Your Solution To Buyers
- Sales Operations..The Care and Feeding of the Sales Organization
- Building a Successful Partnership Program That Produces Revenue

Course lectures may 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. If you do not wish to be recorded, please contact the instructor the first week of class to discuss alternative arrangements. 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.

COURSE APPROACH

Class meetings will include lectures, video presentations, and in-class activities, such as case discussions and experiential exercises.

ATTENDANCE

Considering a core notion of this course is interactive, attending all classes is essential. Please arrive on time so that our sessions can start promptly. If for some unavoidable reason you must miss a session, please let me know in advance - in writing - so that your absence will not be unexplained.

ORGANIZATION:

- Instructor Discussion
- Assigned outside reading
- In-Class Exercises and Simulations
- Roundtable Discussion and Presentations
- Team/Individual Project and Presentation

COURSE OBJECTIVES:

- Introduce students to the Sales role and responsibilities

- Introduce the students to the priorities of Sales in a startup
- To introduce students to the fundamentals of how to uncover buyer needs and educate them on needs that they may have not yet thought of themselves
- To impart best practices for building a formal sales process, measuring the conversion rates and times from step to step, the basics of sales methodology, building a successful partnership program, and how to help potential buyers solve problems.
- To enable students to quickly differentiate between high functioning and poor performing sales teams
- To develop an understanding of key factors that enhance or diminish the likelihood of sales success
- Develop a robust sales presentation for a business

CLASS PROJECT:

- You will work in teams. Your team will either choose or be assigned a real entrepreneurial company. Your team will prepare and deliver a full sales presentation for that company. You can choose team members or, if not, teams will be formed randomly by the instructor.

TEXT AND REQUIRED SUPPLIES:

- Internet Connected Device to Canvas

GRADING:

- Class Attendance 20%
- Class Participation 20%
- Individual Weekly Assignments 20%
- Teammates Feedback 15%
- Final Sales Pitch 25%

CODE OF CONDUCT:

- Arrive on time and ready to engage
- Be respectful of other class members and do not use electronic devices unless requested by the Instructor
- Use the time allocated for in-class assignments or project work for **those** assignments

YOUR IDEAS AND EVALUATIONS:

- Willingness to contribute and provide your own ideas and adaptations of the principles discussed in class will be important to maximizing your own abilities to apply what you are learning as the class progresses.

POLICIES: Defining a Credit Hour, Office of the Provost

UMICH Diversity, Equity, and Inclusion

Overarching Strategy 1: Create an Inclusive and Equitable Campus Climate

Overarching Strategy 2: Recruit, Retain and Develop a Diverse Community

Overarching Strategy 3: Support Innovative and Inclusive Scholarship and Teaching

http://diversity.umich.edu/about/

http://diversity.umich.edu/wp-content/uploads/2016/10/strategic-plan.pdf

https://www.engin.umich.edu/about/diversity/plan/

College of Engineering's DEI vision: A "best-in-class" institution for developing engineers who excel as multicultural technologists and leaders – intellectually and socially engaged, valued, interactive, and well connected to resources, information, each other, the College, the University, the nation and the world.

Wolverine Culture of Care

For the safety of all students, faculty, and staff on campus, it is important for each of us to be mindful of safety measures that have been put in place for our protection. By returning to campus, you have acknowledged your responsibility for protecting the collective health of our community. Your participation in this course on an in-person basis is conditional upon your adherence to all safety measures mandated by the State of Michigan and the University, including maintaining physical distancing of six feet from others and properly wearing a face covering in class. Other applicable safety measures are described in the Wolverine Culture of Care. Your ability to participate in this course in-person as well as your grade may be impacted by failure to comply with campus safety measures. Individuals seeking to request an accommodation related to the face covering requirement under the Americans with Disabilities Act should contact the Office for Institutional Equity. If you are unable or unwilling to adhere to these safety measures while in a face-to-face class setting, you will be required to participate on a remote basis (if available) or to disenroll from the class. I also encourage you to review the Statement of Students Rights and Responsibilities, which includes a COVID-related addendum.

Religious-Academic Conflicts

It is the policy of the University of Michigan to make every reasonable effort to allow members of the University community to observe their religious holidays without academic penalty. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to make-up missed academic work. It is the obligation of students to provide the instructor with reasonable notice of the dates on which they will be absent. When the absence coincides with an exam or other assignment due date, the options to make up that

missed work may be limited and will be determined by the instructor within the boundaries of the respective class.

https://provost.umich.edu/resources-policies/calendars/

Students Representing the University in an Official Capacity Off-Campus

There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. Absence from classes while representing the University does not relieve students from responsibility for any part of the course missed during the period of absence. Within reason, an instructor should provide appropriate arrangements to the student for missed work, providing such accommodations does not place unreasonable burden on the instructor or fundamentally alter the integrity of the course. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the course.

Students with Disabilities

If you think you may need an accommodation for a disability, please let the course instructor know at the beginning of the term. Next, contact the Services for Students with Disabilities (SSD) office. Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation (VISA) form and we can arrange for your accommodation. Any information you provide is private and confidential and will be treated as such. If you already have a VISA form from SSD, please present this form to me at the beginning of the term, but no later than at least two weeks prior to the need for the accommodation so that there is enough time for the appropriate arrangements to be made.

Student Mental Health and Wellbeing

University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and caps.umich.edu, during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (734) 764-8320 and uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see uhs.umich.edu/aodresources

. For a listing of other mental health resources available on and off campus, visit: umich.edu/~mhealth

Student Sexual Misconduct Policy

Title IX prohibits discrimination on the basis of sex, which includes sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We understand that sexual violence can undermine students' academic success and we encourage anyone dealing with sexual misconduct to talk to someone about their experience, so they can get the support they need. Confidential support and academic advocacy can be found with the Sexual Assault Prevention and Awareness Center (SAPAC) on their 24-hour crisis line, (734) 936-3333 and sapac.umich.edu/

Alleged violations can be non-confidentially reported to the Office for Institutional Equity (OIE) at institutional.equity@umich.edu.

Academic Misconduct

The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. The College promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct. All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see bulletin.engin.umich.edu/rules

"Entrepreneurship Education is the Humanities of the 21st Century!" Dr. Thomas Zurbuchen, CFE's Co-Founder.

U-M CFE contact info: entrepreneurship@umich.edu || 734.763.1021
The CFE is open during normal business hours Monday - Friday.
The CFE is located on U-M's North Campus: 2281 Bonisteel Blvd, 3350 Duderstadt Center.

********** Go BLUE! **********

University of Michigan
Winter 2024 Instructor Report
ENTR 390 055 - ENTR 599 055
Theodore Dacko

13 out of 30 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)	5	8	0	0	0	0	4.3	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	3	8	2	0	0	0	4.1	4.2	4.2
I knew what was expected of me in this course.(Q1633)	6	5	1	1	0	0	4.4	4.4	4.6
I had a strong desire to take this course.(Q4)	4	8	0	1	0	0	4.2	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)	3	8	2	0	0	0	4.1	2.9	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
Theodore Dacko seemed well prepared for class meetings.(Q230)	10	3	0	0	0	0	4.9	4.7	4.8
Theodore Dacko explained material clearly.(Q199)	9	4	0	0	0	0	4.8	4.6	4.7
Theodore Dacko treated students with respect.(Q217)	9	4	0	0	0	0	4.8	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)	6	7	0	0	0	0	4.4
The material presented in this course is also presented in other courses. (Q741)	3	4	3	0	2	1	3.8
I developed skills to serve my professional goals. (Q570)	6	6	1	0	0	0	4.4

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Theodore Dacko was an excellent teacher. (Q2)	7	6	0	0	0	0	4.6

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Fall 2023 Instructor Report
ENTR 390 055 - ENTR 599 055
Theodore Dacko

10 out of 26 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)	8	0	0	0	0	0	5.0	4.5	4.5
My interest in the subject has increased because of this course. (Q1632)	7	1	0	0	0	0	4.9	4.2	4.2
I knew what was expected of me in this course.(Q1633)	7	0	1	0	0	0	4.9	4.4	4.5
I had a strong desire to take this course.(Q4)	5	2	1	0	0	0	4.7	4.1	4.0
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)	1	7	0	0	0	0	4.1	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
Theodore Dacko seemed well prepared for class meetings.(Q230)	7	1	0	0	0	0	4.9	4.7	4.8
Theodore Dacko explained material clearly.(Q199)	7	1	0	0	0	0	4.9	4.6	4.7
Theodore Dacko treated students with respect.(Q217)	7	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)	7	1	0	0	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	4	1	1	1	1	0	4.5
I developed skills to serve my professional goals. (Q570)	8	0	0	0	0	0	5.0

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Theodore Dacko was an excellent teacher. (Q2)	7	1	0	0	0	0	4.9

The medians are calculated from Fall 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENTR 390 055 - ENTR 599 055
Kurt Skifstad

20 out of 23 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)	8	10	0	0	2	0	4.3	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	7	8	3	0	2	0	4.1	4.1	4.2
I knew what was expected of me in this course.(Q1633)	4	3	5	2	6	0	2.9	4.3	4.6
I had a strong desire to take this course.(Q4)	6	12	0	2	0	0	4.2	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)	2	1	10	5	2	0	2.8	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
Kurt Skifstad seemed well prepared for class meetings.(Q230)	11	6	1	1	1	0	4.6	4.7	4.8
Kurt Skifstad explained material clearly.(Q199)	8	5	4	1	2	0	4.1	4.6	4.7
Kurt Skifstad treated students with respect.(Q217)	13	6	0	0	1	0	4.7	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)	7	6	3	2	2	0	4.0
The material presented in this course is also presented in other courses. (Q741)	4	3	8	5	0	0	3.1
I developed skills to serve my professional goals. (Q570)	9	7	2	1	1	0	4.4

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Kurt Skifstad was an excellent teacher. (Q2)	6	7	4	1	2	0	3.9

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 upper 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: 2025-01-17
Effective Term: Winter 2026

☑	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): Entrepreneurship Subject: ENTR Catalog: 420
☐	☐ 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) Re-imagining Companies Through Innovation
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Reimagine Companies
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Analyze all aspects of a company, develop market intelligence, and provide advice that will reshape that company. Acquire consulting skills, technology, and market assessment, analyze privately held companies, and evaluate their capacity to innovate. This Practicum is offered in collaboration with the U-M Economic Growth Institute, which has decades of experience providing strategic guidance to manufacturing companies. Student project teams are directly involved in gathering and interpreting to recommend decisions, and help reinvent the firm.	
☑	Full Term Credit Hours Undergraduate Min: 3 Graduate Min: 3 Undergraduate Max: 3 Graduate Max: 3	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: 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)
☐	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: Parker Finn Cognizant Faculty Member Title: Adjunct

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

Contact Person: Christine Gordon Email: gordc@umich.edu Phone: 734 763 1021

CoE Curriculum Committee Representative:	Print:	Date:
CoE Curriculum Committee Chair:	Print:	Date:
Home Department Chair:	Print: Volker Sick	Date: 8 Jan '25
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 Analyze all aspects of a company, develop market intelligence, and provide advice that will reshape that company. Acquire consulting skills, technology, and market assessment, analyze privately held companies, and evaluate their capacity to innovate. This Practicum is offered in collaboration with the U-M Economic Growth Institute, which has decades of experience providing strategic guidance to manufacturing companies. Student project teams are directly involved in gathering and interpreting to recommend decisions, and help reinvent the firm.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 3
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:
ENTR electives are trans-disciplinary, serving students across all engineering departments as well as students university-wide.

Effective 2018, ENTR counts for up to 4cr of undergraduate Professional or Creative Development Coursework (PCDC). This course is also recognized by the university-wide Entrepreneurship Minor Curriculum Committee as one of its approved electives.

As an ENTR 400 level offering, it is possible under Rackham requirements that the design of this course be approved by its Registrar to carry graduate credit. (https://rackham.umich.edu/academic-policies/section3/)

Special resources of facilities required for this course:

Supporting statement:
The CoE's Center for Entrepreneurship respectfully requests that Re-imaging Companies Through Innovation (Practicum) be made a permanent course, ENTR 420. This course was piloted as ENTR 490/599 (Special Topics) Section .344.

This 3-credit course explores and demonstrates to students why critical thinking and consulting opportunities are academically, economically, and socially important to innovation and entrepreneurial ventures.

Through discussions, individual/group exercises, presentations, consulting role-play, and guest speakers, this course differentiates. Learning Objectives culminate in a multi-part action plan to address:

- Building skills to analyze and assess a company;
- Understanding the various tools utilized in analyzing a company and its industry;
- Gathering market/industry intelligence;
- Identifying solutions to reshape a company;
- Learning how to evaluate a company's innovation potential;
- Developing consulting skills including presentation, communication, and problem solving.

Having this course converted from Special Topics to permanent serves the CoE well. We have seen consistent enrollment and positive feedback from enrolled students semester after semester, owing to this robust 5-year CoE<>CFE<>EGI curricular partnership.

Semester/Faculty. Enrollment.
Q1 "Overall this is an excellent course"
Q4 "I had a strong desire to take this course"

WN24/Finn. 31 enrolled.
Q1 (4.7)
Q2 (5.0)

WN23/Finn. 27 enrolled.
Q1 (4.8
Q2 (4.9)

WN22/Finn. 23 enrolled.
Q1 (4.6)
Q2 (5.0)

WN20/Finn. 10 enrolled.
Q1 (5.0)
Q2 (5.0

WN19/Sorrell+Wilson. 17 enrolled.
Q1 (4.8)
Q2 (4.6, 4.9)

Thank you!

COLLEGE OF ENGINEERING
CENTER FOR ENTREPRENEURSHIP
UNIVERSITY OF MICHIGAN

ENTR 490.344: Reimagining Companies Through Innovation
Winter 2024 | 3 Credit Hours
Course Meeting Location: LSA 1280 and Economic Growth Institute

CFE Faculty:
Parker Finn, finnp@umich.edu

In-person and/or Virtual Office Hours:
TBD, typically available in-person after class. Available remotely via Zoom and Google Meet.

Class location:
LSA 1280. For consulting sessions, meet at Room 216, Economic Growth Institute, 506 E. Liberty Street, Ann Arbor MI- 48104
(The door on Liberty Street is locked. Use buzzer for the third floor when arriving. Take the elevator to the second floor.)

Course Delivery:
There will be in-person, synchronous (real-time) instruction on the scheduled meeting day/time listed for this course. This modality was published in U-M's course catalog when you enrolled. The CoE and CFE are committed to maintaining the agreed-upon modality after students have enrolled and instruction has commenced. Enrolled students are expected to attend in-person and engage in activities during class-time. Attendance may be taken.

If you have an emergency, become ill, or even need quarantine/recovery, please notify me as soon as possible to make arrangements for a missed class. (Consult with SSD for any ongoing accommodation needs).

Please note 1) class may feature group discourse and 2) class may be recorded via Zoom or Lecture Capture; recordings may be linked in our course Canvas site.

*Students are prohibited from recording/distributing 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.

*If you do not wish to be recorded, please contact the instructor the first week of class (or as soon as you enroll in the course, whichever is latest) to discuss alternative arrangements, since ENTR lectures may be audio/video recorded and made available to other students in this course. Additional information regarding course recordings and privacy concerns can be found on the *UM ITS Recording and Privacy Concerns webpage* and *VP Public Affairs website/resources*.

U-M CFE contact info: entrepreneurship@umich.edu || 734.763.1021
The CFE is open during normal business hours M-F. CFE is located on U-M's North Campus: 2281 Bonisteel Blvd, 3350 Duderstadt Center.

Course Overview

In this course you will learn to analyze all aspects of a company, develop market intelligence, and provide advice that will reshape a company. This class is offered in collaboration with the U-M Economic Growth Institute, which has decades of experience providing strategic guidance to small- and medium-sized companies. Working with a manufacturing company, you will be directly involved in gathering and interpreting for high-level decision making to help reinvent the firm. You will understand and apply consulting skills, technology, and market assessment, analyze privately held companies, and evaluate their capacity to innovate.

Course Pedagogy

The following sources will be used:

1. Lectures, presentations, exercises and discussions
2. Case study analysis
3. Expert guest speakers
4. Student presentations
5. Student deliverables (Industry Overview and Advisory Plans)

Learning Objectives

1. Build skills to analyze and assess a company
2. Understand the various tools utilized in analyzing a company and its industry
3. Gather market/industry intelligence
4. Identify solutions to reshape a company
5. Learn how to evaluate a company's innovation potential
6. Develop consulting skills including presentation, communication, and problem solving

Through discussions, individual/group exercises, presentations, consulting role-play, and guest speakers, this course will differentiate your educational experience. The Mission of the CFE is to unlock the full entrepreneurial potential at the University of Michigan by helping people to understand, experience, practice, and refine the skills needed to successfully translate their knowledge, ideas, leadership, creativity, and enthusiasm into lasting value in the world.

Course Materials

There are no textbooks. Recommended readings and handouts will be provided as needed prior to each class.

Evaluation and Grading

Assignment	Points or Percentage
Class Participation (attendance and involvement)	20%
Industry Overview	25%
Financial Analysis (finance terms quiz, ratios assignment)	5%
Final Report (Action Plan - divided into multiple parts)	40%
Final Presentation	10%
TOTAL	100%

Regarding letter grades and GPA, note ENTR courses fall under the College of Engineering.
CoE GPA information is found at: Grades and Scholastic Standing – Bulletin

Course Outline (subject to situational change)

Calendars | Office of the Registrar

Session	Class Date	Topics	Assignments & Assessments
1	1/11/2024	Class overview and introductions	
2	1/16/0224	Introduction to frameworks, assessing a company	Assignment 1 - apply framework exercise
3	1/18/2024	Discuss Assignment 1 Industry research part I	Assignment 1 due
4	1/23/2024	Industry research part II Market sizing exercise, Research time	Assignment 2 - market sizing exercise Assignment - Industry Overview
5	1/25/2024	Financial statements part I	Assignment 2 due
6	1/30/2024	Financial statements part II	Assignment - Financial analysis
7	2/1/2024	Financial statements hands on work part I Meet with Team Leaders	
8	2/6/2024	Financial statements hands on work part II Meet with Team Leaders	
9	2/8/2024	Financial analysis wrap-up, Intro to Advisory Plan	Industry Overview due
10	2/13/2024	Introduction Marketing and Sales	Financial analysis due
11	2/15/2024	Introduction to Advisory Plan and SWOT Preparing for first consulting meeting Exam	Financial terms exam

12	2/20/2024	Assessing the company I Meet with Team Leaders	
13	2/22/2024	Team debrief first round consulting Discuss market/product framework Team breakout	
	2/27/24	Spring Break	
	2/29/24	Spring Break	
14	3/5/2024	Assessing the company II Meet with Team Leaders	
15	3/7/2024	Guest Speaker	
16	3/12/2024	Introduction to Operations Cost-Benefit - 3 tools for recommendations	
17	3/14/2024	Introduction to advanced manufacturing (Industry 4.0)	
18	3/19/2024	SWOT to TOWS Analysis, Revisit Frameworks	Assignment - Final Report
19	3/21/2024	Assessing the company III Meet with Team Leaders	
20	3/26/2024	Guest Speaker	
21	3/28/2024	Developing your assessment: SWOT to SMART Goals, Cost-Benefit, Framing a Strategy	Assignment - Final Presentation
22	4/2/2024	Writing strategy piece and projects section, Preparing a presentation	
23	4/4/24	Guest Speaker	
24	4/9/2024	Special Topics, Employee Ownership	
25	4/11/2024	Class recap and individual work	
26	4/16/2024	Presentations	
27	4/18/2024	Presentations	
28	4/23/2024	Presentations	Final report due by last class

Policies

- U-M Health Response, and ResponsiBLUE for daily screening
  - U-M's COVID-19 Vaccination Policy (updated 8/17/22) here.
  - U-M's Face Covering Policy (updated 5/2/22) here.
- U-M Statement of Student Rights and Responsibilities
- Academic Accommodations//Services for Students with Disabilities
- CoE Academic Rules, Rights and Responsibilities – Bulletin
- An important component of ENTR project-based courses, real-world impact. *Student projects must comply with Federal, State, and local government guidelines,* in addition to *U-M policy.* To paraphrase CoE project guidelines, important skills developed may include:
  - Preparation of written reports and oral presentations to communicate ideas to a broad audience
  - Problem solving and the creative design process
  - Teamwork and team management
  - Decision-making skills
  - Professional responsibility
  - Societal impact and sustainability
- Enrolled students with F-1 or J-1 VISAs are to work with U-M's International Center advisors and adhere to stated policies, particularly related to Curricular or Optional Practical Training (CPT/OPT) and project based courses. *(Projects are overseen/graded by faculty and may also involve mentoring by representatives from external organizations).*

University Attendance Policy

A student is expected to attend every class and laboratory for which he or she has registered per its listed modality in U-M Wolverine Access/Course Catalog. Course modality ensures financial aid/VISA requirements are met. Per U-M's Registrar's Office, courses are not "hybrid at will." Each instructor will make known to the student their policy with respect to absences in the course. It is the student's responsibility to be aware of this policy. The instructor makes the final decision to excuse or not to excuse excessive absences. An instructor is entitled to give a failing grade (E) for excessive absences or an Unofficial Drop (UE) for a student who stops attending class at some point during the semester.

Student's class participation grade will include a measure of the student's attendance record.

Technology Use

Except for an emergency, or when used in a class activity (such as interacting with an online quiz), cell phones should not be in sight or used in class. Please put them away before class begins. Laptops, tablets, and other electronic devices should be used only in conjunction with exercises directly related to class activity. We recognize that laptops can be a useful way to take notes or even to search out additional information. However, inappropriate use—defined as use that inhibits the learning experience for you or for others in the room—is prohibited.

Culture of Care

Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc. If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers the following resources:

- Student Crisis Line (734) 936-3333
- Services for Students with Disabilities: ssd.umich.edu
- Counseling and Psychological Services: caps.umich.edu; (734) 764-8312

- Consultation, Assistance and Resources in Engineering: care.engin.umich.edu
- UHS Wellness Center, for informed well-being: uhs.umich.edu/wolverine-wellness
- Resources for Student Well-being: wellbeing.studentlife.umich.edu
- Maize & Blue Cupboard (grocery access): mbc.studentlife.umich.edu
- Sexual Assault Prevention and Awareness Center: sapac.umich.edu
- Reporting and Resources for Student Sexual Misconduct
- Office of Student Conflict Resolution: oscr.umich.edu

U-M DEI and CoE Office of Culture, Community and Equity

All CFE ENTR curricular experiences are committed to supporting U-M's policy of equal opportunity for all persons. The true asset of this course is the diversity all students bring to it. Please feel free to contact me with any problems, concerns, or suggestions. Per CoE's Director of Engineering Research, Dr. C Finelli, "*Everyone is expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the course.*"

Religious-Academic Conflicts

It is the policy of the University of Michigan to make every reasonable effort to allow members of the University community to observe their religious holidays without academic penalty. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to make-up missed academic work. It is the obligation of students to provide the instructor with reasonable notice of the dates on which they will be absent. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the respective class.

Students Representing the University in an Official Capacity Off-Campus (www.provost.umich.edu)

There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. Absence from classes while representing the University does not relieve students from responsibility for any part of the course missed during the period of absence. Within reason, an instructor should provide appropriate arrangements to the student for missed work, providing such accommodations does not place unreasonable burden on the instructor or fundamentally alter the integrity of the course. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the course.

Academic Misconduct

The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. The College of Engineering, which ENTR courses fall under, promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct. All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education/Office of the Assistant Dean of Graduate and Professional Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see bulletin.engin.umich.edu/rules.

ENTR courses serve students University-wide, *and are* recognized by the campus-wide, Provost's initiative, U-M Minor in Entrepreneurship as well as CoE's Graduate Certificate in Innovation and Entrepreneurship.

Within U-M's College of Engineering, CFE ENTR electives are recognized as Intellectual Breadth >> Professional and creative development courses. ENTR courses offer a student the opportunity to build on non-engineering and non-technical courses to develop their creativity and professional capabilities. For some departments, ENTR is recognized as "flex tech" or a "technical elective."

********** Go BLUE! **********

University of Michigan
Winter 2024 Instructor Report
ENTR 490 344 - ENTR 599 344
Parker Finn

14 out of 31 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)	9	4	1	0	0	0	4.7	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	7	7	0	0	0	0	4.5	4.2	4.2
I knew what was expected of me in this course.(Q1633)	9	4	1	0	0	0	4.7	4.4	4.6
I had a strong desire to take this course.(Q4)	6	6	0	2	0	0	4.3	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	10	2	1	0	2.9	2.9	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
Parker Finn seemed well prepared for class meetings.(Q230)	13	0	0	0	0	0	5.0	4.7	4.8
Parker Finn explained material clearly.(Q199)	13	0	0	1	0	0	5.0	4.6	4.7
Parker Finn treated students with respect.(Q217)	13	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)	12	1	1	0	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	4	2	4	3	0	1	3.4
I developed skills to serve my professional goals. (Q570)	9	4	1	0	0	0	4.7

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Parker Finn was an excellent teacher. (Q2)	12	1	1	0	0	0	4.9

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENTR 490 344 - ENTR 599 344
Parker Finn

16 out of 27 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)	11	5	0	0	0	0	4.8	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	10	5	0	1	0	0	4.7	4.1	4.2
I knew what was expected of me in this course.(Q1633)	12	4	0	0	0	0	4.8	4.3	4.6
I had a strong desire to take this course.(Q4)	4	9	2	1	0	0	4.1	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	2	11	3	0	0	3.0	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
Parker Finn seemed well prepared for class meetings.(Q230)	14	2	0	0	0	0	4.9	4.7	4.8
Parker Finn explained material clearly.(Q199)	14	2	0	0	0	0	4.9	4.6	4.7
Parker Finn treated students with respect.(Q217)	16	0	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)	11	4	1	0	0	0	4.8
The material presented in this course is also presented in other courses. (Q741)	2	4	5	4	1	0	3.1
I developed skills to serve my professional goals. (Q570)	10	5	1	0	0	0	4.7

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Parker Finn was an excellent teacher. (Q2)	15	0	1	0	0	0	5.0

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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2022 Instructor Report Without Comments
ENTR 490 344 - ENTR 599 344
Parker Finn

13 out of 23 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	5	0	0	0	0	4.6	4.6	4.5
My interest in the subject has increased because of this course. (Q1632)	6	6	1	0	0	0	4.4	4.2	4.2
I knew what was expected of me in this course.(Q1633)	8	5	0	0	0	0	4.7	4.6	4.4
I had a strong desire to take this course.(Q4)	7	4	2	0	0	0	4.6	4.1	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	2	11	0	0	0	3.1	3.0	3.0

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Parker Finn seemed well prepared for class meetings.(Q230)	13	0	0	0	0	0	5.0	4.8	4.7
Parker Finn explained material clearly.(Q199)	13	0	0	0	0	0	5.0	4.7	4.7
Parker Finn treated students with respect.(Q217)	13	0	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)	7	5	1	0	0	0	4.6
Students felt free to ask questions, disagree, and express ideas. (Q487)	10	3	0	0	0	0	4.9
I developed skills to serve my professional goals. (Q570)	7	6	0	0	0	0	4.6
The material presented in this course is also presented in other courses. (Q741)	4	2	4	2	0	1	3.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Parker Finn was an excellent teacher. (Q2)	13	0	0	0	0	0	5.0

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 upper 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: 2024-12-03
Effective Term: Fall 2025

☑	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): Entrepreneurship Subject: ENTR Catalog: 422
☐	☐ 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) Organizational Values and Ethics in Startups
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Org Values & Ethics
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Focus on the ethical challenges and social responsibility issues faced by entrepreneurs. Through case studies, media analyses, self-reflection exercises, and team projects, students will examine the impact of ethical decision-making on emerging ventures, company culture, DEI, and the broader community when creating services or products. The development of individual and organizational strategies for addressing the impact of these challenges will be explored. Students will gain skills to develop intentional thought, preparing them for leadership in entrepreneurial ventures.	
☑	Full Term Credit Hours Undergraduate Min: 2 Graduate Min: 2 Undergraduate Max: 2 Graduate Max: 2	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: 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)
☐	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: Alison Bailey Cognizant Faculty Member Title: Dr Bailey/LEC2

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

Contact Person: Christine Gordon Email: gordc@umich.edu Phone: 734.763.1021

CoE Curriculum Committee Representative:		Print:	Date:
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:	[signature]	Print: Volker Sick, CFE Faculty Director	Date: 8 Jan 2025
Cross-Listed Department Chair:	N/A	Print:	Date:
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description	Course Description Focus on the ethical challenges and social responsibility issues faced by entrepreneurs. Through case studies, media analyses, self-reflection exercises, and team projects, students will examine the impact of ethical decision-making on emerging ventures, company culture, DEI, and the broader community when creating services or products. The development of individual and organizational strategies for addressing the impact of these challenges will be explored. Students will gain skills to develop intentional thought, preparing them for leadership in entrepreneurial ventures.
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:
ENTR electives are trans-disciplinary, serving students across all engineering departments as well as students university-wide.

Effective 2018, ENTR counts for up to 4cr of undergraduate Professional or Creative Development Coursework (PCDC). This course is also recognized by the university-wide Entrepreneurship Minor Curriculum Committee as one of its approved electives.

As an ENTR 400 level offering, it is possible under Rackham requirements that the design of this course be approved by its Registrar to carry graduate credit. (https://rackham.umich.edu/academic-policies/section3/)

Special resources of facilities required for this course:

Supporting statement:
The CoE's Center for Entrepreneurship respectfully requests that Organizational Values in Startups be made a permanent course, ENTR 422. This course was piloted as ENTR 390/599 (Special Topics) Section 050.

The University and the College of Engineering have a mission to increase diversity, equity, and inclusion (DEI). "Diversity

broadens our perspectives and paves the way for innovation. Diverse teams get better results." In support, the CFE piloted ENTR 599.050 in WN17. In FA18 the CFE included a Meet Together section, ENTR 390.050.

This 2-credit course explores DEI and organizational values, in order to demonstrate to students why such critical thinking opportunities are academically, economically, and socially important to innovation and entrepreneurial ventures.

Course Topics and Outcomes:
- Demonstrate a greater capacity for seeing issues from different perspectives and identifying sources of bias when making ethical judgments.
- Conceptualize an understanding of how the design of an organization may support or inhibit professionals making ethical decisions.
- Upon successful completion of this course the learner will be able to:
    • Articulate a working definition of business ethics, and convey how that has societal impact.
    • Create an ethical framework for a hypothetical or real business.
    • Demonstrate awareness of the varied DEI perspectives and experiences as they relate to goal-creation within the entrepreneurship process.
    • Demonstrate the ability to self-assess and identify areas where personal and business ethics overlap and/or do not overlap.
    • Develop a personal rubric for assessing the culture and ethics of a potential employer or team.
    • Explain the value of diversity and inclusion in a workplace setting and how this relates to organizational values and ethics.

Having this course convert from Special Topics to permanent serves the CoE well. We have seen consistent enrollment and positive feedback from enrolled students semester after semester.

Thank you.

Summary Page of enrollment and student eval results (pulled from Blue).

FA24/Bailey. 35 enrolled.
End of Course data n/a.

WN24/Bailey. 37 enrolled.
Q1 "Overall this is an excellent course" (4.4)
Q4 "I had a strong desire to take this course" (3.9)

FA23/Bailey. 28 enrolled.
Q1 (5.0)
Q4 (4.6)

WN23/Bailey. 26 enrolled.
Q1 (4.9)
Q4 (3.4)

FA22/Bailey. 32 enrolled.
Q1 (4.9)
Q4 (4.2)

WN22/Bailey. 16 enrolled.
Q1 (4.3)
Q4 (4.7)

FA21/Bailey. 18 enrolled.

Q1 (4.8)
Q4 (4.3)

WN21/Bailey. 25 enrolled.
Q1 (4.3)
Q4 (4.2)

FA20/Bailey. 14 enrolled.
Q1 (4.8)
Q4 (3.8)

FA19/Bailey. 17 enrolled.
Q1 (5.0)
Q4 (4.9)

WN19/Bailey. 11 enrolled.
Q1 (4.8)
Q4 (4.5)

FA18/Bailey. 14 enrolled.
Q1 (5.0)
Q4 (4.8)

WN18/Bailey. 12 enrolled.
Q1 (4.8)
Q4 (4.8)

FA17/Bailey. 23 enrolled.
Q1 (4.8)
Q4 (4.8)

WN17/Bailey. 24 enrolled.
Q1 (4.3)
Q4 (4.6)

COLLEGE OF ENGINEERING
CENTER FOR ENTREPRENEURSHIP
UNIVERSITY OF MICHIGAN

ENTR 390/599.050: Org Management & Ethics
Fall 2024 | 2 Credit Hours
Mondays | 4:00pm-6:00pm
Course meeting location is listed in Wolverine Access

CFE Faculty: Alison Bailey, PhD; Email: acbailey@umich.edu
Instructor Assistant: Elizabeth(Liz) Camilli; Email: ecamilli@umich.edu
Faculty Office Hours: Mondays by appointment. Note Zoom at U-M for virtual office hours
Class Location: School of Kinesiology – 830 N. University. Room 2600

Course Overview

It's been shown that diversity drives creativity and innovation, makes teams smarter and more effective, and leads to better outcomes for organizations. Leaders who prioritize inclusivity also know how to leverage talents, skills, and knowledge to make an impact and achieve their goals. Working in teams, students will be tasked to explore, and research such topics as the **ethics, values, and social responsibility** of a start-up/organization. Discussions, class participation, and group assignments will ask for innovative thought and critical thinking resulting in two team assignments and a final team project for in-class presentations..

Throughout the semester, you will develop the knowledge necessary to create workplaces and communities that value DEI by building on UM's current efforts, and further launch yourself/your entrepreneurial endeavors with a stronger DEI mindset. The skills gained in this course will serve you well as current students and help you be an agent of change in your future careers.

In this course, students will:

- Read the assigned reading materials
- Complete pre-class assignments / reading to participate in in-class discussion
- Work in teams to create thoughtful, innovative class assignments.
- Explore how ethics and social responsibility proactively develop a start-up and/or an established the company's mission, making better decisions and leading to better products/services.

Entrepreneurship is about creating value for yourself and others. It involves applying learned professional skills along with interpersonal skills like creativity, persistence, and leadership. The CFE identifies 6 behaviors of Entrepreneurial Mindset: opportunity identification, innovation, experimentation, relationship building, risk management and

perseverance. Beyond EM, the CFE values Maximum Positive Impact • Inclusion and Service Accountability • Collaboration, Organization, Teamwork • Innovation and Continuous Improvement.

Welcome to Class!

Course Delivery

Attendance – This is an in-person, synchronous (real-time) course. This modality was published in U-M's course catalog when you enrolled. Higher ed guidelines: for every 1 credit hour anticipate 2-3 hrs. of curricular engagement, including in-class lectures + in-class exercises + outside of class work.

Enrolled students are expected to attend in person and engage in activities during class time. Attendance will be taken. Please review your *entire* semester schedule: any unique overlap with the meeting pattern or deliverables of this class (religious observations, required course special exams, representing U-M in an official capacity, etc) must be presented to course faculty by U-M's Drop/Add date so that reasonable accommodation can be discussed in advance.

Beginning Monday, September 9, all students are allowed up to two (2) absences from class, for any reason. For any absences beyond two classes, 1 percent will be deducted from the student's overall grade. For example, if a student misses two (2) classes, after their allotted absences (after September 9), 2 percentage points will be deducted from their overall grade.

If you have an emergency or become ill, please notify course faculty as soon as possible to determine if arrangements or accommodations can be made for an emergently missed class. (Consult with SSD for any ongoing accommodation needs).

Please note 1) the class may feature group discourse and 2) the class may be recorded via Lecture Capture; recordings may be linked in our course Canvas site.

*Students are prohibited from recording/distributing 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. If you do not wish to be recorded, please contact the instructor the first week of class (or as soon as you enroll in the course, whichever is the latest) to discuss alternative arrangements, since ENTR lectures may be audio/video recorded and made available to other students in this course. Additional information regarding course recordings and privacy concerns can be found on the *UM ITS Recording and Privacy Concerns webpage* and *VP Public Affairs website/resources*.

Learning Objectives

1. *Conceptualize an understanding of how the design of an organization may support or inhibit professionals from making ethical decisions.*

2. *Demonstrate a greater capacity for seeing issues from different perspectives and identifying sources of bias when making ethical judgments.*

3. *Upon successful completion of this course the learner will be able to*

    a. *Articulate a working definition of business ethics.*
    b. *Create an ethical framework for a hypothetical or real business.*
    c. *Demonstrate awareness of the varied perspectives, experiences, and goals in the ENTR process.*
    e. *Demonstrate the ability to self-assess and identify areas where personal and business ethics overlap and/or do not overlap.*
    g. *Develop a personal rubric for assessing the culture and ethics of a potential employer or team.*
    h. *Explain the value of diversity and inclusion in a business setting and how this relates to organizational values and ethics.*

COURSE PEDAGOGY

The CFE identifies 6 behaviors of entrepreneurial mindset: opportunity identification, innovation, experimentation, relationship building, risk management and perseverance. In this elective course, in the development of business ethics, company social responsibility, and the ethical dilemmas faced by entrepreneurs, their impact on start-ups and the broader community are explored through case studies, media, critical and intentional thinking through dialogue, and the creation of team projects (relationship building, experimentation). This course prepares students to address ethical decision-making in the workplace by providing an opportunity to first analyze ethical dilemmas, concepts, and ideas to then develop individual and organizational strategies for addressing ethical competencies (risk management and perseverance). Students draw on insights from other courses, real-life experiences, real-world companies, and course content (opportunity identification). The course includes self-reflective exercises, development, analytical and practical skills for understanding the value of workplace ethics (innovation).

This course will:

1. *Explore the relationship between ethics and the organization.*

2. *Assess one's ethical competence and discern how to strengthen this capacity best.*

3. *Explore values, ethics, and company responsibility*

4. *Analyze an organization's decision-making and policy-making processes within an ethical framework. (The final project)*

Course Materials

There are no textbooks for this course. Students will be required to utilize the library (online or in-person) for scholarly articles related to project work and watch preassigned educational videos for thoughtful in-class discussions, individual journaling, and team project work.

Student Behavior Expectations and Rules

It is my goal to promote an inclusive, accepting environment in this course. As the topics of ethics, social responsibility, leadership, diversity, equity, and inclusion can be extremely personal and subjective, all participants will be expected to:

1. *Actively and patiently listen*
2. *This is a safe space - Ridiculing others when another person is sharing thoughts or experiences will not be accepted*
3. *Take the experiences and perspectives of others into consideration while listening and before speaking*
4. *Step out of the class when responding to emergency phone calls*
5. *Be respectful of your team's time and work. Follow up with assigned tasks, and contribute to team projects within 24 hours or otherwise agreed to.*
6. ***There are no 'make-up' or replacement assignments if a class is missed***
7. *Other expectations as established collaboratively.*

Evaluation and Grading

Assignment / Project Description	***Due Date***	***% of Grade***
In-class Contributions to Discussion – illustrated by in-class discussion, presentations, and weekly written reflections. ***Weekly written Reflection defined:*** *1 to 2 typed ideas, thoughts, or questions that the week's in-class activities generated for you. Due every Tuesday (by 10:00 PM submit to Canvas). In sentence format.* ***Reflections*** *are to be submitted/uploaded to Canvas* ***September 9 - October 28*** *for a total of 7 submissions; Fall break not included – October 14.*	*Each week - for 7 weeks*	*10.5%*
Exploration Reflection Interview (discussion) *–On* ***November 4*** *(or before) Set up a 30-minute interview with someone (a fellow student; friend, family member, etc.) and ask:* ***How would you describe organizational ethics?*** *From the knowledge gained from that meeting, submit your final Reflection* ***due November 6****. As you talk with the interviewee, consider the type of company you want to create for your final project.* ** (****Late Reflection submissions receive a grade of zero after Thursday 5:00 PM****)*	*One Interview – using class time on Monday, November 4.* ***Reflection Interview submission due November 6***	*4.5%*
Presentation #1 - *Should society treat entrepreneurs differently because of their contributions to society and the economy? Why or why not?* ***Instructions:*** *The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question.* ***Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.*** *The outline should include at least one scholarly reference used to*	***October 7*** *(by 10:00 PM submitted/uploaded to Canvas)* **** ****Students must be in person to present on the day of class to receive their grade. No exceptions.*	*25%*

develop the assignment.		
Presentation #2 *- Should businesses sacrifice ethics for innovation? What are the circumstances for why or why not?* ***Instructions:*** *The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question.* ***Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.*** *The outline should include at least one scholarly reference used to develop the assignment.*	***November 11*** *(by 10:00 PM submitted/ uploaded to Canvas)* **** ****Students must be in person to present on the day of class to receive their grade. No exceptions*	*25%*
Final Team Project Outline DUE – *Create your Team Start-Up - Outline how a start-up instills its values, business ethics, and company social responsibility into its developing organization.* ***Final Project Presentation should include:*** *(1) a summary description of the start-up/organization; (2) a mission statement; (3) values and ethics; (4) explain how the company ethics influences decision-making; (5) explain how the company's values affect its employee - consider DEI; (6) explain how the company ethics affects its community and/or society; and (7) provide a conclusion / final thought.* ***Instructions:*** *The team works together to complete the final project. Each team member must individually present for approximately 5 minutes.* ***Write and submit an outline (no more than 2 pages) to Canvas – 12 Font Print – double spaced – do not PDF.*** *The outline should include at least two scholarly references used to develop the assignment.*	***December 2*** *(by 10:00 PM submitted/uploaded to Canvas)* ***December 9*** *- Students must be in person to present on the day of class to receive their grade. No exceptions.*	*25%* *10%*
TOTAL		***100%***

Regarding letter grades and GPA, note ENTR courses fall under the College of Engineering. CoE GPA information is found at: [Grades and Scholastic Standing – Bulletin]

Grading Scale

Grade	*Percentage*
A+	*97-100%*
A	*93-96%*
A-	*90-92%*
B+	*87-89%*
B	*83-86%*
B-	*80-82%*
C+	*77-79%*
C	*73-76%*
C-	*70-72%*
D+	*67-69%*
D	*63-66%*
D-	*60-62%*
F	*Below 60%*

Course Outline (subject to situational change) ***Calendars | Office of the Registrar***
******** *Students, review* ***all*** *of your course syllabi for any exam or final presentation overlap this semester. Accommodations must be made well in advance, in transparency of all effected courses/course faculty.*

Per U-M's Registrar//Special Examinations:
*"Special examinations are pre-arranged for certain courses, primarily large multi-section courses. If there is a conflict between a special exam and a regular exam, the course administering the special exam is responsible for arranging alternate dates and/or times. Students with special examination conflicts should contact the department or faculty member." ***

Assessable Learning Outcomes

Course Outline (subject to situational change) Calendars | Office of the Registrar
No Classes held: Monday 2 September | Labor Day
Monday-Tuesday 14-15 October | Fall Break
Wednesday-Friday 27-29 | Thanksgiving Break
The Fall 2024 semester spans 13-14 weeks

** Students, please review **all** of your course syllabi for any overlap this semester (religious observations, rep'ing U-M in an official capacity, special exams, etc). A student request of faculty for reasonable accommodation must be made by U-M's FA24 Drop/Add Deadline MON 16 September).

Aug. 26	Define: *What is ethics?* Standards of moral behavior - behavior accepted by society as right versus wrong.	Class introduction; review syllabus in detail; become familiar with terms (values, ethics, social responsibility, company culture, etc.) Milestone (1): Students understand the syllabus and understand the course, assignments, deadlines, and expectations of the course. Milestone (2): Students meet and orient to group members. As a team begin thinking and plan on how to complete Assignment #1. Assignment roles should be decided upon by the end of the week. Milestone (3): Student begins to develop an educated opinion about ethics as it relates to business and start-ups	Class introductions and general discussion of ethics and moral behavior Discussion: Why study organizational ethics? Group formation for assignments
Sept. 2	Labour Day	No Classes	Labour Day
Sept. 9	Define: *What is business ethics?* Standards of moral behavior -	In-class group discussion in preparation for assignment #1 - **Should society treat entrepreneurs differently because of their contributions to**	Discussion: Why study organizational ethics? What has been your experience with ethics?

	behavior accepted by society as right versus wrong.	**society and the economy? Why or why not?** In class group work session **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* Milestone (1): Continue team discussion and brainstorm for Assignment #1 due Sept.30. Milestone (2): Students have a better understanding of what motivates people to be honest in business **Begin** *Submit weekly reflection to Canvas by Tuesday (10:00PM)	
Sept. 16	Focus: How can a start-up / company proactively develop its ethics and values?	**Presentation #1 -** Should society treat entrepreneurs differently because of their contributions to society and the economy? Why or why not? **Instructions:** The team works together to present a response to the question. Each team member must	Explore ethics and values within a start-up / company. What is the value of Social Responsibility?

		individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Submit weekly reflection to Canvas by Tuesday (10:00PM)	
Sept. 23	Focus: How can a start-up / company proactively develop its ethics and values?	**Presentation #1 -** Should society treat entrepreneurs differently because of their contributions to society and the economy? Why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Submit weekly reflection to Canvas by Tuesday	Explore ethics and values within a start-up/company. What has been your experience with ethics?

		(10:00 PM) Milestone (1): Assignment #1 submitted/uploaded to Canvas. Milestone (2): student has a better understanding and an educated opinion on how to build a company culture *Submit weekly reflection to Canvas by Tuesday (10:00PM)	
Sept. 30	Explore: Ethical Standards	**Presentation #1 -** Should society treat entrepreneurs differently because of their contributions to society and the economy? Why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Submit weekly Reflection to Canvas by Tuesday (10:00 PM) Milestone (1): Assignment #1 submitted/uploaded to Canvas. Milestone (2): student has	Consider what motivates an organization's leaders to be good company citizens

		a better understanding and an educated opinion on how to build a company culture *** *Each student must be in person to present on the day of class to receive your grade. No exceptions***	

Oct. 7	Explore: Ethical Standards **Group Presentations**	**Presentation #2** - Should businesses sacrifice ethics for innovation? What are the circumstances for why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Submit weekly reflection to Canvas by Tuesday (10:00 PM) Milestone (1): Continue teamwork to complete Assignment #2 Milestone (2): Students can conceptualize the ways in which businesses have positive effects on society and solve problems on a macro level. *Assignment presentations today – 10/7*	Consider what motivates an organization's leaders to be good company citizens

Oct. 14	**Fall Break**	**Fall Break**	**Fall Break**
Oct. 21	Develop: Cultural Fit	(1) Working in Groups (**in-class group work only**) - *During the Interview process, how can you explore the values of an organization? How do you determine if the start-up/organization is a good fit for you?* **Instructions:** Groups will brainstorm ideas and share with class (2) **Assignment #2** - Should businesses sacrifice ethics for innovation? What are the circumstances for why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Submit weekly reflection to Canvas by Tuesday (10:00PM) Milestone (1): Students can differentiate which type of organization/start-up they would desire to	Consider how you find a good culture fit for a potential job

		work for by evaluating such concepts as company mission, values, etc.	
Oct. 28	Explore: Values and DEI	(1) How does an organization/institution show that 'people matter' (i.e. employees, faculty students)?– Consider diversity, equity, and inclusion (DEI) – **in-class group work only** *Teams should be prepared to report out their work to the entire class.* (2) **Presentation #2** - Should businesses sacrifice ethics for innovation? What are the circumstances for why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The*	Should a company include DEI as part of its values and mission?

		outline should include at least one scholarly reference used to develop the assignment. *Submit weekly reflection to Canvas by Tuesday (10:00PM) Milestone (1): Students have developed an educated opinion on how DEI connects with the organization including its ethics. Milestone (2): Begin group discussion and plans to complete Final Project Due: 12/2. Decide and confirm role assignments. ***Each student must be in person to present on the day of class to receive their grade. No exceptions***	
Nov. 4	**Reflection Interview** (**No Class in Session**)	**Exploration Reflection Interview** – On **November 4,** or before, set up a 30-minute interview with someone (a fellow student; friend, family member, etc.) and ask: ***How would you define organizational ethics?*** From the knowledge gained from that meeting submit your final Reflection ***due November 6 (10:00 PM)***. As you talk with the interviewee, consider the type of company you want	Class time allotted for Reflection Interview

		to create for your final project. ***The entire class time will be given to complete the interview***	
Nov. 11	Building a Company Culture **Group Presentations**	(3) **Presentation #2** - Should businesses sacrifice ethics for innovation? What are the circumstances for why or why not? **Instructions:** The team works together to present a response to the question. Each team member must individually present for approximately 2 minutes in response to the question. **Write and submit a One-page outline to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least one scholarly reference used to develop the assignment.* *Milestone (2): Student can articulate the importance of ethical decision-making in AI *Assignment presentation today– 11/11*	Have the values of the leaders been inoculated into the fabric of the organization such as its written policies? Are ethical behaviors modeled by its founders/leaders? *Class time provided to work in teams for the final project.*

Nov. 18	Building a Company Culture	**Final Team Presentation –** Create your Team Start-Up - *Outline how a start-up instills its values, business ethics, and company social responsibility into its developing organization.* **The final project presentation should include:** (1) a summary description of the start-up/organization; (2) a mission statement; (3) values and ethics; (4) explain how the company ethics influences decision-making; (5) explain how the company's values affect its employee - consider DEI; (6) explain how the company ethics affects its community and/or society; and (7) provide a conclusion / final thought. **Instructions:** The team works together to complete the final project. Each team member must individually present for approximately 5 minutes. **Write and submit an outline (no more than 2 pages) to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least two scholarly references used to develop the assignment.* Milestone: (1) Final Project	Have the values of the leaders been inoculated into the fabric of the organization such as its written policies? Are ethical behaviors modeled by its founders/leaders?

		submitted/uploaded to Canvas. Milestone (2) Teams work to prepare for presentation/report out to the entire class on 12/9 Milestone (3): Students can articulate how a start-up instills its values, business ethics, and company social responsibility into their developing organization	
Nov. 25	Building a Company Culture	**Final Team Presentation –** Create your Team Start-Up - *Outline how a start-up instills its values, business ethics, and company social responsibility into its developing organization*. **The final project presentation should include:** (1) a summary description of the start-up/organization; (2) a mission statement; (3) values and ethics; (4) explain how the company ethics influences decision-making; (5) explain how the company's values affect its employee - consider DEI; (6) explain how the company ethics affects its community and/or society; and (7) provide a conclusion / final thought. **Instructions:** The team works together to complete the final project. Each team member must individually present for approximately 5	Have the values of the leaders been inoculated into the fabric of the organization such as its written policies? Are ethical behaviors modeled by its founders/leaders?

		minutes. **Write and submit an outline (no more than 2 pages) to Canvas – 12 Font Print – double spaced – do not PDF.** *The outline should include at least two scholarly references used to develop the assignment.* Milestone (1): Team presentation Milestone (2): Students share final reflections verbally. Milestone (3): Student can articulate how a start-up instills its values, business ethics, and company social responsibility into their developing organization Milestone (4): enjoy sharing your hard work. •	
Dec. 2	Building a Company Culture	***Final Project Outline due -Dec.2 -10:00 PM***	Have the values of the leaders been inoculated into the fabric of the organization such as its written policies? Are ethical behaviors modeled by its founders/leaders?
Dec. 9	**Group Presentations**	***Groups will present their group projects to the entire class*** Milestone (1): Team presentation Milestone (2): Students share final reflections verbally Milestone (3): Students	

		can articulate how a start-up instills its values, business ethics, and company social responsibility into their developing organization Milestone (4): enjoy sharing your hard work. ***Each student must be in person to present on the day of class to receive your grade. No exceptions***	

Policies

- U-M Statement of Student Rights and Responsibilities (oscr.umich.edu/statement)
- Services for Students with Disabilities (ssd.umich.edu)
- CoE Academic Rules, Rights and Responsibilities – Bulletin (bulletin.engin.umich.edu/rules)
- An important component of ENTR project-based courses, real-world impact. *Student projects must comply with Federal, State, and local government guidelines,* in addition to *U-M policy*. To paraphrase CoE project guidelines, important skills developed may include:
  - Preparation of written reports and oral presentations to communicate ideas to a broad audience
  - Problem solving and the creative design process
  - Teamwork and team management
  - Decision-making skills
  - Professional responsibility
  - Societal impact and sustainability
- Enrolled students with F-1 or J-1 VISAs are to work with U-M's International Center advisors (internationalcenter.umich.edu/) and adhere to stated policies. Note: Course projects are overseen/graded by faculty and may also involve mentoring by representatives from external organizations.

University Attendance Policy
A student is expected to attend every class and laboratory for which they have registered per its listed modality in U-M Wolverine Access/Course Catalog. Course modality ensures financial aid/VISA requirements are met. Per U-M's Registrar's Office, courses are not "hybrid at will." **It is the student's responsibility to be aware of the attendance policy for this course (details below).** The instructor makes the final decision to excuse or not to excuse excessive absences. An instructor is entitled to give a failing grade (E) for excessive absences or an Unofficial Drop (UE) for a student who stops attending class at some point during the semester. U-M's semester spans 14 weeks of class sessions. Please note U-M's registration and withdrawal deadlines.

- ***Beginning Monday, September 9, all students are allowed up to two (2) absences from class, for any reason. For any absences beyond two classes, 1 percent will deducted from the student's overall grade. For example, if a student misses two (2) classes, after their allotted absences (after September 9), 2 percentage points will be deducted from their overall grade.***

Technology Use During Class
Except for an emergency, cell phones should not be in sight or used in class. Please put them away before class begins. Laptops, tablets, and other electronic devices should be used only in conjunction with exercises directly related to class activity. We recognize that laptops can be a useful way to take notes or even to search out additional information. However, inappropriate use—defined as use that inhibits the learning experience for you or for others in the room—is prohibited.

Culture of Care
"Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc. If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you." If the source of your stressors is academic, please contact me so that we can find solutions together. For personal concerns, U-M offers the following resources:

- Student Crisis Line (734) 936-3333
- Counseling and Psychological Services: caps.umich.edu; (734) 764-8312
- Consultation, Assistance and Resources in Engineering: care.engin.umich.edu
- UHS Wellness Center, for informed well-being: uhs.umich.edu/wolverine-wellness
- Resources for Student Well-being: wellbeing.studentlife.umich.edu
- Maize & Blue Cupboard (grocery access): mbc.studentlife.umich.edu
- Sexual Assault Prevention and Awareness Center: sapac.umich.edu
- Reporting and Resources for Student Sexual Misconduct
- Office of Student Conflict Resolution: oscr.umich.edu
- CoE Office of Culture, Community and Equity: culture.engin.umich.edu

All College of Engineering, Center for Entrepreneurship (CFE ENTR) curricular experiences are committed to supporting U-M's policy of equal opportunity for all persons. The true asset of this course is the diversity all students bring to it. Please feel free to contact course

faculty and/or the department/unit with any problems, concerns, or suggestions. Per CoE's Director of Engineering Research, Dr. C Finelli, "*Everyone is expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the course.*"

Services for Students with Disabilities: ssd.umich.edu
"The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact Services for Students with Disabilities (734-763-3000 or ssdoffice@umich.edu). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience."

Religious - Academic Conflicts provost.umich.edu/resources-policies/calendars/ and provost.umich.edu
"Although the University of Michigan, as an institution, does not observe religious holidays, it has long been the University's policy that every reasonable effort should be made to help students avoid negative academic consequences when their religious obligations conflict with academic requirements. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities. **It is the obligation of students to provide faculty with reasonable notice of the dates of religious holidays on which they will be absent. Such notice must be given by the drop/add deadline of the given term.** Should disagreement arise over any aspect of this policy, the parties involved should first contact the Department Chair..." (skifstad@umich.edu) and/or the Engineering Support Office - ATTN Dr. Angela Farrehi (afarrehi@umich.edu -or- engin-support@umich.edu). ENTR classes are part of the College of Engineering.

Students Representing the University in an Official Capacity Off-Campus
"There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. **It is the obligation of students to provide faculty with reasonable written notice of the dates on which they will be absent.** Absence from classes while representing the University does not relieve students from responsibility for any part of the course missed during the period of absence. Within reason, an instructor should provide appropriate arrangements to the student for missed work, providing such accommodations does not place unreasonable burden on the instructor or fundamentally alter the integrity of the course. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the course."

Academic Misconduct

"The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. **The College of Engineering, which ENTR courses fall under, promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct.** All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education/Office of the Assistant Dean of Graduate and Professional Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see bulletin.engin.umich.edu/rules."

"Referencing and validating: you are taking full responsibility for AI-generated materials as if you had produced them yourself - ideas should be attributed and facts should be true. Any and all use of machines that emulate human capabilities (ChatGPT, Stable Diffusion, DALLE, etc.) to perform assignments or other works in the course should be disclosed (this includes all graded deliverables as well as other course works and activities). An explanatory appendix is required for each and every unique usage to describe in clear steps how such a machine was used, including which machine, iteration, editing, etc." (Note, genai.umich.edu/guidance/students).

ENTR courses are interdisciplinary, serve students University-wide, *and are* recognized by the campus-wide Provost's initiative, U-M Minor in Entrepreneurship as well as CoE's Graduate Certificate in Innovation and Entrepreneurship.

Within U-M's College of Engineering, CFE ENTR electives are recognized as Intellectual Breadth >> Professional and creative development courses. ENTR courses offer a student the opportunity to build on non-engineering and non-technical courses to develop their creativity and professional capabilities. For some departments, ENTR is recognized as "flex tech" or a "technical elective."

U-M's CFE leads with Academic, Experiential, and Career-focused programming that provides:

- Facility with, and fluency in the Entrepreneurial Mindset
- Opportunity to practice and develop Entrepreneurial Skills
- Support for Entrepreneurial Activities
- Access to Entrepreneurial Career Opportunities

"Entrepreneurship Education is the Humanities of the 21st Century!" Dr. Thomas Zurbuchen, CFE's Co-Founder.

U-M CFE contact info: entrepreneurship@umich.edu || 734.763.1021

The CFE is open during normal business hours Monday - Friday.

The CFE is located on U-M's North Campus: 2281 Bonisteel Blvd, 3350 Duderstadt Center.

****************************** Go **BLUE!** ***********************************

University of Michigan
Winter 2024 Instructor Report
ENTR 390 050 - ENTR 599 050
Alison Bailey

12 out of 37 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)	3	9	0	0	0	0	4.2	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	3	9	0	0	0	0	4.2	4.2	4.2
I knew what was expected of me in this course.(Q1633)	8	4	0	0	0	0	4.8	4.4	4.6
I had a strong desire to take this course.(Q4)	2	7	1	1	1	0	3.9	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)	3	8	1	0	0	0	4.1	2.9	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
Alison Bailey seemed well prepared for class meetings.(Q230)	9	3	0	0	0	0	4.8	4.7	4.8
Alison Bailey explained material clearly.(Q199)	8	3	1	0	0	0	4.8	4.6	4.7
Alison Bailey treated students with respect.(Q217)	10	2	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)	5	6	0	0	0	0	4.4
The material presented in this course is also presented in other courses. (Q741)	2	6	2	1	0	1	3.9
I developed skills to serve my professional goals. (Q570)	3	6	3	0	0	0	4.0

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Alison Bailey was an excellent teacher. (Q2)	9	3	0	0	0	0	4.8

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Fall 2023 Instructor Report
ENTR 390 050 - ENTR 599 050
Alison Bailey

8 out of 28 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)	3	4	1	0	0	0	4.3	4.5	4.5
My interest in the subject has increased because of this course. (Q1632)	3	4	0	1	0	0	4.3	4.2	4.2
I knew what was expected of me in this course.(Q1633)	5	3	0	0	0	0	4.7	4.4	4.5
I had a strong desire to take this course.(Q4)	4	2	1	0	0	0	4.6	4.1	4.0
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	1	0	0	0	4.3	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
Alison Bailey seemed well prepared for class meetings.(Q230)	8	0	0	0	0	0	5.0	4.7	4.8
Alison Bailey explained material clearly.(Q199)	8	0	0	0	0	0	5.0	4.6	4.7
Alison Bailey treated students with respect.(Q217)	7	0	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)	7	0	0	0	0	0	5.0
The material presented in this course is also presented in other courses. (Q741)	2	3	2	0	0	0	4.0
I developed skills to serve my professional goals. (Q570)	2	5	0	0	0	0	4.2

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Alison Bailey was an excellent teacher. (Q2)	7	0	0	0	0	0	5.0

The medians are calculated from Fall 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENTR 390 050 - ENTR 599 050
Alison Bailey

11 out of 26 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)	4	6	1	0	0	0	4.3	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	4	5	2	0	0	0	4.2	4.1	4.2
I knew what was expected of me in this course.(Q1633)	6	4	1	0	0	0	4.6	4.3	4.6
I had a strong desire to take this course.(Q4)	1	4	6	0	0	0	3.4	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	6	5	0	0	0	3.6	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
Alison Bailey seemed well prepared for class meetings.(Q230)	7	3	1	0	0	0	4.7	4.7	4.8
Alison Bailey explained material clearly.(Q199)	7	3	1	0	0	0	4.7	4.6	4.7
Alison Bailey treated students with respect.(Q217)	9	2	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)	9	1	1	0	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	3	3	1	1	0	3	4.2
I developed skills to serve my professional goals. (Q570)	6	3	1	0	0	1	4.7

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Alison Bailey was an excellent teacher. (Q2)	8	2	1	0	0	0	4.8

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 upper 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: 2024-12-03
Effective Term: Fall 2025

☑	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): Entrepreneurship Subject: ENTR Catalog: 423
☐	☐ 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) Leading an Entrepreneurial Team
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Leading Teams
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Future entrepreneurs are taught how to identify and prioritize the "who" (human capital), the "what" (skills), and the "why" needed for business growth. Students will learn how to establish and promote a high-performing company culture, essential for leading successful entrepreneurial ventures. Coursework involves case studies in organizational structure and development, and active role-play exercises. Learn the fundamentals of the CEO role, establishing and protecting a startup culture, and best practices in recruiting, interviewing, and managing an organization.	
☑	Full Term Credit Hours Undergraduate Min: 2 Graduate Min: 2 Undergraduate Max: 2 Graduate Max: 2	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: 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)
☐	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: Ted Dacko

Cognizant Faculty Member Title: LEC2

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

Contact Person: Christine Gordon Email: gordc@umich.edu Phone: 734.763.1021

CoE Curriculum Committee Representative:		Print:	Date:
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Volker Sick, CFE Faculty Director	Date: 8 Jan 2025
Cross-Listed Department Chair:	N/A	Print:	Date:
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:	Requested:
Course Description	Course Description Future entrepreneurs are taught how to identify and prioritize the "who" (human capital), the "what" (skills), and the "why" needed for business growth. Students will learn how to establish and promote a high-performing company culture, essential for leading successful entrepreneurial ventures. Coursework involves case studies in organizational structure and development, and active role-play exercises. Learn the fundamentals of the CEO role, establishing and protecting a startup culture, and best practices in recruiting, interviewing, and managing an organization.
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:
ENTR electives are trans-disciplinary, serving engineering students across departments as well as students university-wide.

Effective 2018, ENTR counts for up to 4cr of undergraduate Professional or Creative Development Coursework (PCDC). This course is also recognized by the university-wide Entrepreneurship Minor Curriculum Committee as one of its approved electives.

As an ENTR 400 level offering, it is possible under Rackham requirements that the design of this course be approved by its Registrar to carry graduate credit. (https://rackham.umich.edu/academic-policies/section3/)

Special resources of facilities required for this course:
None

Supporting statement:
The CoE's Center for Entrepreneurship respectfully requests that Leading an Entrepreneurial Team be made a permanent course, ENTR 423. This course was founded by the CFE's former Executive Director and piloted as ENTR 490 (Special Topics) Section .014.

The University and the College of Engineering have a mission to shape students as Leaders and Best. In support of this, the CFE piloted ENTR 490.014 in WN16.

This 2-credit course guides students into new ways of looking at leadership roles, and demonstrates why such critical thinking opportunities are academically, strategically, and socially important to innovation and entrepreneurial ventures.

Course Topics include:
- the Founder/CEO role and responsibilities;
- understanding priorities and responsibilities of board members;
- how to identify their own values and leadership style and build a complimentary team to support that style;
- best practices for handling team recruiting, management, incentives, conflict resolution, and pathways to success;
- differentiation between high functioning and poor performing teams;
- understanding key factors that enhance or diminish the likelihood of team success;
- understanding of team dynamics in a typical entrepreneurial “start-up” environment

Having this course converted from Special Topics to permanent serves the CoE quite well. We have seen consistent enrollment and very positive feedback from enrolled students semester after semester. Thank you.

Semester/faculty and # enrolled
Q1 “Overall this is an excellent course”
Q4 “I had a strong desire to take this course”

WN24/Dacko. 25 enrolled.
Q1 (4.4)
Q4 (4.6)

FA23/Dacko. 25 enrolled.
Q1 (4.9)
Q4 (4.8)

WN23/Dacko. 26 enrolled.
Q1 (4.9)
Q4 (4.7)

FA22/Dacko. 41 enrolled.
Q1 (4.7)
Q4 (4.6)

WN22/Dacko. 31 enrolled.
Q1 (4.8)
Q4 (4.8)

FA21/Dacko. 33 enrolled.
Q1 (4.6)
Q4 (4.3)

WN21/Dacko. 44 enrolled.
Q1 (4.9)
Q4 (4.7)

FA20/Dacko. 38 enrolled.
Q1 (5.0)
Q4 (4.9)

WN20/Dacko. 26 enrolled.
Q1 (4.7)
Q4 (4.8)

FA19/Dacko. 30 enrolled.
Q1 (4.6)
Q4 (4.2)

WN19/Dacko. 41 enrolled.
Q1 (4.6)
Q4 (4.6)

FA18/Dacko. 34 enrolled.
Q1 (4.8)
Q4 (4.6)

WN18/Dacko. 32 enrolled.
Q1 (4.3)
Q4 (4.2)

FA17/Dacko. 20 enrolled.
Q1 (4.6)
Q4 (4.4)

WN17/Lee. 27 enrolled.
Q1 (4.8)
Q4 (5.0)

WN16/Frank. 30 enrolled.
Q1 (5.0)
Q4 (5.0)

COLLEGE OF ENGINEERING
CENTER FOR ENTREPRENEURSHIP
UNIVERSITY OF MICHIGAN

ENTR 490.014: Leading an Entrepreneurial Team

Fall 2024 | 2 Credit Hours

Fridays | 10am-12pm

Course meeting location is listed in Wolverine Access

CFE Faculty: Ted Dacko
E-Mail: dacko@umich.edu

Course Overview

Many entrepreneurs think that when they build the product, they are 90% of the way to being successful. This simply is not the case. Learning to be a CEO and leader, building a culture and an entrepreneurial team and holding that team accountable for results makes the company successful.

This course is designed to teach the fundamentals of identifying and prioritizing the "who" (human resource capital), the "what" (skill sets) and "why" needed for your venture to grow and thrive. Building and managing a world-class team is the most critical factor determining the success of a start-up company. You will learn the fundamentals of the CEO role, establishing and protecting a startup culture, setting an exciting company vision, developing a strategy with your team and how to ensure strategy success and best practices in recruiting, interviewing, and managing your organization. Students will learn how to keep their entrepreneurial team motivated, accountable, and happy. Students will also study what to do in failure mode to resolve internal conflicts and terminate team relationships when necessary. Students will also learn how to "sell" their ideas and vision to employees, investors, board members, partners and others. And the course will help students learn to work as a team (in a real entrepreneurial environment) and learn how to build and manage a board.

Course work includes selected readings in organizational structure and development, case study review, in-class discussion and active role-play exercises designed to demonstrate skill proficiencies.

COURSE DELIVERY: There will be in-person, real-time instruction on the scheduled meeting day/time listed for this course. *It is the expectation that enrolled students will engage in class during class-time.* Attendance will be taken. Classroom Lecture Capture will be activated and Zoom recordings may also occur. ENTR faculty verify all class recordings are linked in the semester's course Canvas site.

Students are prohibited from recording/distributing 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.

*If you do not wish to be recorded, please contact the instructor the first week of class (or as soon as you enroll in the course, whichever is latest) to discuss alternative arrangements, since ENTR lectures may be audio/video recorded and made available to other students in this course. Additional information regarding course recordings and privacy concerns can be found on the *UM ITS Recording and Privacy Concerns webpage*.

ORGANIZATION:

- Instructor Discussion
- Assigned outside reading
- In-Class Exercises and Simulations
- Roundtable Discussion and Presentations
- Team Project and Presentation

COURSE TOPICS:

- Ideal Team Makeup
- Using Storytelling to Attract the Right Team
- Understanding and Communicating Your Mission, Purpose and Values
- Building the Right Culture
- Leadership and Management and The Difference
- The Entrepreneurial CEO Job. What Is It?
- Strategy and The Team
- Effective Communications
- People Issues
- Creating and Managing a Board of Directors
- How To Best Choose and Use Mentors
- Fundraising...Without Funds, You Can't Build a Team or a Company

COURSE OBJECTIVES:

- Introduce students to the Founder/CEO role and responsibilities
- Introduce the students to the priorities and responsibilities of board members
- To introduce students to the fundamentals of how to identify their own values and leadership style and build a complimentary team to support that style.
- To impart best practices for handling team recruiting, management, incentives, conflict resolution, and pathways to success

- To enable students to quickly differentiate between high functioning and poor performing teams
- To develop an understanding of key factors that enhance or diminish the likelihood of team success; process, communication, delegation and accountability
- A specific understanding of team dynamics in a typical entrepreneurial “start-up” environment

TEXT AND REQUIRED SUPPLIES:

- Internet Connected Device to Canvas

GRADING:

- Class Participation & Attendance 25%
- Individual Deliverables 25%
- Team Deliverables 25%
- Final Presentation 25%

CODE OF CONDUCT:

- Arrive on time and ready to engage
- Be respectful of other class members and do not use electronic devices unless requested by the Instructor
- Use the time allocated for in-class assignments or project work for **those** assignments

YOUR IDEAS AND EVALUATIONS:

- Willingness to contribute and provide your own ideas and adaptations of the principles discussed in class will be important to maximizing your own abilities to apply what you are learning as the class progresses.

CLASS PROJECT:

- By the end of September, you will form a team of 5+ people (depending on class size) in the class to create a skill sharing/training “company” around a topic that your team is deeply passionate about (e.g. photography, cooking, college admissions, etc.). Throughout the remainder of the class, you will need to develop your training program (your business) and find customers on campus (or online) to be trained by you. This company can be as technical (or manual) as you would like. At a minimum, you will need to get people to sign up for a training session and create enough value that

people will want to show up and pay you for it. You will be evaluated on KPIs such 1) number of people trained and 2) revenues from sales as well as outcomes produced (results). You will be required to conduct a board presentation/meeting with the a group of entrepreneurs acting as your board of directors. At the end of the term you will evaluate your teammates.

POLICIES: Defining a credit hour, Office of the Provost

UMICH Diversity, Equity, and Inclusion

Overarching Strategy 1: Create an Inclusive and Equitable Campus Climate

Overarching Strategy 2: Recruit, Retain and Develop a Diverse Community

Overarching Strategy 3: Support Innovative and Inclusive Scholarship and Teaching

http://diversity.umich.edu/about/

http://diversity.umich.edu/wp-content/uploads/2016/10/strategic-plan.pdf

College of Engineering's DEI vision: A "best-in-class" institution for developing engineers who excel as multicultural technologists and leaders – intellectually and socially engaged, valued, interactive, and well connected to resources, information, each other, the College, the University, the nation and the world.

Religious-Academic Conflicts

It is the policy of the University of Michigan to make every reasonable effort to allow members of the University community to observe their religious holidays without academic penalty. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to make-up missed academic work. It is the obligation of students to provide the instructor with reasonable notice of the dates on which they will be absent. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the respective class.

Students Representing the University in an Official Capacity Off-Campus

There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. Absence from classes while representing the

University does not relieve students from responsibility for any part of the course missed during the period of absence. Within reason, an instructor should provide appropriate arrangements to the student for missed work, providing such accommodations does not place unreasonable burden on the instructor or fundamentally alter the integrity of the course. When the absence coincides with an exam or other assignment due date, the options to make up that missed work may be limited and will be determined by the instructor within the boundaries of the course.

Students with Disabilities

If you think you may need an accommodation for a disability, please let the course instructor know at the beginning of the term. Next, contact the Services for Students with Disabilities (SSD) office. Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation (VISA) form and we can arrange for your accommodation. Any information you provide is private and confidential and will be treated as such. If you already have a VISA form from SSD, please present this form to me at the beginning of the term, but no later than at least two weeks prior to the need for the accommodation so that there is enough time for the appropriate arrangements to be made.

Student Mental Health and Wellbeing

University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and caps.umich.edu during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (734) 764-8320 and uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see uhs.umich.edu/aodresources. For a listing of other mental health resources available on and off campus, visit: umich.edu/~mhealth.

Student Sexual Misconduct Policy

Title IX prohibits discrimination on the basis of sex, which includes sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We understand that sexual violence can undermine students' academic success and we encourage anyone dealing with sexual misconduct to talk to someone about their experience, so they can get the support they need. Confidential support and academic advocacy can be found with the Sexual Assault Prevention and Awareness Center (SAPAC) on their 24-hour crisis line, (734) 936-3333 and sapac.umich.edu/

Alleged violations can be non-confidentially reported to the Office for Institutional Equity (OIE) at institutional.equity@umich.edu.

Academic Misconduct

The University of Michigan community functions best when its members treat one another with honesty, fairness, respect, and trust. The College promotes the assumption of personal responsibility and integrity, and prohibits all forms of academic dishonesty and misconduct. All cases of academic misconduct will be referred to the Office of the Assistant Dean for Undergraduate Education. Being found responsible for academic misconduct will usually result in a grade sanction, in addition to any sanction from the College. For more information, including examples of behaviors that are considered academic misconduct and potential sanctions, please see bulletin.engin.umich.edu/rules

"Entrepreneurship Education is the Humanities of the 21st Century!" Dr. Thomas Zurbuchen, CFE's Co-Founder.

U-M CFE contact info: entrepreneurship@umich.edu || 734.763.1021
The CFE is open during normal business hours Monday - Friday.
The CFE is located on U-M's North Campus: 2281 Bonisteel Blvd, 3350 Duderstadt Center.

**********Go BLUE!**********

University of Michigan
Winter 2024 Instructor Report
ENTR 490 014 - ENTR 599 490
Theodore Dacko

9 out of 25 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)	7	1	0	1	0	0	4.9	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	5	2	2	0	0	0	4.6	4.2	4.2
I knew what was expected of me in this course.(Q1633)	5	4	0	0	0	0	4.6	4.4	4.6
I had a strong desire to take this course.(Q4)	5	4	0	0	0	0	4.6	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)	2	3	4	0	0	0	3.7	2.9	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
Theodore Dacko seemed well prepared for class meetings.(Q230)	8	1	0	0	0	0	4.9	4.7	4.8
Theodore Dacko explained material clearly.(Q199)	8	1	0	0	0	0	4.9	4.6	4.7
Theodore Dacko 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)	4	4	0	0	1	0	4.4
The material presented in this course is also presented in other courses. (Q741)	3	1	3	1	0	1	3.5
I developed skills to serve my professional goals. (Q570)	4	4	0	0	0	1	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Theodore Dacko was an excellent teacher. (Q2)	6	2	0	1	0	0	4.8

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Fall 2023 Instructor Report
ENTR 490 014 - ENTR 599 490
Theodore Dacko

10 out of 25 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)	7	3	0	0	0	0	4.8	4.5	4.5
My interest in the subject has increased because of this course. (Q1632)	7	3	0	0	0	0	4.8	4.2	4.2
I knew what was expected of me in this course.(Q1633)	6	4	0	0	0	0	4.7	4.4	4.5
I had a strong desire to take this course.(Q4)	7	3	0	0	0	0	4.8	4.1	4.0
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)	2	4	4	0	0	0	3.8	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
Theodore Dacko seemed well prepared for class meetings.(Q230)	10	0	0	0	0	0	5.0	4.7	4.8
Theodore Dacko explained material clearly.(Q199)	10	0	0	0	0	0	5.0	4.6	4.7
Theodore Dacko treated students with respect.(Q217)	9	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)	8	2	0	0	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	6	1	0	2	0	1	4.8
I developed skills to serve my professional goals. (Q570)	8	2	0	0	0	0	4.9

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Theodore Dacko was an excellent teacher. (Q2)	9	1	0	0	0	0	4.9

The medians are calculated from Fall 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ENTR 490 014 - ENTR 599 490
Theodore Dacko

8 out of 26 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	0	0	0	0	4.8	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	5	2	1	0	0	0	4.7	4.1	4.2
I knew what was expected of me in this course.(Q1633)	6	2	0	0	0	0	4.8	4.3	4.6
I had a strong desire to take this course.(Q4)	5	3	0	0	0	0	4.7	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)	1	1	5	1	0	0	3.1	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
Theodore Dacko seemed well prepared for class meetings.(Q230)	7	1	0	0	0	0	4.9	4.7	4.8
Theodore Dacko explained material clearly.(Q199)	6	2	0	0	0	0	4.8	4.6	4.7
Theodore Dacko treated students with respect.(Q217)	7	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)	7	1	0	0	0	0	4.9
The material presented in this course is also presented in other courses. (Q741)	4	1	0	2	0	1	4.6
I developed skills to serve my professional goals. (Q570)	4	3	1	0	0	0	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Theodore Dacko was an excellent teacher. (Q2)	7	1	0	0	0	0	4.9

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 upper 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: 2024-10-21
Effective Term: Winter 2026

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

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Industrial & Operations Engin Subject: IOE Catalog: 430	Dept (Home): Industrial & Operations Engin Subject: IOE Catalog: 430
☐	☐ 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) Global Cultural Systems Engineering	Course Title (full title) Global Cultural Systems Engineering
☐	Abbreviated Title (20 char) Global Cult Sys Engr	Abbreviated Title (20 char) Global Cult Sys Engr
☐	Course Description (Please limit to 80 words and attach separate sheet if necessary) Selected topics of systems engineering are examined from the global cultural perspective. Topics include global cultural issues of design, marketing, and communication; engineering aesthetics and ethics; individual and aggregated behavioral decision making; social networking and online communities; research and evaluation methods; applications in many areas of systems engineering.	
☐	Full Term Credit Hours Undergraduate Min: 3 Graduate Min: 3 Undergraduate Max: 3 Graduate Max: 3	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: 3	☐ Course is Y graded ☐ Can be taken more than once in the same term

Subject: Industrial & Operations Engin Catalog: 430

☐

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) IOE 333 and IOE 366 or graduate standing Minimum grade requirement: C-	Enforced Prerequisite (254 char) IOE 333 or graduate standing Minimum grade requirement: C-
☐	Credit Exclusions	Credit Exclusions

☐

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

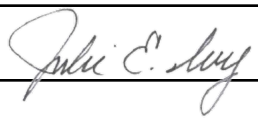
Graded Component
- ☑
- ☐
- ☐
- ☐
- ☐
- ☐

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

Cognizant Faculty Member Name: Yili Liu Cognizant Faculty Member Title: Professor

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

Contact Person: Leonora Lucaj Email: lucajl@umich.edu Phone: 734-764-3297

CoE Curriculum Committee Representative:		Print: Yavuz Bozer	Date: 1/16/2025
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Julie Ivy	Date: 1/16/2025
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 Selected topics of systems engineering are examined from the global cultural perspective. Topics include global cultural issues of design, marketing, and communication; engineering aesthetics and ethics; individual and aggregated behavioral decision making; social networking and online communities; research and evaluation methods; applications in many areas of systems engineering.	Course Description Selected topics of systems engineering are examined from the global cultural perspective. Topics include global cultural issues of design, marketing, and communication; engineering aesthetics and ethics; individual and aggregated behavioral decision making; social networking and online communities; research and evaluation methods; applications in many areas of systems engineering.
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)	Contact hours (lab)

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:
Tech Elective

Special resources of facilities required for this course:

Supporting statement:
IOE 430 uses only a very small amount of IOE 366 materials (those about multi-factorial experimental design), which will be introduced to students in IOE 430 through one lecture and/or supplemental materials to be provided to the students. Removing IOE 366 as a prerequisite will open IOE 430 to more students, including students in the HFE minor.

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Phone: 734.763.2113
Fax: 734.936.3148
ro.curriculum@umich.edu
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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: 2024-10-04
Effective Term: Fall 2025

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

	CURRENT LISTING	**REQUESTED LISTING**
☐	Dept (Home): Industrial & Operations Engin Subject: IOE Catalog: 437	Dept (Home): Industrial & Operations Engin Subject: IOE Catalog: 437
☐	☐ 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) Automotive Human Factors	Course Title (full title) Automotive Human Factors
☐	Abbreviated Title (20 char) Automotive Human Fac	Abbreviated Title (20 char) Automotive Human Fac
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) An overview of human factors and driving to help engineers design motor vehicles that are safe and easy to use, and to provide basic knowledge for those interested in conducting automotive human factors/ergonomics research. The focus is on the total vehicle (all aspects of vehicle design) and for an inter-national market. Key topics include design guidelines, crash investigation and statistics, driving performance measures, vehicle dynamics, occupant packaging, and driver vision.	
☐	Full Term Credit Hours Undergraduate Min: 3 Graduate Min: 3 Undergraduate Max: 3 Graduate Max: 3	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: Industrial & Operations Engin Catalog: 437

☐

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) Senior and IOE 333/334 or Graduate Standing	Advisory Prerequisite (254 char) Senior and IOE 333 or Graduate Standing
☐	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

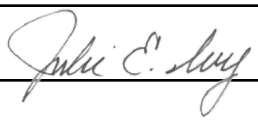
Graded Component
- ☑
- ☐
- ☐
- ☐
- ☐
- ☐

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

Cognizant Faculty Member Name: Jessie Yang Cognizant Faculty Member Title: Associate Professor

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

Contact Person: Leonora Lucaj Email: lucajl@umich.edu Phone: 734-764-3297

CoE Curriculum Committee Representative:		Print: Yavuz Bozer	Date: 1/16/2025
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Julie Ivy	Date: 1/16/2025
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 provides an overview of human factors and driving to help engineers design motor vehicles that are safe and easy to use, and to provide basic knowledge for those interested in conducting automotive human factors/ergonomics research. The focus is on the total vehicle (all aspects of vehicle design) and for an inter-national market. Key topics include design guidelines, crash investigation and statistics, driving performance measures, vehicle dynamics, occupant packaging, and driver vision.	Course Description An overview of human factors and driving to help engineers design motor vehicles that are safe and easy to use, and to provide basic knowledge for those interested in conducting automotive human factors/ergonomics research. The focus is on the total vehicle (all aspects of vehicle design) and for an inter-national market. Key topics include design guidelines, crash investigation and statistics, driving performance measures, vehicle dynamics, occupant packaging, and driver vision.
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)	Contact hours (lab)

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:
Tech Elective

Special resources of facilities required for this course:

Supporting statement:
We are removing IOE 334 as a prerequisite since it was removed from the curriculum. We are removing a few words from the beginning of the course description to make it read better.

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: 2024-11-26
Effective Term: Fall 2025

☑	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): Industrial & Operations Engin Subject: IOE Catalog: 524
☐	☐ 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) Master's Practicum in Industrial and Operations Engineering
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) MS Practicum IOE
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Master's student teams work on a sponsored IOE master's design project applying their IOE skills to a problem determined by the sponsor's organizational needs. The course culminates in a final presentation and report which should demonstrate mastery of advanced IOE models/techniques as well as technical communication skills. Projects are overseen/graded by the instructor of record, with input from the mentor assigned by the sponsor and will involve supervision and mentoring by representatives from the sponsoring organizations.	
☑	Full Term Credit Hours Undergraduate Min: Undergraduate Max: Graduate Min: 3 Graduate Max: 3	Half Term Credit Hours Undergraduate Min: Undergraduate Max: Graduate Min: Graduate Max:
☑	Course Credit Type Rackham Graduate Student, Non-Rackham Graduate Student	
☐	Repeatability ☐ Course is Repeatable for Credit Maximum number of repeatable credits: -0-	☐ 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
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- ☐ 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) IOE Master's students who have completed at least one full term of the IOE master's program. Exposure to data analytics, quantitative modeling, and related topics. IOE 510, (STATS 500 or IOE 591), IOE 543, IOE 515.
☐	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: Xiuli Chao

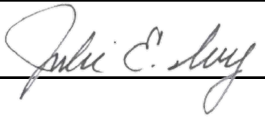
Cognizant Faculty Member Title: Professor

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

Contact Person: Leonora Lucaj Email: lucajl@umich.edu Phone: 734-764-3297

CoE Curriculum Committee Representative: Yavuz Bozer  Print: Date: 1/16/2025

CoE Curriculum Committee Chair: Print: Date:

Home Department Chair: Julie Ivy  Print: Date: 1/16/2025

Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
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DEPARTMENTAL/COLLEGE USE ONLY

Current:	**Requested:**
Course Description	Course Description Master's student teams work on a sponsored IOE master's design project applying their IOE skills to a problem determined by the sponsor's organizational needs. The course culminates in a final presentation and report which should demonstrate mastery of advanced IOE models/ techniques as well as technical communication skills. Projects are overseen/graded by the instructor of record, with input from the mentor assigned by the sponsor and will involve supervision and mentoring by representatives from the sponsoring organizations.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 3
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:

IOE 524 – Practicum in Industrial and Operations Engineering was initially discussed in December 2022 in conversations with Dr. Brian Denton, who was serving as IOE Department Chair at the time. The objective of the course was to provide IOE master's students with an opportunity to utilize their IOE skills on “real life” industrial engineering challenges found in industry, service, and healthcare industries. These “real-life” challenges are provided by companies and organizations in southeast Michigan who sponsor projects and provide support through mentoring and access to organizational resources to help solve these challenges. Current IOE Department Chair, Dr. Julie Ivy, has expressed support.

Expected outcomes for the students include:

- Develop skills in defining problems and identifying appropriate solution methodologies.
- The ability to integrate and apply IOE skills to design and develop a solution to a real client problem consisting of a new product, process, or plan for an organization.
- Develop skills in interacting with sponsors, obtaining needed information, and jointly developing design solutions.
- Prepare and deliver an effective presentation on the design solution. • Prepare a written report describing the design solution.
- Develop teamwork skills that encourages equitable participation from all members.

The class compliments the current IOE curriculum by giving the students an opportunity to use the knowledge they are gaining in their other course work on a real-life problem for a sponsoring organization. There are currently no 500 level graduate practicum courses, however there can be some overlap with IOE 525 field projects and IOE 590 Master's Directed Study projects. IOE 524 gives master’s students the opportunity to gain valuable structured industry experience as part of their academic work, which will help them in their search for career opportunities. Due to the importance of effective technical communication, a TechComm instructional component (conducted by TechComm faculty) is included with lectures and practice sessions, providing students the necessary skills for successful project execution.

Projects are carefully curated to ensure they will provide a challenging experience and an appropriate learning opportunity for graduate level IOE students. This includes but is not limited to providing a significant challenge in one or more areas of IOE specialization requiring the use of advanced IOE skills to develop an appropriate solution. An important part of the challenge needs to be a “systems” component that requires the students to think at a strategic level, not only addressing a specific problem, but addressing the total business/organizational environment and change management landscape. Projects are reviewed by cognizant faculty for completeness and adequacy.

Students are then matched to projects in teams of 3-4 students based on their interest and skills set. Through the semester the students are challenged to refine the sponsor’s problem statement, clearly define deliverables, structure and manage their project schedules such that they can achieve the sponsor’s goals. Academic deliverables include:

1. Based on the sponsoring organization’s proposal, the student teams will research the proposal and develop a problem statement that is agreed to, and signed, by the sponsor. This would include a short presentation to the sponsor and instructor.

2. Weekly progress reports provided to the instructor and sponsor.

3. Mid-project presentation to key stakeholders and the instructor.

4. Mid-project report to the sponsor and instructor.

5. Final project presentation to key stakeholders and the instructor.

6. Final report to the sponsors and instructor.

In support of these deliverables and achieving sponsor's project objectives, students are given the following instruction (assigned instructors or guest speakers):

- Technical Communications (TechComm) Instruction throughout the semester provided by TechComm faculty. This includes:
  - Lectures on producing and conducting technical presentations.
  - Lectures on writing technical reports.
  - TechComm evaluations of mid-project and final presentations given in class.
  - TechComm support/feedback in writing mid-term and final reports.
- Instruction on the use of Lean tools in consultative situations.
- Implementing change in corporate environments.
- Application of lean concepts in consulting environments.
- During class sessions, student teams are given one on one coaching by the instructor, in support of their project needs. This includes, but was not limited to, coaching/instruction in sponsor relations, team dynamics, problem statement definition, lean problem solving and tools, business case development, etc…

Supporting quotes for past students:

"This was one of the most amazing classes I had taken. It allowed me to have the opportunity to work on an industry project with project sponsors. I learned so much and Professor Muscat offered amazing advice, feedback, and followed up with us on every step. Overall, I thoroughly enjoyed this course and have recommended it to my friends too."

" The one–on–ones with Ray with our team weekly were highly beneficial. Ray shared his experiences and led us on how IE concepts can be applied regardless of the context. We got to experience IE skills from start to finish, starting with understanding the project problem, data collection, talking to different team members and most importantly finding creative ways to solve the problem."

"The hands–on experience in the industry is very valuable chance, it improves my ability from both soft and technical aspects. The guest speakers really deepen my understanding in different industry, and Ray gives very invaluable advice."

"I would consider the project itself as the major strengths of this class. Mr. Muscat's professionalism and experience in manufacturing management helps me to learn a lot."

Except for minor changes, the syllabus for the proposed course with be the same as the syllabus shown for the Fall 2024 semester. Enrollment for the class has been:

- Winter 2023, 8 students (3 projects)
- Fall 2023, 14 students (4 projects)
- Winter 2024, 14 students (4 projects)
- Fall 2024, 26 students (9 projects)

Project sponsors have included Coupa Software, Ford Motor Company, Eaton Mobility, BorgWarner and Michigan Medicine (Mott Children's Hospital, Brighton Center for Specialty Care, University Hospital Emergency Room, Physician

IOE 591, Fall 2024
Practicum in Industrial and Operations Engineering
IOE Graduate Design Project Course Syllabus

Classroom: IOE 1680
Class Time: Thursday 4:30 PM to 7:30 PM and other selected times

FACULTY INSTRUCTORS

Ray Muscat (rmuscat@umich.edu) Department of Industrial and Operations Engineering Office phone: 616-638-0769 Office Hours: By appointment	**Jennifer Royston** (roystonj@umich.edu) Program in Technical Communication Office Hours: By appointment

GRADUATE STUDENT INSTRUCTOR

Sara Cahn (scahn@umich.edu)
Department of Industrial and Operations Engineering
Office Hours: Monday 1-2 PM Via Zoom

PREREQUISITES: Graduate standing in Master of Industrial and Operations Engineering with at least one semester completed. Exposure to data analytics, quantitative modeling, and related topics, such as are covered in master's courses like IOE510: Linear Programming; Statistics 500: Statistical Learning I **or** IOE 591 Introduction to Data Analytics, IOE 543: Scheduling, IOE515: Stochastic Processes. Ability to work with data using SQL, Python, Excel, or related software accessible without license costs to the sponsor is strongly encouraged.

COURSE WEBPAGE: Accessible through:
https://umich.instructure.com/courses/712347

COURSE GOAL

To provide practical experience in attacking real-world organizational and industrial problems via a capstone project wherein graduating IOE master's students apply advanced methods learned in IOE classes while learning teamwork, project management, presentation, and report writing skills.

COURSE OBJECTIVES

Learn how to:

- Formulate and solve an open-ended IOE problem for an external project sponsor
- Interact with sponsors when solving IOE problems to define project scope and requirements and to assess project milestones and final outcomes.
- Work in teams to address IOE problems ensuring equitable participation by all team members

- Write and present a professional report

COURSE OUTCOMES

- Develop skills in defining problems and identifying appropriate solution methodologies.
- Integrate and apply advanced IOE skills to design and develop a solution to a real organizational challenge consisting of a new product, process, or plan for an organization.
- Develop skills in interacting with sponsors, obtaining needed information, and jointly developing design solutions.
- Prepare and deliver an effective presentation on the design solution. • Prepare a written report describing the design solution.
- Develop teamwork skills that encourage equitable participation from all members.

PROJECTS

For the next four months, you will be working in teams of 3-5 students on an IOE related industrial or organizational problem. Organizations from manufacturing, service industries and local non-profits/governments sponsor these projects and expect each team to provide specific deliverables at the end of the semester.

The deliverables required for each team will differ slightly depending on the requirements of the sponsor. However, regardless of the project, the work your team accomplishes in this course is important to both your sponsor and the IOE Department. Students are expected to abide by the terms and conditions of the University of Michigan, College of Engineering Honor Code and to always conduct themselves in a professional and responsible manner. **In particular, students are required to arrive on time, present themselves appropriately and be prepared for all meetings with team members, sponsors, and classmates.**

The instructor will curate projects with sponsors, assign students to project teams, lead class sessions, and be available for consultation as issues arise during the term. The instructor will also track the progress of each project with the team and the company liaison.

PROJECT MENTOR
Each project will have an organizational mentor assigned as the team's primary contact person. This person will help your team arrange initial site visits, provide direction for the project from the organization's standpoint, assist students in gathering data, and assist in other issues that may arise during the project's course. The mentor, if possible, will arrange for a final report to be presented to the management of the company **and will participate in grading.**

FACULTY ADVISORS
IOE Professors are valuable resources, with backgrounds and skills relevant to a variety of aspects of student projects. You are encouraged to contact them with questions about

technical issues related to your project.

PROJECT OBJECTIVES

Each project will have unique objectives to meet the needs of the sponsoring organization. The sponsor, project mentor, and student project team members must discuss, understand and agree to these objectives. To best meet the needs of the sponsor and project each project will involve a different approach. These objectives may evolve over the semester because of data collected or experimental results.

SPONSOR RELATIONS

It is expected as part of this course that the students develop and maintain positive relationships with their sponsors, project mentor and IOE 591 Professor. This is no different from maintaining good relationships with your supervisor and colleagues in any work environment. To develop and maintain sponsor relations, the student group is expected to:

1. **Communicate regularly with your sponsor**

- Teams are responsible for providing their mentors with a weekly status report each Monday and uploading a copy to Canvas on selected weeks by 11:59PM on Mondays. The intent of the report is to provide the mentor an update on the status of current tasks and to identify any issues or problems that pose a risk to the successful completion. Please send this report by Monday of each week, to cover a full week of work. Status reports must be addressed to the mentor, not to the instructor.

  There is no standard form for the status report however it must include:

  - A professional email summarizing the week's progress with enough detail for the sponsor to appreciate progress and understand problems.
  - At least one PowerPoint slide presenting the details of the main accomplishment for the week. This slide must not simply repeat the email, but must provide significantly more detail, preferably using graphics or other visuals. As the class progresses, this slide should start documenting an outline of the specific deliverables you plan to achieve and continuously update with more details as they become available.
  - A timesheet for each team member, breaking down time worked, and tasks worked on in 0.1-hour increments.
  - An updated Gantt chart.
  - Teams are expected to report exceptional situations to their mentors and ask for assistance or guidance immediately – not waiting for the weekly status report – when these situations impede project progress. However, teams must recognize that sponsors have many responsibilities and may not be able to respond quickly to such requests.

2. **Frequently meet (face to face or via zoom or phone) with your mentor** • Teams are expected to frequently meet with their mentors to update them on progress and coordinate project activities with the mentor's requirements.

Normally, student groups while formulating the project plan will meet with the mentor

weekly at the beginning of the semester; meet approximately every other week at the middle of the semester; and meet weekly at the end of the semester while developing final report and presentation. This may vary depending upon mentor location.

3. In case you have problems developing and/or maintaining positive relationships with your sponsor and project coordinator:

    - Speak with the IOE 591 Instructor about the approach to handling the situation.
    - Speak with your sponsor and/or project coordinator about the situation.

TEXT

There is no text for this course, but pertinent material will be placed on the course website or handed out in class. The students can access the course website through Canvas.

TEAM GRADES

The final grade for IOE 591, as with evaluations of most professional projects and assignments, will be based upon inputs from multiple people and multiple factors. You will receive interim feedback on the incremental assignments from the IOE 591 Instructor to understand how you are progressing in the class.

Following grade weighing determines each student's course grade:

1. **Sponsor (40%)**. The sponsor contributes significantly to your course grade since you are performing the project for a sponsor. The sponsor will base the grade upon the following factors: sponsor interactions, project proposal, interim report, final report, final sponsor presentation, and -- most importantly -- meeting project goals.

2. **Course Instructors (60%)**. The professor will be responsible for grading the technical content of project deliverables, sponsor relations, direction of the project and the student project team.

    This portion of the grade is based upon the following factors (*note: weights are approximate with the outcome of the project being of greatest importance*): weekly status reports (~15%), project proposal (~10%), midterm status presentation and report (~25%), final presentation and report (~ 50%).

    The sponsor's perceptions of the team significantly influence the course instructor; therefore, the sponsor effectively influences more than half of your grade.

INDIVIDUAL STUDENT GRADES

Your ***individual*** course grade will be determined as follows:

Based on the peer evaluation forms and other materials, the instructors will assign either "+", or "0", or "-", to each member of your team. If you receive a "+" you will get a higher grade than the team grade. If you receive a "0" you will get exactly the team grade, and if you receive a "-" you will get a lower grade than the team grade. e.g., if your team receives a B+ then your "+" might result in your getting a grade of A-, while a "-" might result in a B. I have designed the peer evaluations to prevent your team from getting together and giving everyone "+" thereby artificially raising your grades. In extreme *cases*, if you have not "done your share" for the team, as judged by your peers and the sponsors, we will override the grading schemes outlined above, and there is a high probability that *you will fail this course.*

EXPECTATIONS OF PARTICIPANTS IN IOE 591 PROJECTS

Project progress and results improve if everyone understands the general expectations for students and mentors involved with IOE 591 projects. The mentor and student team for each project may mutually agree to revise these expectations as required by circumstances.

Expectations for Students

1. **Commit 10 hours per week per student to the project.** These hours are in addition to the hours in class. A significant portion of these hours will be during normal working hours for your sponsor because:
    - Each student team should meet (either face to face or via telephone) with the sponsor each week of the term unless you have a specific agreement to another schedule.
    - Data collection at the sponsor's facility is required for most projects. • You must meet with other members of your project team at a time convenient for your team members.

2. **Organize yourselves as a team and schedule project activities to meet your sponsor's requirements.** You must function as a cohesive team, with everyone contributing equally. Also, please share with each other your strengths and growth areas so you can complement each other. You are encouraged to develop a team contract to facilitate effective team functioning. If you are having problems among your team, contact your instructor early in the term to resolve team dynamics.

3. **Prepare agendas and questions for meetings and communications to conserve the time of your sponsor and coordinator.** Students should take the lead in scheduling these meetings**.** Since the sponsor, coordinator, and students have busy schedules, it is important to schedule these meetings far in advance. It may be best to schedule the meetings for the whole term during the first week or two of the term.

4. **Conduct a literature search of related studies, methodologies, and data.** You should learn as much as you can from the work of others to deliver a high-quality solution to your sponsor without wasting time "reinventing the wheel." Summary

results of this literature search should be included in your reports.

5. **Conduct objective and quantitative analyses to support recommendations.** The sponsor depends upon you to provide objective, quantitative analyses. You should review with your coordinator any data collection tools and methodologies before sharing them with your sponsor or initiating any data collection.

6. **Provide draft and final copies of the proposal, midterm status report, and final report.** Teams should submit these documents in hardcopy format and upload them to Canvas. Teams should incorporate reviewer comments into the documents before sharing them with the sponsor. Students should address all review comments to prepare a completed document.

7. **Maintain lines of communication with the sponsor via status reports and regular meetings as described earlier in this document**. Teams should upload Status reports to Canvas to enable instructors to provide timely guidance

8. **Provide a paper copy of the final report to the sponsor**. Ask your sponsor how many copies they require.

9. **Conduct yourselves in a professional manner in all project-related contacts.** This includes appropriate professional attire, timeliness, and behavior.

10. **Be prepared for class and actively participate in discussions**. This includes reading assigned readings and being able to discuss them.

Expectations for Mentors

The sponsor, or Mentor, is the person who has initiated the project. To ensure that projects successfully deliver desired results, sponsors should:

1. **Provide students with:**

   • A complete description of the problem including requirements and expectations

   • All required data that will not be collected by the students

   • Relevant sponsor organizational considerations or restrictions

   • Previous or current related studies

   • Contact information for people to get in touch with regarding the project

   • Any other information of which students should be aware

2. **Meet with the student team as required, generally weekly.** Students should take the lead in scheduling these meetings. For students to complete their projects, it is important that they be able to meet with their sponsors, so your commitment to meeting with the students is important. If a face-to-face meeting is not possible, schedule a teleconference. These meetings are necessary to keep the project on track, to provide guidance to the students, and to identify and discuss questions and issues.

3. **Introduce the project and student team to everyone they will work with.** The student team will receive more support if people know the project is important to the organization.

4. **Communicate with the student team at least once each week.** Even if a meeting is not required in each week, some communication is required. Students should initiate this communication, in the form of a meeting, telephone call, or e-mail. Please express your preferences to the students.

5. **Eliminate barriers in order to complete the project by the end of the semester.** For example, if students experience delays in obtaining needed data, the sponsor can assist by expediting the data collection.

6. **Review and provide feedback on draft documents.** These documents include the proposal, midterm status report, and final report. The purpose of this activity is to assure that students' understanding, and presentation of materials and terminology are appropriate, and these documents address your requirements.

7. **Arrange the final presentation and inform the students about their audience.** The sponsor should invite all appropriate people to the final presentation. Prior to the presentation, the sponsor should tell the students who will be attending and the knowledge, background, and expectations of each attendee.

8. **Provide feedback to the IOE 591 professor on the students' conduct and general impression as professionals.**

9. **Provide 40% of the overall grade for the students after the final report and presentation are complete utilizing the sponsor evaluation form provided for.** The sponsor can adjust Grades within a team to reflect significantly different contributions by individual members of the team.
   The grade is due to class Instructor by December 11, 2024.

Expectations for the Professor

The professor for IOE 591 will function as the primary coordinator for the projects. He/she will serve as a guide for each student team, with emphasis on promoting analytical quality and positive sponsor relationships. Expectations for the coordinator include:

1. **Coach the students in each team.** This coaching will help ensure that teams understand their project environment, address their sponsor's requirements, use appropriate analytical methods, and avoid problems. It will also encourage the students to do objective, quantitative analyses.

2. **Communicate or meet with each team as required to provide guidance and to identify questions and issues**. Communications may be in the form of a face-to-face meeting, telephone or Zoom call, or e-mail. Students should take the lead in

scheduling these meetings.

3. **Critique the student team's approach and provide feedback and challenge as necessary.**

4. **Review and provide technical feedback on draft proposals and reports.** The purpose of these reviews is to ensure that documents address sponsor requirements, use appropriate analytical methods correctly, and that the students' understanding, and presentation of materials is appropriate.

5. **Provide feedback on the team conduct and general impression as professionals.**

Student Well-Being

Students may experience stressors that can affect both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact

me so that we can find solutions together. For personal concerns, U-M offers many resources, some of which are listed at Resources for Student Well-being on the Well-being for U-M Students website. You can also search for additional resources on that website.

Diversity, Equity, and Inclusion

"At U-M Industrial and Operations Engineering (IOE), we value all people and are committed to promoting diversity, equity and inclusion (DEI) in its fullest form for everyone in our community and beyond. We advance scientific and mathematical methods and develop engineering technologies to help solve human-centered local and global challenges; meaning we impact people, processes, and systems through generating and analyzing data across a range of applications. Not only does incorporating DEI principles make our solutions more powerful, applicable, and ethical, promoting and fostering DEI is a core value of the IOE community and leadership. At U-M IOE we view DEI as interwoven with our research, teaching, and community involvement."

If we fall short, we want to hear from you. Use our website to learn about ways to report concerns or misconduct anonymously, confidentially, or formally, and know that you will be heard, you will be taken seriously, and the U-M IOE community will stand behind you. https://sites.google.com/umich.edu/report-concerns-and-misconduct/ "

I consider this classroom to be a place where you are treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to

contribute to a respectful, welcoming, and inclusive environment for every other member of the class.

I am dedicated to helping each of you achieve all that you can in this class and make this class the best learning experience of your education at the University. To achieve this objective, I utilize three waves of Peer Evaluations. Their purpose is to identify potential issues in terms of team-member contribution so that these issues may be quickly resolved.

IOE 591 COURSE HONOR POLICY

All students in the class must conduct themselves in a decent and honorable manner. We assume that you will not obtain any unfair assistance with your assignments. The College of Engineering Honor Code applies to all students in the class. Details of the honor code, including interpretations are available at: (http://www.engin.umich.edu/students/honorcode/).

The general honor policy of the class is this:

Teams perform most of the work in this course. For such assignments, you need to collaborate, with equal participation, within your team, and submit your combined work for a team grade.

You must adhere to the expectations described in the course syllabus unless given permission by the instructor to deviate from a particular expectation.

On team assignments and project work, you can receive assistance and guidance from your instructors, sponsors, other university faculty, and any other resources that your instructors or sponsors provide to you. You can also utilize any publicly available information resources (e.g. internet, government reports, etc.), library resources, university software, or sponsor-provided information resources and software in order to complete your project work.

In accordance with the Honor Code, you should not take the work of others and submit it as if it were the work of your team. Work, which includes material derived in any way from the efforts of another author, should be fully and properly documented, by either direct quotation or paraphrasing. To avoid plagiarism, it is necessary to cite all sources of both ideas and direct quotations, including those found on the internet. The basic principle is to provide enough information so that the original source of material can be located. If your team submits software for your project, the team may not submit as their own work a computer program or part thereof which is not the result of their own thought and efforts. You must acknowledge and document contributions to a program from external sources.

For individual assignments, you must work alone and submit your own work.

AI functions (ChatGPT, Stable Diffusion, DALLE, etc.)

AI functions such as ChatGPT have become popular in recent years. Learning how to use AI

functions properly and efficiently is important for all of us. Used properly, these technologies can enhance our work; used improperly, they can border on plagiarism. In principle you may submit material that contains AI-generated content or is based on or derived from it. **Any and all use of AI functions that emulate human capabilities (ChatGPT, Stable Diffusion, DALLE, etc.) to perform assignments or other works in the course should be disclosed (this includes all graded deliverables as well as other course works and activities).** If you have used AI functions on anything you submit for IOE 591-087, please include an explanation as to: (1) what was your original prompt to the chatbot; (2) what was the response(s) that the chatbot provided to you; and, (3) how did you rework and revise so that your final document was both factually accurate and reflected your writing voice and style. **WARNING:** The current state-of-the-art of machine learning capabilities have two salient features: (1) the quality is such that more work may be required in a machine-assisted model; and, (2) it is feasible to discern the presence of "machine fingerprints". Our goal as a community of learners is to explore and understand how these tools may be used to augment human performance. However, violation of the explicit disclosure requirement may subject students to standard College of Engineering and University of Michigan processes for reporting, determining misconduct (if any), and assigning sanctions (as appropriate) as would be employed for any other type of potential Academic Misconduct. Finally, the instructors and GSI may, at any point during the semester, schedule a 15-minute meeting with students to discuss the use of AI functions. For more information, please see the link.

University of Michigan
Winter 2024 Instructor Preliminary Report
IOE 591-087: Special Topics
Raymond Muscat

10 out of 14 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median
This course advanced my understanding of the subject matter.(Q1631)	8	2	0	0	0	0	4.9
My interest in the subject has increased because of this course.(Q1632)	7	2	1	0	0	0	4.8
I knew what was expected of me in this course.(Q1633)	7	3	0	0	0	0	4.8
I had a strong desire to take this course.(Q4)	7	3	0	0	0	0	4.8
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)	1	0	5	2	2	0	2.7

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Raymond Muscat seemed well prepared for class meetings.(Q230)	7	3	0	0	0	0	4.8
Raymond Muscat explained material clearly.(Q199)	8	1	1	0	0	0	4.9
Raymond Muscat treated students with respect.(Q217)	9	0	0	0	1	0	4.9

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	9	0	0	0	1	0	4.9
Examinations covered the important aspects of the course. (Q356)	1	1	0	0	0	8	4.5

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Raymond Muscat was an excellent teacher. (Q2)	9	0	0	1	0	0	4.9
Raymond Muscat stressed important points in lectures/discussions. (Q203)	7	2	0	0	0	0	4.9
Raymond Muscat appeared to have a thorough knowledge of the subject. (Q207)	7	3	0	0	0	0	4.8
Raymond Muscat acknowledged all questions insofar as possible. (Q216)	8	1	1	0	0	0	4.9
Raymond Muscat encouraged constructive criticism. (Q218)	7	2	1	0	0	0	4.8

University of Michigan
Winter 2023 Instructor Report
IOE 591-087: Special Topics
Raymond Muscat

5 out of 8 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)	3	2	0	0	0	0	4.7	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	4	1	0	0	0	0	4.9	4.1	4.2
I knew what was expected of me in this course.(Q1633)	3	2	0	0	0	0	4.7	4.3	4.6
I had a strong desire to take this course.(Q4)	4	1	0	0	0	0	4.9	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	0	2	2	1	0	2.3	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
Raymond Muscat seemed well prepared for class meetings.(Q230)	4	1	0	0	0	0	4.9	4.7	4.8
Raymond Muscat explained material clearly.(Q199)	4	1	0	0	0	0	4.9	4.6	4.7
Raymond Muscat treated students with respect.(Q217)	4	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)	4	1	0	0	0	0	4.9
Examinations covered the important aspects of the course. (Q356)	4	1	0	0	0	0	4.9

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Raymond Muscat was an excellent teacher. (Q2)	4	1	0	0	0	0	4.9
Raymond Muscat stressed important points in lectures/discussions. (Q203)	4	1	0	0	0	0	4.9
Raymond Muscat appeared to have a thorough knowledge of the subject. (Q207)	4	1	0	0	0	0	4.9
Raymond Muscat acknowledged all questions insofar as possible. (Q216)	4	1	0	0	0	0	4.9
Raymond Muscat encouraged constructive criticism. (Q218)	3	1	0	0	0	1	4.8

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 graduate level with enrollment of 1 to 15 in College of Engineering.

University of Michigan
Fall 2023 Instructor Report
IOE 591-087: Special Topics
Raymond Muscat

10 out of 14 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)	9	0	1	0	0	0	4.9	4.5	4.5
My interest in the subject has increased because of this course. (Q1632)	9	0	1	0	0	0	4.9	4.2	4.2
I knew what was expected of me in this course.(Q1633)	9	1	0	0	0	0	4.9	4.4	4.5
I had a strong desire to take this course.(Q4)	9	0	1	0	0	0	4.9	4.1	4.0
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)	1	1	2	5	1	0	2.3	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
Raymond Muscat seemed well prepared for class meetings.(Q230)	9	1	0	0	0	0	4.9	4.7	4.8
Raymond Muscat explained material clearly.(Q199)	9	0	1	0	0	0	4.9	4.6	4.7
Raymond Muscat treated students with respect.(Q217)	10	0	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)	9	0	1	0	0	0	4.9
Examinations covered the important aspects of the course. (Q356)	4	1	0	0	0	5	4.9

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Raymond Muscat was an excellent teacher. (Q2)	9	1	0	0	0	0	4.9
Raymond Muscat stressed important points in lectures/discussions. (Q203)	8	2	0	0	0	0	4.9
Raymond Muscat appeared to have a thorough knowledge of the subject. (Q207)	8	2	0	0	0	0	4.9
Raymond Muscat acknowledged all questions insofar as possible. (Q216)	8	2	0	0	0	0	4.9
Raymond Muscat encouraged constructive criticism. (Q218)	7	3	0	0	0	0	4.8

The medians are calculated from Fall 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 graduate level with enrollment of 1 to 15 in College of Engineering.

University of Michigan
Fall 2024 Instructor Preliminary Report
IOE 591-087: Special Topics
Raymond Muscat

15 out of 26 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median
This course advanced my understanding of the subject matter.(Q1631)	11	4	0	0	0	0	4.8
My interest in the subject has increased because of this course.(Q1632)	11	3	1	0	0	0	4.8
I knew what was expected of me in this course.(Q1633)	12	2	1	0	0	0	4.9
I had a strong desire to take this course.(Q4)	12	3	0	0	0	0	4.9
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)	1	1	4	7	2	0	2.3

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Raymond Muscat seemed well prepared for class meetings.(Q230)	14	1	0	0	0	0	5.0
Raymond Muscat explained material clearly.(Q199)	13	2	0	0	0	0	4.9
Raymond Muscat treated students with respect.(Q217)	14	1	0	0	0	0	5.0

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	11	4	0	0	0	0	4.8
Examinations covered the important aspects of the course. (Q356)	5	2	0	0	0	8	4.8

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Raymond Muscat was an excellent teacher. (Q2)	13	2	0	0	0	0	4.9
Raymond Muscat stressed important points in lectures/discussions. (Q203)	13	1	1	0	0	0	4.9
Raymond Muscat appeared to have a thorough knowledge of the subject. (Q207)	11	3	0	0	0	1	4.9
Raymond Muscat acknowledged all questions insofar as possible. (Q216)	12	3	0	0	0	0	4.9
Raymond Muscat encouraged constructive criticism. (Q218)	10	5	0	0	0	0	4.8

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: 2025-01-23
Effective Term: Fall 2025

☑	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): Robotics Subject: ROB Catalog: 201
☐	☐ 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) Calculus for the Modern Engineer
☑	Abbreviated Title (20 char)	Abbreviated Title (20 char) Calc Modern Eng
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Introduction to key concepts in single-variable integral and differential calculus, Jacobians, gradients, and ordinary differential equations. Theory is applied computationally to real-world engineering problems like modeling robots, integrating drone IMU signals, gradient descent with constraints, and feedback control, offering a hands-on approach to calculus in robotics.	
☑	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: 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)
☑	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) ROB 101 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: Jessy Grizzle Cognizant Faculty Member Title: Professor

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

Contact Person:Kayla Dombrowski Email: kakelle@umich.edu Phone: 734-936-7999

CoE Curriculum Committee Representative:	Anouck R Girard	Print: Anouck Girard	Date: 12-23-2024
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Dawn Tilbury	Date: 12-18-24
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 Introduction to key concepts in single-variable integral and differential calculus, Jacobians, gradients, and ordinary differential equations. Theory is applied computationally to real-world engineering problems like modeling robots, integrating drone IMU signals, gradient descent with constraints, and feedback control, offering a hands-on approach to calculus in robotics.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 4
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:
In the future, we intend for this course to replace Math 115, Math 116, and Math 216, offering a more applied, computational approach to these foundational topics. Robotics is not reducing the total number of required math credits. Students must still earn 8 additional math credits beyond Calculus for the Modern Engineer. If students already have credit for Math 115, Math 116, or Math 216 before taking this course, those credits will count toward their math requirements. However, taking any of these courses after completing Calculus for the Modern Engineer will require advisor approval.

Students are encouraged to select their additional math credits from advanced courses, including Math 215 (Multivariable and Vector Calculus), Math 217 (Linear Algebra with proofs), Math 312 (Applied Modern Algebra), Math 351 (Principles of Analysis), Math 371 (Numerical Methods), Math 412 (Abstract Algebra), Math 416 (Theory of Algorithms), and Math 451 (Advanced Calculus I, a proof-based course in Real Analysis). In Robotics, mathematical knowledge is power—especially when it can be rapidly transformed into code.

The material in ROB 201: Calculus for Engineers will equip students with essential mathematical tools that directly support higher-level robotics courses. Specifically, it prepares students for ME 240 and the upcoming ROB 298: 3D Dynamics (to be piloted in Winter 2025), as it covers fundamental topics such as the center of mass of robotic links, potential and kinetic energy for point masses, and elementary aspects of Lagrange’s Method for deriving dynamical equations. Importantly, the course emphasizes applying these concepts through computational methods, ensuring students are comfortable translating theory into code.

Additionally, ROB 201 is designed to align with the needs of advanced Robotics courses:

ROB 310: Robot Sensors and Signals benefits from the course's coverage of Laplace transforms.
ROB 311: Build Robots and Make Them Move requires a solid understanding of dynamical models and feedback control, both of which are introduced in this course.
ROB 320: Robot Operating Systems and ROB 330: Localization, Mapping, and Navigation gain from the inclusion of inverse kinematics and constrained gradient descent, respectively.

Moreover, the foundational knowledge provided in ROB 201 will enhance students' readiness for advanced courses such as ROB 422: Introduction to Algorithmic Robotics and ROB 489-002/003: Robot Control, where a deep understanding of mathematical principles and their computational applications is critical to success.

Special resources of facilities required for this course:

Supporting statement:
The Robotics faculty aim to prepare students for the era of Information, AI, Data, and Robotics. To achieve this, we are moving beyond traditional, Sputnik-era methods of engineering education, where students endure four semesters of Calculus before engaging with real-world engineering challenges. This course integrates mathematical theory with modern computational tools and real-world case studies, bringing abstract concepts to life. We emphasize accomplishment-based assessments through projects based on real engineering examples, rather than conventional exams. For this approach to succeed, our students must not only master Calculus but also be prepared to go beyond it. This requires (a) a deep understanding of Calculus, and (b) freeing up space in the curriculum to enable advanced mathematical study.

In the future, we intend for this course to replace Math 115, Math 116, and Math 216, offering a more streamlined, applied, and computational approach to these foundational topics. Despite these changes, Robotics is not reducing the total number of required math credits. Students must still earn 8 additional math credits beyond Calculus for the Modern Engineer. If students already have credit for Math 115, Math 116, or Math 216 before taking this course, those credits will count toward their math requirements. However, taking any of these courses after completing Calculus for the Modern Engineer will require advisor approval.

Students are encouraged to select their additional math credits from advanced courses, including Math 215 (Multivariable and Vector Calculus), Math 217 (Linear Algebra with proofs), Math 312 (Applied Modern Algebra), Math 351 (Principles of Analysis), Math 371 (Numerical Methods), Math 412 (Abstract Algebra), Math 416 (Theory of Algorithms), and Math 451 (Advanced Calculus I, a proof-based course in Real Analysis). In Robotics, mathematical knowledge is power—especially when it can be rapidly applied through coding.

Prof. Grizzle has met with the Chair of Mathematics, Karen Smith. We both agree that ROB 201 cannot be "watered down" mathematically. Robotics is confident that the course will match or exceed the theoretical level of existing math courses. For example, limits will be taught using epsilon-delta definitions, which have been dropped from the standard introductory calculus sequence. Every theorem in the course is also proved, providing rigor for students interested in advanced mathematics. This additional rigor will particularly benefit students pursuing a math minor.

The increasing trend of Math 115 being the most highly transferred course at UofM, along with similar trends for other math courses, highlights the need for this change. Both the Ross Business School and the School of Kinesiology have expressed interest in the course’s approach. Contacts include Catherine (Cathy) Shakespeare (shakespe@umich.edu) and Peter Bodary (pfbodary@umich.edu). Conversations with Atul suggest that the Computer Science department may also be interested, particularly for the LSA CS degree.

ROB 298/201: Special Topics: *Calculus for the Modern Engineer*

Textbook is open-sourced on GitHub

Second offering: Winter 2025, MoWe 4:30PM - 6:20PM, FRB 1060 and Zoom

Lots of Supplemental Information:

- Draft Article on ROB 201: What is it? What problem is it trying to solve? How did it come about?
- Syllabus for W25
- End of Term Instructor Report F24
- End of Term Individual Report F24
- **Midterm Instructor Report for ROB 201** F24
- **Midterm Individual Report for ROB 201 F24**
- **5 Google slides** hitting the highlights

Pilot Offering: Fall 2024: Letter grade distribution for Fall 2024 at the end of this document because special topics courses are not posted to Atlas.

Instructor and course creator: Prof. Jessy Grizzle

Credits: 4

Prerequisite: ROB 101 *Computational Linear Algebra* for its preparation in linear algebra and Julia. If you have had Math 214, 217, or other linear algebra courses and are skilled enough in programming that you can pick up Julia in a few weeks, then you can petition to join the class. All of the course material from ROB 101 is available online.

Questions: Please post questions on the Robotics Undergraduate Q&A Forum with **subject ROB 201** (the likely course number for Fall 2025).

Caveat Emptor: the Robotics Department can guarantee credit only for students in Robotics. We have no control over what other departments, no matter the School or College, will accept. Non-Robotics majors will have to petition their home departments. That is not something we can do for you.

The course is meant to replace Math 115 (Differential Calculus), Math 116 (Integral Calculus), and Math 216 (Differential Equations and Laplace Transforms). At least in Robotics, ROB 201 does not reduce your overall math requirements as explained later in this document. **For a list**

of topics, see this excerpt. The topics will be taught in a different order. A new open-source textbook has been written and is available to everyone as a PDF at no cost.

Attendance is strongly encouraged, but asynchronous participation is allowed. All lectures and recitations will be recorded. Office hours will be online.

Course Description: Introduction to key concepts in single-variable integral and differential calculus, Jacobians, gradients, and ordinary differential equations. Theory is applied computationally to real-world engineering problems like modeling robots, integrating drone IMU signals, gradient descent with constraints, and feedback control, offering a hands-on approach to calculus in robotics.

Midterm Course Evaluations:

- Excellent course: **4.29**
- Workload: **3.12** (means typical)
- I gained a good understanding of principles: **4.50**

Is the course right for you? The pace is brisk, so markers for success are:

- Can spend min. of 8 hours per week outside lecture
- Organized, respect deadlines, work due each week
- Know to reach out for help earlier instead of later
- Enjoy fundamental principles brought to life with applications
- Honest with self. Lying to one's self about mapping intentions to reality is harmful to success

Who can take the course: Anyone, even LSA and Ross students, but not all Departments currently allow credit! If you have no prior experience with Calculus or limited experience through Math 115, this course is designed for you. Students who have already earned credit for Math 115 and Math 116 are also eligible to take the course. Our treatment of ODEs and our introductions to Laplace Transforms and Lagrangian dynamics will have you well-prepared for ME 240.

ME 240 requires Math 216. *Will Calculus for the Modern Engineer be accepted as well?* Yes. While Math 216 is accepted as a co-req, ROB 298 will be accepted as a pre-req, where we underline that you must have completed ROB 298 before taking ME 240. We've also learned that Profs. Gillespie and Fazzeli are introducing a Robotics Dynamics course in W-25; some of you may prefer to take that. Clearly, ROB 201 will be an accepted pre-req.

Math 115 or 116 is required to declare Robotics. Will ROB 298 count in place of that? Yes. Associate Dean Kevin Pipe has given Robotics permission to declare students who complete Calculus for the Modern Engineer as we ramp up the course. Will this work for other CoE departments? That is up to each individual department to decide after consulting with ADUE Kevin Pipe.

ROB 298/201 Calculus for the Modern Engineer does not reduce overall math requirements for Robotics majors, but it does give you the ability to select math courses that appeal to you and you take them when they best fit your schedule:

- No prior calculus
    - Take ROB 298 Calculus for the Modern Engineer
    - Choose 8 credits of math courses from a curated list. Learn the math that appeals to you!
- Have credit for Math 115
    - Take ROB 298 Calculus for the Modern Engineer
    - Choose 4 credits of math courses from a curated list. Learn the math that appeals to you!
- Have credit for Math 115 and 116
    - Take ROB 298 Calculus for the Modern Engineer
    - Done with math requirements in Robotics.

- We have talked with Math and MechEng (e.g. 240)

- Questions: email Prof Grizzle grizzle@umich.edu

Curated List: You are recommended to choose your additional credits from the list below. If you have other courses in mind, then please talk to an advisor.

- MATH 215: Multivariable and Vector Calculus
- MATH 217: Linear Algebra (with proofs)
- MATH 312: Applied Modern Algebra
- MATH 351: Principles of Analysis
- MATH 371/ENGR 371: Numerical Methods
- MATH 412: Introduction to Modern Algebra
- MATH 416: Theory of Algorithms
- MATH 451: Advanced Calculus I
- **EECS 203 Discrete Math is NOT currently on the list. Must petition.**

Syllabus: Calculus for the Modern Engineer

Grading:

- 20% 8 Hw sets consisting of a written part and a jupyter notebook in Julia
- 20% for 5 Individually completed quizzes (open for one week)
- 9% Course Participation (both course evaluations, using Piazza to post and answer questions, completing Google forms)
- 51% 3 individual Projects, equally weighted
  - **Numerical Integration:** Uses linear acceleration collected from the IMU of a drone. Students first work with "clean data" and build, using the Trapezoidal Rule, a "real-time" estimate of speed and position, such as

$$v(t) = v(t_0) + \int_{t_0}^{t} a(\tau)\, d\tau.$$

$$p(t) = p(t_0) + \int_{t_0}^{t} v(\tau)\, d\tau.$$

    Students then experience how acceleration bias affects estimated speed and position. A one-line correction reminiscent of the measurement step in Kalman Filtering is introduced to correct for the bias. Students experimentally tune the filter's gains. The first project is deliberately short and sweet. The work can be viewed as numerically solving an ODE, but ODEs have not been covered at this point. The work is setting them up for ODEs.
  - **Gradient Descent with Equality Constraints:** Part 1 of the project begins with the ballistic equations, choosing the initial speed and angle of a basketball so that it makes a free throw. Formulation one involves solving a 2×2 system of linear equations in the initial speed (v_x, v_y), with time of flight fixed. Formulation two involves applying gradient descent to a cost function equal to the squared distance of the ball from the hoop's center at a fixed time (hence time of flight is still fixed); here, there are no constraints. Then, in pass three, we let the cost be time of flight plus initial speed squared, with the position of the hoop as a pair of linear constraints. The students are then taught within the project how to use JuMP, a professional package to verify all of their previous hand-coded results. In Part 2, the system is a floating base model of a single link with two points masses on its ends, to represent a very simple gymnast. I include the dynamical model in JuMP for them (as a set of equality constraints via trapezoidal integration). Similar to the basketball problem, students optimize time of flight plus initial speed squared subject to linear constraints on the landing posture of the "gymnast", using JuMP. Then, because it is spectacular, they work with a diver on a 10-meter platform. Finally, they return to the fundamentals of gradient descent with constraints, no longer using JuMP, but using the ForwardDiff package to compute the required gradients. They have to code up the gradient descent with constraints for the diver.
  - **Modeling and Feedback Control of a Planar Version of ROB 311's BallBot:** The project beings with understanding the BallBot and translating that understanding to computing the potential energy and kinetic energy of its two parts: a planar (representation) of a basketball and a single link torso that sits upon the basketball via three sets of omni-directional wheels. From the energy-based description of the model, I give them code that computes the so-called "Robot Equations" $(D(q) \cdot \ddot{q} + C(q, \dot{q}) \cdot \dot{q} + G(q) = \Gamma)$ using Lagrange's Method. They use software tools to compute a linear state-variable model of the robot and transfer function representations. The BallBot is very similar to a Segway. The complete control design for the Segway is given in the textbook, along with all steps for qualitative and numerical analysis of the controller gains. Students follow this method on the linear model of the BallBot, test the controller in simulation, first on the linearized model, and then on the full nonlinear model. Appropriate software tools to make these steps transparent and fun are provided.

1 Pre-calculus: Notation, Functions, and Various Algebraic Facts

- 1 hour lecture.
- Students are expected to review this material mostly on their own.
- 20 question Quiz over the material to ensure mastery.
- The Approximation Principle is highlighted in HW01,

Learning Objectives

By the end of this chapter, the student should be able to:

- Recognize calculus as the science of approximations.
- Interpret mathematical notation and appreciate its efficacy in conveying complex mathematical ideas succinctly.
- Revisit and refresh knowledge on key mathematical concepts that are crucial for understanding calculus.
- Develop an understanding of the importance of algorithms in mathematical problem-solving and analysis.
- Cultivate a taste for careful and precise mathematical reasoning.
- Explore Euler's number, e, and learn how it arose from a simple everyday question.

Outcomes

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

- Recognize the utility and importance of mathematical notation in the precise expression of mathematical concepts.
- Observe the Approximation Principle at work through the study of numbers like π, $\sqrt{2}$, and e.
- Understand and apply the Bisection Algorithm as an example of the Approximation Principle in numerical methods.
- Review and properly apply rules for manipulating inequalities.
- Reaffirm understanding of fundamental concepts such as functions, domains, ranges, and inverses.
- Conduct a thorough examination of roots and powers and their properties.
- Review and consolidate knowledge of the key characteristics of exponential and logarithmic functions.
- Utilize Euler's Formula to simplify complex trigonometric expressions effectively.
- Revisit (or learn) the Binomial Theorem and its applications in algebraic expansions.
- Learn how to effectively apply shifting and scaling operations to functions for various analytical purposes.

2 Calculus Foundations: Proofs, Finite Sums, Limits at Infinity, and Geometric Sums

- 4 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, the student should be able to:

- Understand the significance of mathematical proofs and articulate their importance in Calculus and its applications.
- Master the technique of proof by induction and apply it to demonstrate the validity of mathematical statements.
- Comprehend the concept of limits and see some of their initial uses in Calculus.

Outcomes

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

- Apply logical rules to construct (simple) mathematical arguments.
- Learn there are at least two kinds of infinity.
- Analyze sums of powers of integers to build a foundational understanding of integration.
- Calculate limits at infinity for functions that are significant in Calculus.

- Acquire additional knowledge about Euler's number and its unique properties.

3 Definite Integration as the Signed Area Under a Curve

- 5 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, the student should be able to:

- Define and explain the concept of a definite integral within the context of calculus.
- Execute accurate computations of definite integrals using appropriate mathematical techniques, such as the Trapezoidal Rule and Simpson's Rule.
- Describe and apply the basic properties of definite integrals to solve problems.
- Recognize and demonstrate the applications of definite integrals in various engineering scenarios.

Outcomes

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

- Construct and calculate Riemann lower and upper sums to approximate definite integrals.
- Acquire insight into what kinds of functions can be integrated.
- Employ numerical algorithms used in engineering practice to compute definite integrals.
- Utilize integration techniques to infer changes in position from a given velocity function, particularly in robotic applications.
- Identify the mathematical origins of parabolic trajectories in ballistic motion.
- Determine the area enclosed between two functions.
- Compute essential parameters for robotic models, such as total mass and center of mass.
- Learn how to trick a single-variable integral into computing the volume of a solid of revolution.

4 Properties of Functions: Left and Right Limits, Types of Continuity, Boundedness, and Generalizations of Max and Min

- 5 hours lecture + recitation.
- Written and Julia HWs

Remark: This Chapter reveals some of the mathematical backbone of Calculus. Traditionally, much of this material is placed earlier in a Calculus course. Because many of the topics are abstract and very technical, we delayed them until you've gotten the hang of combining programming and numerical calculations when learning mathematical concepts.

Learning Objectives

By the end of this chapter, the student should be able to:

- Appreciate the foundational role of calculus in mathematical modeling and problem-solving, integrating programming and numerical methods to solidify these concepts.
- Analyze the behavior of functions at specific points using the concept of one-sided limits.
- Thoroughly understand the nature of function continuity and discover that continuity comes in more than one flavor.

- Derive closed-form expressions for the integrals of exponential functions and apply these techniques to integrate trigonometric functions.
- Determine the boundedness of functions and understand the implications for mathematical analysis and applications.
- Recognize that while maximum and minimum values are important, they are not the full story.

Outcomes

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

- Acquire both intuitive and formal understandings of one-sided limits and their calculation.
- Apply numerical methods to estimate one-sided limits and assess the continuity of functions using the epsilon-delta definition.
- Recognize when it is permissible to take limits within functions and apply this knowledge to the integration of exponentials.
- Identify and analyze piecewise continuous functions and extend this understanding to a broader class of Riemann integrable functions.
- Review and apply the concepts of maximum and minimum function values, and explore alternative behaviors when these extrema do not exist.

5 Differentiation

- 5 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, the student should be able to:

- Understand two conceptual views of a single-variable derivative
- Appreciate the effectiveness of various software tools for computing derivatives
- See real problems where single-variable derivatives are important in engineering.
- Make the leap to partial derivatives, which are single-variable derivatives applied to multivariable functions.

Outcomes

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

- Apply the definition of the derivative as rise over run in the limit.
- Understand the centrality of the derivative for linear approximation of a function.
- Compute a few derivatives via the rise over run definition.
- Obtain a sense of when common functions are differentiable and when they are not.
- Learn how to compute derivatives with various software packages.
- Master the Rules of Differentiation and Understand their Origin.
- Apply single-variable derivatives to determine speed from position.
- Apply the fact that a strictly positive derivative implies the function is strictly monotonically increasing.
- Use L'Hôpital's Rule for limits of indeterminate form.
- Compute Jacobians, gradients, and Hessians, with examples using software.

- Understand and use the total derivative.

6 Engineering Applications of the Derivative

- 5 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, the student should be able to:

- Analyze and model engineering problems using the principles of calculus, specifically through the application of derivatives to understand system behaviors.
- Develop strategies for solving optimization problems, both with and without constraints.
- Critically assess the role of derivatives in determining system dynamics and understand the significance of dynamic equations in engineering contexts.
- Apply the concept of energy to the analysis of mechanical systems using the framework of Lagrangian mechanics.

Outcomes

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

- Calculate path length and arc length for given paths.
- Solve engineering problems involving root finding and minimization.
- Use gradient descent to find local minima of functions and understand its limitations.
- Apply second derivative tests to determine the nature of critical points in functions.
- Solve optimization problems involving equality and inequality constraints using Lagrange multipliers.
- Derive and apply Lagrange's equations to solve problems in dynamics.
- Compute kinetic and potential energy for mechanical systems.
- Model and analyze the motion of complex systems like multi-link manipulators using Lagrange's formalism.
- Determine moments of inertia for various bodies and understand their effects on rotational motion.

7 Antiderivatives and the Fundamental Theorems of Calculus

- 4.5 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, students should be able to:

- Understand that antidifferentiation is essentially the inverse operation of differentiation.
- Comprehend the two Fundamental Theorems of Calculus and explain the precise sense in which differentiation and integration are inverse operations on functions.
- Understand that while antidifferentiation and definite integration are technically distinct operations, they are often perceived as identical in the context of Calculus education. This perception is partially justified by their closely related concepts. However, it's crucial to acknowledge the potential drawbacks of this viewpoint, particularly the confusion and discouragement that can arise from the complex rules associated with manually computing antiderivatives.
- Appreciate the historical and practical context of computing antiderivatives by hand, and recognize the modern approaches that render hand computations almost obsolete for all but the simplest of cases.

Outcomes

Upon successful completion of this chapter, students will:

- Be introduced to the concept of antiderivatives and familiarize themselves with elementary techniques for finding them.
- Gain a thorough understanding of the Fundamental Theorems of Calculus, including their implications in both geometric and analytic contexts.
- Develop an insight into the interplay between differentiation, antiderivatives, and definite integration, enhancing their comprehension of calculus as a whole.
- Cultivate an appreciation for the traditional methods of finding antiderivatives while also understanding the value and efficiency of using computational tools for real-world applications.

8 Improper Integrals

- 2 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By the end of this chapter, students should be able to:

- Define improper integrals and understand their significance within the context of calculus.
- Identify integrals that may pose difficulties due to their unbounded nature or the behavior of the function being integrated.
- Answer the pressing question: can an integral be doubly improper?
- Explore the applications of improper integrals, emphasizing their practical importance in Statistics and Probability.

Outcomes

Upon successful completion of this chapter, students will:

- Master the technique of integrating over unbounded domains using limits.
- Learn to manage and integrate functions with singularities or discontinuities by applying limits to circumvent infinite behavior at finite points, thus handling vertical asymptotes effectively.
- Gain a comprehensive understanding of the analytical methods for solving improper integrals, employing antiderivatives to facilitate calculation.
- Acquire skills in applying numerical methods, specifically Julia's `QuadGK`, for evaluating improper integrals, particularly when analytical solutions are challenging to obtain.
- Delve into two probability theory examples that utilize improper integrals, reinforcing the concept's application in real-world scenarios and theoretical studies.

9 Ordinary Differential Equations

- 6 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

By completing this chapter, students will:

- Gain an introduction to differential equations, focusing on their significance and the various classifications.
- Learn the foundational theories and techniques for solving one-dimensional first-order ordinary differential equations (ODEs).
- Acquire knowledge on the fundamentals and solution methods for vector first-order ODEs.
- Explore the application of numerical methods in solving vector first-order ODEs.
- Delve into the characteristics of linear systems of first-order ODEs and their implications for mathematical modeling.

Outcomes

Upon mastering the content of this chapter, students will be equipped to:

- Understand the definition and classification of ODEs based on their order, linearity, and whether they are homogeneous or non-homogeneous.
- Engage with various strategies for tackling first-order ODEs, covering separable, linear, and select nonlinear equations.
- Dive into the theory and application of solving systems of linear differential equations, highlighting their importance across diverse applications.
- Comprehend the utilization of ODEs in modeling and solving real-world problems across various domains.
- Grasp the fundamentals of numerical methods designed for solving ODEs in scenarios where analytic solutions are challenging or unattainable.
- Deeply investigate linear systems of ODEs, focusing on:
  - The structure and solution of linear vector ODEs, symbolized as $\dot{x} = Ax, x(t_0) = x_0$.
  - The concept and significance of the matrix exponential, denoted as e^{At}.
  - Essential attributes of the matrix exponential, such as $\frac{d}{dt}e^{At} = Ae^{At} = e^{At}A$.
  - Methods for solving linear vector ODEs, exemplified by $x(t) = e^{A(t-t_0)}x_0$.
  - The role of complex scalar exponentials, $e^{(a+\mathbf{i}\,\omega)t}$, in the context of ODE solutions.
  - The interplay between eigenvectors, eigenvalues, and the matrix exponential, such as $Av = \lambda v \implies e^{A(t-t_0)}v = e^{\lambda(t-t_0)}v$.
  - The criteria for stability in linear systems, $\mathrm{real}(\lambda) < 0 \implies \lim_{t\to\infty} e^{A(t-t_0)}v = 0_{n\times 1}$, underlining how the real parts of eigenvalues influence the system's long-term behavior.
  - The application of these principles to general initial conditions when A has a complete set of eigenvectors.

10 Laplace Transforms through the Lens of Feedback Control

- 7 hours lecture + recitation.
- Written and Julia HWs

Learning Objectives

- To introduce the concept and mathematical theory of Laplace Transforms.
- To become familiar with common Laplace transforms and their properties.
- To understand the process and methods of finding inverse Laplace transforms.
- To apply Laplace transforms for solving linear ordinary differential equations (ODEs).
- To define and derive transfer functions for linear time-invariant systems.
- To understand the importance and application of transfer functions in the design of Singe-Input Single-Output (SISO) feedback loops.
- To use appropriate software tools for each of the above topics.

Outcomes

- Gaining a foundational understanding of Laplace transforms and their application in engineering problems.
- Mastery of standard Laplace transforms of common functions and their key properties.
- Ability to understand inverse Laplace transforms using techniques such as partial fraction decomposition and tools in Julia.
- Proficiency in applying Laplace transforms to simplify and solve linear ODEs with initial conditions.
- Comprehensive understanding of transfer functions, their derivation, and significance in system analysis.
- Applying knowledge of transfer functions to design and analyze SISO feedback loops in engineering systems, particularly in robotics.

Balance of Time

- Reinforcing key topics in integration.
- Reinforcing key topics in differentiation.
- Reinforcing key topics in ODEs

University of Michigan
Fall 2024 Midterm Instructor Report
ROB 298-001: Spec Topics Robotics
Jessy Grizzle

22 out of 24 students responded to this midterm evaluation.

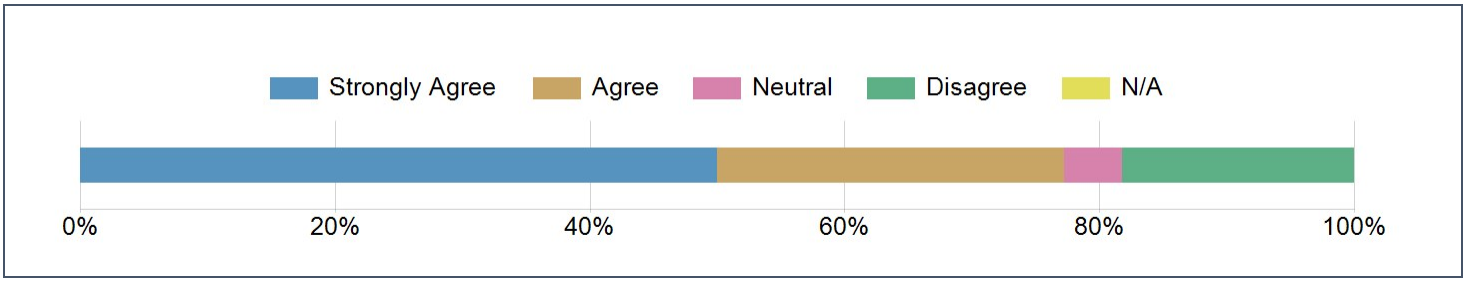
Responses to questions related to the course:

	SA	A	N	D	SD	N/A	Median
Overall, this was an excellent course. (Q1)	8	14	0	0	0	0	4.29
I had a strong desire to take this course. (Q4)	11	7	3	1	0	0	4.50
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	6	13	3	0	0	3.12
This course advanced my understanding of the subject matter. (Q1631)	11	11	0	0	0	0	4.50
My interest in the subject has increased because of this course. (Q1632)	7	13	2	0	0	0	4.19
I knew what was expected of me in this course. (SA=Almost Always, A=Frequently, N=Sometimes, D=Occasionally, SD=Hardly Ever).	13	9	0	0	0	0	4.65
I gained a good understanding of concepts/principles in this field. (Q121)	11	11	0	0	0	0	4.50
The amount of work required was appropriate for the credit received. (Q239)	10	11	1	0	0	0	4.41
Grades were assigned fairly and impartially. (Q365)	15	6	0	0	0	1	4.80

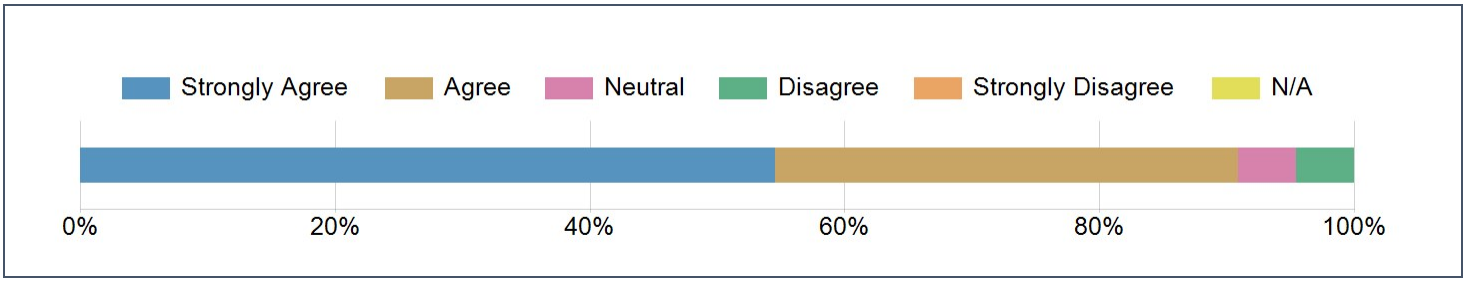
Responses to questions related to the instructor:

	SA	A	N	D	SD	N/A	Median
Overall, Jessy Grizzle was an excellent teacher. (Q2)	15	7	0	0	0	0	4.77
Jessy Grizzle seemed well prepared for class meetings. (Q230)	17	5	0	0	0	0	4.85
Jessy Grizzle explained material clearly. (Q199)	14	8	0	0	0	0	4.71
Jessy Grizzle treated students with respect. (Q217)	18	4	0	0	0	0	4.89
Jessy Grizzle appeared to have a thorough knowledge of the subject. (Q207)	19	3	0	0	0	0	4.92
Jessy Grizzle acknowledged all questions insofar as possible. (Q216)	19	3	0	0	0	0	4.92

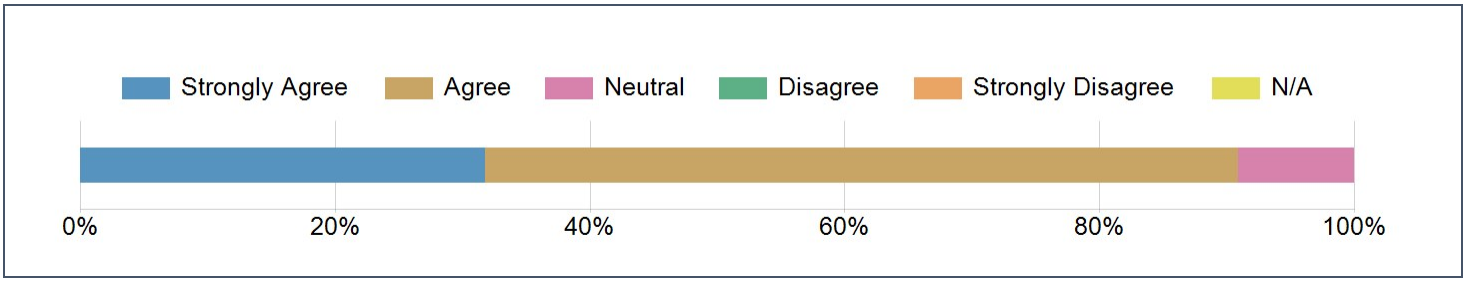
I rely more on lectures (live or recorded) than on the textbook to acquire proficiency in the course content.



The Julia programming exercises in this course have successfully helped bring alive the subject of calculus, Making it more relatable and practical, particularly in the context of engineering applications.



The written homework assignments in this course have effectively helped me practice the mechanics of standard calculus operations, such as computing limits, finding areas, and differentiating functions.



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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: 2024-12-12
Effective Term: Winter 2026

☑	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): Robotics Subject: ROB Catalog: 430		
☐	☐ 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) Deep Learning for Robot Perception and Manipulation		
☑	Abbreviated Title (20 char)			Abbreviated Title (20 char) Deep Robot Percept		
☑	Course Description (Please limit to 80 words and attach separate sheet if necessary) Neural-network-based deep learning for robot perception that enable robots to physically manipulate objects. Students implement, train, and debug their own state-of-the-art neural networks. Explore research topics in deep learning for robotics. Analysis, implementation, and reproduction of research publications in the area.					
☑	Full Term Credit Hours Undergraduate Min: 4 Undergraduate Max: 4	Graduate Min: 4 Graduate Max: 4		Half Term Credit Hours Undergraduate Min: Undergraduate Max:	Graduate Min: 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: 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) ROB 330
☑	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) Linear Algebra (ROB 101 or MATH 214 or MATH 217); Differential Equations (MATH 216); Systems programming and algorithms (ROB 320 or EECS 281) 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: Chad Jenkins Cognizant Faculty Member Title:Professor

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

Contact Person: Kayla Dombrowski Email: kakelle@umich.edu Phone: 734-936-7999

CoE Curriculum Committee Representative:	Anouck R Girard	Print: Anouck Girard	Date: 12-23-2024
CoE Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Dawn Tilbury	Date: 12-18-24
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 Neural-network-based deep learning for robot perception that enable robots to physically manipulate objects. Students implement, train, and debug their own state-of-the-art neural networks. Explore research topics in deep learning for robotics. Analysis, implementation, and reproduction of research publications in the area.
Class Length	Class Length Full term
Contact hours (lecture):	Contact hours (lecture): 3
Contact hours (recitation)	Contact hours (recitation)
Contact hours (lab)	Contact hours (lab) 2

Additional Info:

Submitted by:
Home dept

Describe how this course fits with the degree requirements:
Upper level elective Robotics BSE

Special resources of facilities required for this course:
Compute credits and GPU resources for deep learning

Supporting statement:
This course (known as "DeepRob") has been successfully offered for two years (Winter 2023, Winter 2024) as a combined course with undergraduate and graduate sections (ROB 498 and ROB 599). DeepRob offerings were essential for meeting enrollment demands during the launch of the Robotics Department. Student enthusiasm for the DeepRob course has been exceptionally high. Students have been able to build on their DeepRob projects for pathways into research and advanced development, in several cases leading to research publications. DeepRob has the potential to serve as a capstone-style course on the horizon, if this possibility would be beneficial.

Course Syllabus: Deep Learning for Robot Perception

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About

Robots need to see and understand their world to be able to interact with objects and perform useful tasks autonomously. Perception is the essential first step in the process for endowing robots to perform autonomously. Autonomous robots need to make sense of their sensory observations to represent the world around them – and enable their reasoning and action to a goal. Visual perception with cameras as sensors has matured due to the recent advancements in neural networks – which is especially true for performing visual recognition tasks such as object classification, detection, pose estimation, grasp pose detection, etc.

This course aims to cover the necessary background of neural-network-based deep learning for robot perception – building on advancements in computer vision and enabling – for enabling robots to dexterously manipulate physical objects. During the first part of this course, students will learn to implement, train and debug their own neural networks. During the second part of this course,

students will explore recent emerging topics in deep learning for robot perception and manipulation. This exploration will include analysis of research publications in the area, building up to reproducing and implementing state-of-the-art deep learning approaches as a final course project.

This course builds on and is indebted to these existing courses (as a "star" and a "fork" in the open source sense):

- University of Michigan - ROB 498-002 / 599-009: Deep Learning for Robot Perception instructed by Anthony Opipari, Chad Jenkins, and Karthik Desingh
- University of Michigan - EECS 498-007 / 598-005: Deep Learning for Computer Vision instructed by Justin Johnson
- Stanford - CS231n: Deep Learning for Computer Vision instructed by Fei-Fei Li and Andrej Karpathy

Topics and Course Structure

The first half of the course will cover deep learning fundamentals in computer vision catered to robot perception problems.

- Linear classifiers
- Stochastic gradient descent
- Fully-connected networks
- Convolutional networks

The second half of the course will switch to seminar style covering following advanced topics in robot perception and manipulation via discussing publications.

- 3D vision in robotics
- Pose estimation
- Object perception for robot manipulation
- Neural radiance fields for perception
- Robot grasp pose detection

Prerequisites

- Strongly encouraged prerequisites:
  - Programming: ROB 320, EECS 281, or equivalent

    - Linear Algebra: ROB 101, MATH 214, MATH 217, or equivalent
- Recommended prerequisites:
    - Prior experience with the Python programming language is recommended.
    - Familiarity with gradients and how to calculate them from vector calculus.
    - Familiarity with random variables and probability distributions from probability theory.
    - Familiarity with concepts from machine learning (e.g. EECS 445) will be helpful.

Textbook

There is no required textbook for this course, however optional readings will be suggested from the textbook, "Deep Learning" by Ian Goodfellow and Yoshua Bengio and Aaron Courville.

For additional references, consider the following textbooks:

- "Introduction to Robotics and Perception" by Frank Dellaert and Seth Hutchinson
- "Robotics, Vision and Control" by Peter Corke
- "Computer Vision: Algorithms and Applications" by Richard Szeliski
- "Foundations of Computer Vision" by Antonio Torralba, Phillip Isola, and William T. Freeman

Lectures

Lectures will take place in-person.

In-person lectures will be held on **Tuesdays and Thursdays from 3:00-4:30 PM EST in room COOL G906**. Remote access will be available through Zoom (Meeting ID: 965 2450 4025) (Passcode: deeprob)

Discussion Sections

Discussions will take place in-person.

In-person discussions will be held on **Wednesdays from 3:30-5:30 PM EST in room EECS 1311**. Remote access will be available through Zoom (Meeting ID: 965 2450 4025) (Passcode: deeprob)

Programming Projects

You will complete 5 programming projects over the course of the semester. All projects will be implemented using Python, Pytorch and Google Colab.

Final Project

Instead of a final exam at the end of the semester, you will complete a final project working in groups of 1 to 3 students.

The final project will entail five core deliverables: (1) a written paper review, (2) an in-class paper presentation, (3) reproducing the published results of an existing deep learning paper, (4) extending the chosen paper's methods and (5) documenting your reproduction and extension in a written report.

The objective of the final project is for you to gain experience with state of the art approaches in deep learning and a sense of how research in the area is conducted.

Quizzes

Throughout the semester, there will be a total of 16 quizzes administered through gradescope. These quizzes will be posted before lecture sections throughout the semester and be available to take until the beginning of lecture that same day. Quizzes will be released at 7:00AM EST and must be submitted by 5:00PM EST. Each quiz will have a 15 minute time limit. Each quiz will consist of 1 or 2 short questions within the scope of previously covered lectures and graded projects. Use of lecture, project and other course materials is permitted while taking the quizzes. Use of external sources (i.e. from the internet) is not permitted during quizzes.

Grading Policy

Course grades will be determined according to the following criteria:

- Project 0: 6%
- Project 1: 12%
- Project 2: 12%
- Project 3: 12%
- Project 4: 12%
- Final Project:
  - Paper Review: 5%
  - Paper Presentation: 10%
  - Paper Reproduction: 5%
  - Algorithmic Extension: 5%
  - Written Report: 5%

- 16 Pre-Lecture Quizzes: 16% (1% each)

Collaboration Policy

The free flow of discussion and ideas is encouraged. **However, all work submitted must be your own.**

All code submitted must comply with the College of Engineering Honor Code.

No code can be communicated, including verbally. Explicit use of external sources must be clearly cited. Experimentation with and use of generative AI as an educational tool is encouraged, however any use of AI for course work must abide by the College of Engineering Honor Code and must be clearly cited.

Discussion Forum

The Piazza discussion forum is available for discussion of course materials including lectures and projects. **Students are not required to participate, use or join the Piazza forum.**

Any discussion of quizzes and verbatim code on the Piazza forum must be posted privately.

University of Michigan
Winter 2024 Instructor Report
ROB 498 011 - ROB 599 011
Xiaoxiao Du

28 out of 69 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)	16	11	1	0	0	0	4.6	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	17	8	2	0	1	0	4.7	4.2	4.2
I knew what was expected of me in this course.(Q1633)	13	10	4	1	0	0	4.4	4.4	4.6
I had a strong desire to take this course.(Q4)	18	6	3	1	0	0	4.7	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)	4	3	8	7	6	0	2.6	2.9	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
Xiaoxiao Du seemed well prepared for class meetings.(Q230)	21	5	2	0	0	0	4.8	4.7	4.8
Xiaoxiao Du explained material clearly.(Q199)	17	6	5	0	0	0	4.7	4.6	4.7
Xiaoxiao Du treated students with respect.(Q217)	24	3	1	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)	17	5	6	0	0	0	4.7
I gained a good understanding of concepts/principles in this field. (Q121)	18	5	5	0	0	0	4.7
The amount of work required was appropriate for the credit received. (Q239)	14	6	7	1	0	0	4.5
Grades were assigned fairly and impartially. (Q365)	16	7	4	1	0	0	4.6

Responses to questions about the instructor:

12-

	SA	A	N	D	SD	N/A	Your Median
Overall, Xiaoxiao Du was an excellent teacher. (Q2)	17	9	2	0	0	0	4.7
Xiaoxiao Du appeared to have a thorough knowledge of the subject. (Q207)	21	6	1	0	0	0	4.8
Xiaoxiao Du acknowledged all questions insofar as possible. (Q216)	21	6	1	0	0	0	4.8

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2024 Instructor Report
ROB 498 012 - ROB 599 012
Xiaoxiao Du

23 out of 69 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)	15	6	2	0	0	0	4.7	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	16	4	2	0	1	0	4.8	4.2	4.2
I knew what was expected of me in this course.(Q1633)	14	7	2	0	0	0	4.7	4.4	4.6
I had a strong desire to take this course.(Q4)	17	4	2	0	0	0	4.8	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)	4	2	9	5	3	0	2.9	2.9	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
Xiaoxiao Du seemed well prepared for class meetings.(Q230)	17	4	2	0	0	0	4.8	4.7	4.8
Xiaoxiao Du explained material clearly.(Q199)	15	6	2	0	0	0	4.7	4.6	4.7
Xiaoxiao Du treated students with respect.(Q217)	18	4	1	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)	15	6	2	0	0	0	4.7
The lab instructions are clear and complete. (Q1765)	11	7	3	1	0	1	4.5
The provided lab materials (templates, tutorials, etc.) are clear and helpful. (Q1766)	14	4	5	0	0	0	4.7
Overall, my experience with my assigned group members has been excellent. (Q1767)	14	3	5	0	0	1	4.7
The amount of assistance given outside scheduled lab time has been sufficient. (Q1768)	14	5	3	1	0	0	4.7

12-18-24

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Xiaoxiao Du was an excellent teacher. (Q2)	16	5	2	0	0	0	4.8

The medians are calculated from Winter 2024 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 upper division with enrollment of 16 to 74 in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ROB 498 002 - ROB 599 009
Anthony Opipari III

27 out of 81 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)	14	10	2	1	0	0	4.5	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	13	10	3	1	0	0	4.5	4.1	4.2
I knew what was expected of me in this course.(Q1633)	10	12	3	2	0	0	4.2	4.3	4.6
I had a strong desire to take this course.(Q4)	11	13	3	0	0	0	4.3	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)	3	2	17	4	1	0	3.0	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
Anthony Opipari III seemed well prepared for class meetings.(Q230)	16	11	0	0	0	0	4.7	4.7	4.8
Anthony Opipari III explained material clearly.(Q199)	15	11	1	0	0	0	4.6	4.6	4.7
Anthony Opipari III treated students with respect.(Q217)	21	6	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)	10	12	3	1	0	0	4.3
I gained a good understanding of concepts/principles in this field. (Q121)	10	14	1	0	2	0	4.3
The amount of work required was appropriate for the credit received. (Q239)	9	14	3	1	0	0	4.2
Grades were assigned fairly and impartially. (Q365)	8	15	2	1	0	1	4.2

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Anthony Opipari III was an excellent teacher. (Q2)	12	14	0	1	0	0	4.4
Anthony Opipari III appeared to have a thorough knowledge of the subject. (Q207)	14	12	1	0	0	0	4.5
Anthony Opipari III acknowledged all questions insofar as possible. (Q216)	15	10	1	0	1	0	4.6

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 upper division with enrollment of 75 or greater in College of Engineering.

University of Michigan
Winter 2023 Instructor Report
ROB 498-003: Spec Topics Robotics
Anthony Opipari III

1 out of 13 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)	1	0	0	0	0	0	5.0	4.4	4.5
My interest in the subject has increased because of this course. (Q1632)	1	0	0	0	0	0	5.0	4.1	4.2
I knew what was expected of me in this course.(Q1633)	0	1	0	0	0	0	4.0	4.3	4.6
I had a strong desire to take this course.(Q4)	1	0	0	0	0	0	5.0	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	0	1	0	0	0	3.0	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
Anthony Opipari III seemed well prepared for class meetings.(Q230)	1	0	0	0	0	0	5.0	4.7	4.8
Anthony Opipari III explained material clearly.(Q199)	0	1	0	0	0	0	4.0	4.6	4.7
Anthony Opipari III treated students with respect.(Q217)	1	0	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)	1	0	0	0	0	0	5.0
The lab instructions are clear and complete. (Q1765)	0	1	0	0	0	0	4.0
The provided lab materials (templates, tutorials, etc.) are clear and helpful. (Q1766)	0	1	0	0	0	0	4.0
Overall, my experience with my assigned group members has been excellent. (Q1767)	1	0	0	0	0	0	5.0
The amount of assistance given outside scheduled lab time has been sufficient. (Q1768)	1	0	0	0	0	0	5.0

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Anthony Opipari III was an excellent teacher. (Q2)	1	0	0	0	0	0	5.0

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 upper division with enrollment of 1 to 15 in College of Engineering.