

## Spring 2023 Common Course Syllabus (Rev. 1.0)

### Course Information

ECSE 4900, ISYE 4270, MANE 4260, and MTLE 4920 - Multidisciplinary Capstone Design

Credit Hours: 3

Section	Days	Time	Class Room	Fabrication Area
1	MR	10:00 - 11:50 AM	JEC 3232/3332	JEC 2332
2	MR	12:00 - 1:50 PM	JEC 3232/3332	JEC 2332
3	TF	10:00 - 11:50 AM	JEC 3232/3332	JEC 2332
4	TF	12:00 - 1:50 PM	JEC 3232/3332	JEC 2332

### Instruction Method:

- In-Person Course (subject to Rensselaer's COVID-19 policy)
- All course materials for all students will be available on the course website.
- Students will have access to the Design Lab fabrication facility for prototyping

Course Website: <https://designlab.eng.rpi.edu/edn>

### Prerequisites:

- All Courses: ENGR-2050 and Senior Standing
- MTLE-4920 also requires MTLE-4910

### Instructors and Teaching Assistant

See Attachment A.

### Course Description

A capstone design experience that engages students from biomedical, computer and systems, electrical, industrial, materials, and mechanical engineering on teams to solve an open-ended engineering design problem in preparation for professional practice. Students apply knowledge and skills from prior coursework with the guidance of a multidisciplinary team of faculty members and instructional support staff. This is a communication-intensive course.

### Course Text

A textbook is not assigned for this course. Instead, you must research and collect technical information relevant to your assigned project. The textbooks used in previous courses are often helpful references (e.g., *Design & Development* by Ulrich-Eppinger used in Intro to Engineering Design (IED)).

Self-learning video modules are available in the Electronic Design Notebook (EDN): Self-Learning Materials.

[https://designlab.eng.rpi.edu/edn/projects/capstone-support-dev/wiki/Self-learning\\_Materials](https://designlab.eng.rpi.edu/edn/projects/capstone-support-dev/wiki/Self-learning_Materials)

### Online Resources

Online resources used for this course are listed in the table below. Please be sure that you are signed into each resource. If you require assistance to access any of the online resources, please send an email to your Project Engineer or Prof. Kanai (kanaij@rpi.edu) as soon as possible.

Tool	URL
Electronic Design Notebook (EDN)	<a href="https://designlab.eng.rpi.edu/edn/">https://designlab.eng.rpi.edu/edn/</a>
Webex Teams – Spaces	Your Project Engineer will send an email invite
iPeer for Peer Evaluations and Self-Reflections	<a href="http://mdl-vm3.eng.rpi.edu/">http://mdl-vm3.eng.rpi.edu/</a>
Online Safety Training	<a href="https://rpi.percipio.com">https://rpi.percipio.com</a>

### **Student Learning Outcomes**

Students of diverse backgrounds, skills, and perspectives will work in teams on a one-semester project related to the design of a complex engineering system. Each student will be responsible for specific tasks, usually related to their discipline. As responsible engineers, students must show how their designs function properly in the context of the overall system. Students, as individuals and teams, will develop and practice the following:

1. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
2. An ability to communicate with a range of audiences
3. An ability to manage a project
4. An ability to provide leadership
5. An ability to create an inclusive and equitable collaborative team environment
6. An ability to acquire and apply new knowledge to solve technical problems

### **Project Process (Course Content)**

A design process taught in *Introduction to Engineering Design* is used to scope the project and design, build, test, and deliver your proposed design solutions within schedule. The order of these activities may vary dependent on the goals of each project.

The first nine classes apply guided activities to help define and launch your project. Outlines for these in-person class sessions, and instructions for out-of-class preparatory tasks, are provided in a playbook accessible from [the Course Wiki](#). For each class, students must complete the required out-of-class tasks prior to the in-person class session.

Week	Design Activities
1	Team formation Online safety training
1~4	Research and gather customer needs; translate needs into engineering requirements Project scoping and planning, including risk analyses
4~7	Concept generation, evaluation, and selection Define engineering specifications System architecture design Engineering analyses of critical issues and risks
8~15	Develop/evaluate detailed design System Integration System Evaluation and Testing
15~16	Technology Transfer and Wrap Up
On-going	Team meetings both in class and out of class
	Status update presentations to the project sponsor (every 2-3 weeks)
	Minutes for each team meeting/breakout session

For more information, see [Tasks and Due Dates](#)

### **Fabrication Facility**

Students can use the Design Lab fabrication facility, JEC 2232, for prototyping. For some projects, computer simulation and analytical methods may be used to demonstrate feasibility instead of physical prototypes and testing.

Safety is critical. Students must follow safety rules and operational policies. Those in violation are subject to appropriate disciplinary action and/or immediate dismissal from the fabrication area by lab supervisors, faculty, or staff. For more information, see [the Safety web page](#).

### **Course Assessment (Grading)**

This project-based course uses a holistic approach (vs. assignments and tests) to evaluate performance. You must show all your work using the Electronic Design Notebook (EDN) online collaboration tool. Failure to document your work in the EDN will negatively impact your final grade.

Graded tasks are summarized in the following table; all grades are posted to LMS. Your final grade is determined as:

**Final Grade = (Team Grade \* ICF) + Individual Grade**, where *ICF* is Individual Contribution Factor.

An ICF is holistically determined by your Capstone faculty advisor's observation of a student's performance, including but not limited to your active participation both in and out of classes, technical contribution, project management, communication, teamwork and leadership, with input from your Project Engineer, and peer evaluation.

For more information, see the following wiki page.

[https://designlab.eng.rpi.edu/edn/projects/capstone-support-dev/wiki/Tasks\\_and\\_Due\\_Dates](https://designlab.eng.rpi.edu/edn/projects/capstone-support-dev/wiki/Tasks_and_Due_Dates)

Due Date Sections 1&2 (3&4)	Deliverables	Assessment Type	Level of Assessment	% of Final Grade
1/23-1/27	Individual CE Feedback Session # 1	Feedback	Individual	-
1/30 (1/27)	Design Report Phase 1 (Statement of Work)	Rubric	Team	10
2/6 (2/3)	Background Memo	Rubric	Individual	5
2/7-2/13 approx.	Status Update #1 (Presentation)	Feedback	Team	-
2/16 (2/17)	Preliminary Design Review-Poster Presentation	Rubric	Team	5
			Individual (Oral)	5
2/21	Design Report Phase 2 (Preliminary Design Report)	Rubric	Team	15
2/22	Preliminary Peer Evaluation	Feedback	Individual	-
2/24-3/2	Individual CE Feedback Session # 2	Feedback	Individual	-
2/27-3/3 approximate	Status Report 2 (Presentation)	Feedback	Team	-
3/20-3/24 approximate	Status Report 3 (Presentation)	Feedback	Team	-
3/20-3/24 as needed	Individual CE Feedback Session # 3	Feedback	Individual	-
Week 15 - Final Exam Week	Final Design Review- Presentation & Poster	Rubric	Team	15
4/26	Final Design Report	Rubric	Team	30
4/27	Final Peer Evaluation	Feedback	Individual	-
Weekly (Weeks 4-15)	Project Management Using EDN	Rubric	Individual	5
Weekly (Weeks 2-15)	Documented Technical Contribution in EDN	Rubric	Individual	10
			Total	100

## ***Attendance Policy***

Active participation is required for a meaningful capstone experience and affects your individual grade. You are expected to attend all class sessions and participate in meetings with your project team, faculty advisor, project engineer and sponsor mentor. You are also expected to make relevant technical and project management contributions outside of regularly scheduled class times.

It is necessary to communicate with your team, faculty advisor, and Project Engineer of any absence from classes ahead of time. In addition, you are required to make up your work for a missed class(es); this includes an Excused Absence. Missing classes without catching up and being habitually late to classes will negatively affect your final grade. For more information, see the [Excused Absences web page](#).

Students who cannot attend some classes due to religious observance must inform the instructor at the beginning of the semester.

## ***Other Course Policies***

**Mobile Devices** - All mobile devices (cell/smartphones, computers/tablets, etc.) must be used appropriately in class. Negative participation (e.g., gaming, social networking sites) will negatively affect your final grade.

**Confidentiality Requirements:** One of the educational goals of the Capstone Design course is to increase students' awareness of professional ethics and the need to protect confidential technical information. [The Confidentiality wiki page](#) describes the rules for handling information provided by the sponsor that is explicitly marked "confidential." Guidelines are also given for the publication of project results.

A specific issue concerns the use of "free" email services, such as Google and Yahoo, to exchange project technical information. The risk for the release of confidential information can be avoided by using RPI email or the Electronic Design Notebook. Therefore, the Capstone course policy is to **NOT** include any **project technical information** in messages to, from, or automatically forwarded to any **non-RPI email address**. The use of collaboration tools not provided by RPI, such as Google Docs, is not allowed.

**Inclusive Guidelines:** Another educational goal for students is to create an inclusive and equitable collaborative team environment. Each team must accommodate the needs (e.g., scheduling team meetings) of teammates. The standard language in Capstone Design is English.

**Students with disabilities** should inform their faculty advisor(s) of their needs at the beginning of the semester. Further information about services for students with disabilities and the accommodation process is available on the [Disability Service web page](#).

## ***Academic Integrity***

Cheating and dishonesty will not be tolerated. You must provide an honest effort in solving the assigned design challenge by yourself and your teammates. You are encouraged to discuss course material and problems with other students and/or RPI faculty as long as you follow the confidentiality agreement. However, your team's solution must be your own. If you are inspired by another's work, or if you are extending an existing approach, **you must explicitly cite this work**. All test results must be honestly reported. Any student found to have participated in academic dishonesty will receive an "F" grade for the course and may be subject to further disciplinary action.

The University Code of Academic Integrity prohibits students from committing the following acts of

academic dishonesty: academic fraud, copying or allowing one's work to be copied, fabrication/falsification, plagiarism, sabotage of others' work, and substitution. For details, see the [Academic Integrity web page](#).

If you have any questions concerning this policy, ask for clarification.

***Email***

This course uses email communications to provide instructions, feedback, and reminders. Check your RPI email account daily.

***COVID-19 Policy***

Rensselaer is committed to the health and safety of all students. RPI will continue to monitor any new developments with COVID-19 and determine a course of action that will uphold the well-being of students while maintaining a quality educational experience.

Students must follow RPI's COVID-19 guidelines. Refusal to comply with any appropriate request will be treated as would any classroom disruption (request to change the behavior; request to leave the class; dismissal from the class and referral to Student Affairs.) For more information, see <https://covid19.rpi.edu>

## Attachment-A: Team Advisors and Teaching Assistant

### Faculty/Chief Engineers

Office hours are shown in [Chief Engineers](#).

Section(s)	Chief Engineer (Faculty)	Office	Email
2	Prof. Ishwara Bhat	JEC 6032	<a href="mailto:bhati@rpi.edu">bhati@rpi.edu</a>
3	Prof. Paul Chow (ECSE)	CII 6111	<a href="mailto:chowt@rpi.edu">chowt@rpi.edu</a>
1	Prof. Rena Huang (ECSE)	CII 6207	<a href="mailto:huangz3@rpi.edu">huangz3@rpi.edu</a>
1	Prof. Rostyslav (Rosty) Korolov (ISYE)	CII 5223	<a href="mailto:korolr2@rpi.edu">korolr2@rpi.edu</a>
4	Prof. Prabhakar Neti (ECSE)	JEC 6038	<a href="mailto:netip@rpi.edu">netip@rpi.edu</a>
1	Prof. James Olson (MANE)	JEC 5009	<a href="mailto:olsonj7@rpi.edu">olsonj7@rpi.edu</a>
3	Prof. Indika Perera (MANE)	Gurley Bldg	<a href="mailto:pereru2@rpi.edu">pereru2@rpi.edu</a>
2	Prof. Dylan Rees (ECSE)	JEC 6046	<a href="mailto:reesj3@rpi.edu">reesj3@rpi.edu</a>
2&4	Prof. Fred Willett (MANE)	JEC 5046	<a href="mailto:willef2@rpi.edu">willef2@rpi.edu</a>

### Project Engineers

Office hours are shown in [Project Engineers](#)

Section(s)	Project Engineer	Office	Email
2, 3, 4	Mark Anderson	JEC 2027	<a href="mailto:anderm8@rpi.edu">anderm8@rpi.edu</a>
1, 3, 4	Brad DeBoer	JEC 3103	<a href="mailto:deboeb@rpi.edu">deboeb@rpi.edu</a>
2, 3, 4	Prof. Junichi Kanai (ECSE)	JEC 3330A	<a href="mailto:kanaij@rpi.edu">kanaij@rpi.edu</a>
1, 2, 4	Aren Paster	JEC 3103	<a href="mailto:pastea@rpi.edu">pastea@rpi.edu</a>

### Teaching Assistant

Office hours are shown in [Teaching Assistant](#)

Section(s)	Teaching Assistant	Office	Email
	Deanna Ko (MANE)	--	<a href="mailto:kod@rpi.edu">kod@rpi.edu</a>