

MECE 6397: Learning Meets Systems and Controls Spring 2022

Class Sections	Days and Times	Instructional Mode	Classroom
MECE 6397 (25622)	MoWe 1:00pm-2:30pm	Face-to-face	S 120

Instructor: Marzia Cescon

Office Room: Room W206, Engineering Building 2

Online Office Hours: Wednesday 2:30-3:30 pm or by appointment (please send email). Office hours will be held in Microsoft Teams.

Phone: 713-743-2037

Email: mcescon2@uh.edu

Face Covering Policy

To reduce the spread of COVID-19, the University strongly encourages everyone (vaccinated or not) to wear face coverings indoors on campus including classrooms for both faculty and students.

Presence in Class

Your presence in class each session means that you:

- Are NOT exhibiting any [Coronavirus Symptoms](#) that makes you think that you may have COVID-19
- Have NOT tested positive or been diagnosed for COVID-19
- Have NOT knowingly been exposed to someone with COVID-19 or suspected/presumed COVID-19

If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see [Student Protocols](#) for what to do if you experience symptoms and [Potential Exposure to Coronavirus](#) for what to do if you have potentially been exposed to COVID-19. Consult the (select: [Undergraduate Excused Absence Policy](#) or [Graduate Excused Absence Policy](#)) for information regarding excused absences due to medical reasons.

COVID-19 Information

Students are encouraged to visit the University's [COVID-19](#) website for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent [vaccine information](#), consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled

Note. Information contained in this syllabus is subject to change without notice. The instructor holds the right to make amendments to course assignments and due dates. Students are expected to be aware of any additional course policies presented by the instructor during the course.

students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact [the Justin Dart Jr. Student Accessibility Center](#) (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston [Undergraduate Excused Absence Policy](#) and [Graduate Excused Absence Policy](#) for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to [military service](#), [religious holy days](#), [pregnancy and related conditions](#), and [disability](#).

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the [Justin Dart, Jr. Student Accessibility Center](#). If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through Blackboard and Microsoft Teams.

Course Description

Over the next decade, the biggest generator of data is expected to be devices which sense and control the physical world. This will require a rigorous rethinking of the discipline of automatic control to incorporate aspects of machine learning and optimization, in order to meet the new challenges arising. While control theory has been firmly rooted in tradition of model-based design, the availability and scale of data (both temporal and spatial) will require rethinking of the foundations of this discipline. From a machine learning perspective, one of the main challenges going forward is to go beyond pattern recognition and address problems in data driven control and optimization of dynamical processes. This course will provide the students with an introduction to topics at the intersection of learning and control theory, placing them in the appropriate historical context of system identification and adaptive control.

Required Readings and Materials

Like other courses you have taken in Engineering at UH, the course web site for MECE 6397 will also be available in your UH Blackboard account. For this, you may either (i) log into your [accessuh.uh.edu](#) account and select Blackboard, or (ii) go directly to [elearning.uh.edu](#). All course related **announcement and** all course related **assignments will be posted on Blackboard.**

In addition to Blackboard, we will use **Microsoft Teams** for office hours/ live meetings, announcement and in general anything that requires interactivity from both instructor and student side. Furthermore, the following teaching material will be posted on Microsoft Teams:

- Slides used in class
- Reading material (papers, monographs, lecture notes, books)
- Additional video lectures

Course related **submissions** (homework and project reports) will be received **in Blackboard**.

There is no traditional textbook for this course. Our discussions will be guided by papers, monographs, lecture notes, books and videos that are available online or that the instructor will provide to the students.

Course Prerequisites

Students are expected to be mathematically mature with a solid background in **linear algebra**, **calculus and probability**, and be familiar with basic concepts in **optimization** and **control**.

Required prerequisites: MECE 3338 or equivalent, MECE 5367 or equivalent.

Technology Requirements

This course uses a learning management system called Blackboard with some integration of Microsoft Teams to post video lectures, course material, assignment details, announcements, and provide collaborative opportunities. This course is best viewed using a full computer running Windows or Mac OS. The use of mobile devices (or Chromebooks) may prevent course materials to not display or work properly. Below are the minimum technology requirements to be successful in this course:

- Supported operating system (e.g. Windows or Apple computer)
- Stable internet connection (ethernet connection preferred over wireless)
- AccessUH CougarNet Login credentials
- Email account (see “Communication Guidelines and Feedback”)
- Microsoft Office 2016 or later
- [Microsoft Teams](https://teams.microsoft.com/downloads) (teams.microsoft.com/downloads)
- Zoom
- PDF Reader
- Two supported internet browsers (e.g. Mozilla Firefox, Google Chrome)
- Pop-up blockers disabled for trusted sites (e.g UH, Blackboard, Microsoft)
- Cookies enabled for trusted sites (e.g UH, Blackboard, Microsoft)
- On-board or external web camera
- On-board or external computer microphone
- Headphones or headset is optional but preferred

1. **A smartphone (iPhone or Android) and an app which can take pictures of multiple pages and convert to a single pdf file. Examples of such apps are Fastscanner, Genius Scan and Camscanner. At the end of a typical course assessment, students will be required to scan multiple handwritten pages and convert them into a single pdf file using said smartphone apps. Students should then have the ability to upload and submit this pdf file on Blackboard.**

Participation and Attendance

Students are responsible for knowing and adhering to all university and college dates and deadlines. Such dates and deadlines include those for enrollment (registration), adding and dropping of courses, academic holidays, payment and refunds, and applying for graduation. Visit the [UH Academic Calendar](https://uh.edu/academics/catalog/academic-calendar) (uh.edu/academics/catalog/academic-calendar) and the current final exam schedule (<https://uh.edu/academics/courses-enrollment/final-exam-schedules/>) for specific dates.

In a case of emergency, it is the student's responsibility to keep posted on all official University alerts or closures.

Instructional Continuity Plan

This course will adhere to the University of Houston Instructional Continuity plan to provide reasonable extensions or modifications to course requirements in the event of campus-wide disruption that prevents regular course interactions. It is the student's responsibility to keep posted on all official [University alerts](https://alerts.uh.edu) or closures (alerts.uh.edu). The university notifies the campus community through TV announcement monitors, sound alerts, email, text, web, and the '[UH Go](https://uh.edu/go)' [app](https://uh.edu/go) (uh.edu/go). Students should take time to review their personal information and ensure the most current [emergency contact information](https://alerts.uh.edu/update-contact-information) is provided within myUH (alerts.uh.edu/update-contact-information).

[Possible hazards](#) that may result in a closure are: Active Shooter, Bomb Threats, Extreme Heat, Fire, Flood, Hazardous Material Release, Hurricanes, Severe Weather, and Winter Weather (uh.edu/emergency-management/be-prepared).

Course structure and evaluation

We will try to adhere to the following structure. The course is roughly divided into 2 parts: lectures and course project, respectively. The lecture part spans from week 1 to 10, includes 6 units and a number of related homework TBD. The course project runs from week 11 to 16 with some intermediate updates along the road. Suitable choices for projects include implementing, evaluating and comparing tools introduced in class, extending existing theoretical results, and applying tools to a domain specific problem of their choosing. Students will be evaluated based on homework and the project of their choice.

Semester project

Projects may be done individually or in groups of two. In case of graduate research assistants, students are encouraged (but not required) to propose a topic that connects class material to aspects of their research. The first component of the project will consist of a written proposal (2 pages limit, excluding references) and a 3 minutes elevator pitch. This proposal should include: motivation, prior work, problem statement, and ideas/methods/approach to solving the problem. The second component will be a mid-project update (3 pages limit, excluding references) and a 1-slider presentation. This update should include a description of current progress, which may include preliminary results (either computational or theoretical), a description of attempted methods/approaches, current roadblocks, and an outline of your plans for the rest of the semester. The final component of the project will be an end-of-semester report (8 pages limit, excluding references) and accompanying presentation. The final report is meant to mimic a conference setting, and therefore the report should be a self-contained document with an introduction, literature review, problem formulation, main results (and experiments if applicable), and discussion/conclusion sections. Similarly, each group will be expected to give a 20 min presentation, where they describe the problem their project addresses, their progress and potential innovations and concluding remarks.

Deciding of a topic: Each team is strongly encouraged to discuss with the instructor before the proposal submission. Students may start pitching their idea to the instructor anytime during week 1 to 10. This will give them the opportunity

to explore potential projects, as well as receive feedback and suggestions. If a team decides post proposal to switch to another problem, they may do so as long as they resubmit a new proposal.

Project grading: The goal of the project is to stimulate research and discussions between you, your peers and the instructor and to practice scientific writing and technical oral presentation. The project grade will not be based on the amount of progress towards solving an open problem. Rather, it will be a reflection of the amount of effort put into the project and on the clarity and quality of the submitted proposal/update/report and final presentation.

A selection of past years course projects is available at [this link](#).

Tentative schedule

SP2022	MECE 6397: Learning Meets Systems and Controls
Week of	
17 – Jan	Course introduction
24 – Jan	Dynamical systems model and representations
	Frequency domain analysis
31 – Jan	Feedback fundamentals
	Feedback fundamentals (cont'd)
7 – Feb	Subspace-based data-driven learning of dynamical systems
	Subspace-based predictive control
14 – Feb	Iterative learning control and R2R control
	Robust control
21 – Feb	Gain scheduling
	Adaptive control
28 – Feb	Learning dynamical systems in real time
	Self-tuning regulators
7 – Mar	TBD
14 – Mar	Spring break
21 – Mar	Reinforcement Learning
28 – Mar	Reinforcement Learning
4 – Apr	Project proposal deadline and elevator pitch
11 – Apr	Project work
18 – Apr	Mid-project update deadline

Note. Information contained in this syllabus is subject to change without notice. The instructor holds the right to make amendments to course assignments and due dates. Students are expected to be aware of any additional course policies presented by the instructor during the course.

25 – Apr	Project work
2 – May	Project work
9 - May	Final presentations and project report deadline

Communication Guidelines and Feedback

Official UH Email Mailbox

All students are provided an *official* UH email mailbox to use during their enrollment at the University of Houston. The email account will be the primary way instructors, UH entities, and support staff communicate with students. The purpose of this action is to: (1) help retain the integrity and privacy of your personal email account by keeping UH related correspondence within its own email mailbox and (2) provide additional course curriculum [Office 365](#) tools and functionality (uh.edu/office365).

Access and Use Your UH Email Mailbox

There are two ways to access and use your official UH email mailbox.

1. Visit [AccessUH](#) and click on the “Office 366” icon to gain access to the Outlook web app.
2. Download the free Microsoft Outlook app and follow the appropriate tutorial to check, send, and receive UH emails on mobile devices.
 - a. [Android Mobile Devices](http://uofh.sharepoint.com/sites/citelab/SitePages/training-library.aspx) (uofh.sharepoint.com/sites/citelab/SitePages/training-library.aspx)
 - b. [Apple Mobile Devices](http://uofh.sharepoint.com/sites/citelab/SitePages/training-library.aspx) (uofh.sharepoint.com/sites/citelab/SitePages/training-library.aspx)

Update Your Destination Email in AccessUH

Manually update your ‘destination’ email address to redirect to your new official UH email mailbox. Visit the UIT website to learn how to [update the destination email](#) within AccessUH (uh.edu/infotech/services/accounts/email/update-student-address).

Reporting Technical Issues

All technical error reports must include screenshot or video proof attached to an email message. Students are encouraged to start assignments early to help reduce last minute technical issues.

- [Windows: How to Take a Screenshot tutorial](#) (wikihow.com/Take-a-Screenshot-in-Microsoft-Windows)
- [Macintosh: How to Take a Screenshot tutorial](#) (wikihow.com/Take-a-Screenshot-in-Mac-OS-X)

Student Responsibility and Expectations

A [responsible student](#) (catalog.uh.edu/content.php?catoid=6&navoid=1082) is a successful student. At the University of Houston, students are expected to conduct themselves in a mature and responsible manner, respect the opinions, rights, and personal property of others, and meet their financial obligations. Students are responsible for seeking help and guidance from all of the resources that the university makes available to them. They are expected to be proactive and remain informed about university dates and deadlines, and understand academic and disciplinary policies. They are responsible for communication with their professors, advisors, and university staff, and the commitment to being

Note. Information contained in this syllabus is subject to change without notice. The instructor holds the right to make amendments to course assignments and due dates. Students are expected to be aware of any additional course policies presented by the instructor during the course.

organized and prepared to learn. Above all, our students are expected to strive for honesty and academic integrity throughout their period of study at the University of Houston.

- [UH Student Behavior and Conduct](http://uh.edu/dos/behavior-conduct) (uh.edu/dos/behavior-conduct)
- [UH Conduct Assessment and Response \(CART\) Team](http://uh.edu/cart) (uh.edu/cart)

[The College of Education the General Ethics Principles Guide](http://uh.edu/education/student-services/pdf/coe-ethics-code.pdf) (uh.edu/education/student-services/pdf/coe-ethics-code.pdf) describes the standards of practice expected of all college members (employees and students). Members of the college are expected to adhere to the following six principles: [College of Education members will...](#) (1) [Treat all people with dignity and respect.](#) (2) [Foster healthy and caring relationships.](#) (3) [Leverage change to strive for excellence.](#) (4) [Serve the profession with integrity.](#) (5) [Communicate clearly and openly.](#) (6) [Promote trust and confidence.](#)

During the period of this course, students may be expected to participate in synchronous and/or asynchronous online discussions. The following online etiquette will help respect each other's privacy while also creating a friendly atmosphere.

- Keep chats on topic - Avoid inappropriate conversations that may distract others from the course topic or objective.
- Avoid strong/loud language - Be polite. Language can easily be misinterpreted in written communication. Before sending an email or chat message make sure it clearly conveys the intended feeling.
- Use emoticons to express feelings - Nonverbal cues can reinforce the feeling of a message. Use sparingly. :-)
- Respect privacy of peers - Do not post someone's personal information online without their expressed permission.
- Use appropriate dress code on camera - During a video conference dress as if attending a face-to-face class. Avoid offensive clothing.
- Be mindful of background noise and scene/location - Take advantage of quiet areas to avoid distractions to fellow classmates. Avoid offensive décor or noise.
- Be helpful - Assist fellow classmates in understanding course materials.

Honor Code Statement

Students may be asked to sign an honor code statement as part of their submission of any graded work including but not limited to projects, quizzes, and exams: *"I understand and agree to abide by the provisions in the (select: [University of Houston Undergraduate Academic Honesty Policy](#), [University of Houston Graduate Academic Honesty Policy](#)). I understand that academic honesty is taken very seriously, and in the cases of violations, penalties may include suspension or expulsion from the University of Houston."*

Copyright

Materials in this course may be protected by copyright and should not be redistributed. Visit the [UH Library Copyright Resources](http://guides.lib.uh.edu/copyright) (guides.lib.uh.edu/copyright) for support resources regarding the basics of copyright, tools, fair use, and copyright law.

Center for Students with DisABILITIES

In accordance with 504/ADA guidelines, reasonable academic accommodations will be provided to students who request and require them. Call the [Center for Students with DisABILITIES](http://uh.edu/csd) (uh.edu/csd) at 713-743-5400 or visit their website to receive support and/or attain the correct documentation to present to your instructor. To receive these accommodations, students should request the specific accommodations, by submitting them to the instructor in writing, by Tuesday, September 1, 2020.

Counseling and Psychological Services (CAPS)

[Counseling and Psychological Services \(CAPS\)](http://uh.edu/caps) (uh.edu/caps) can help students who are having difficulties managing stress, adjusting to college, adjusting to the demands of an academic program, or feeling sad and hopeless. You can reach CAPS by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the [“Let's Talk” program](http://uh.edu/caps/outreach/lets_talk.html) (uh.edu/caps/outreach/lets_talk.html), a drop-in consultation service at convenient locations and hours around campus.

Support Services

Learning online doesn't mean that you are on your own. We are in this together and the University of Houston is committed to your success. We have rounded up a comprehensive list of resources, tools and tips to help you [Power On Learning](http://uh.edu/power-on/learning/) (uh.edu/power-on/learning/).

[Student assistance for Blackboard](http://uh.edu/blackboard/help) (uh.edu/blackboard/help) can be found by visiting, calling 713-743-1411, or emailing their support team. If you cannot purchase or download the suggested software programs, utilize the Engineering Computing Center (ECC, <http://ecc.egr.uh.edu/>) located on the first floor of Engineering Building 2. Software or hardware can be purchased at the UH Bookstore or [UH CougarByte Discount](http://cougarbyte.com) website (cougarbyte.com). Additional [UH computer labs are available all over campus](http://uh.edu/infotech/services/facilities-equipment/comp-labs) (uh.edu/infotech/services/facilities-equipment/comp-labs).

Other university support services include:

- [Student Resources](http://uh.edu/students) (uh.edu/students)
- [Library](http://libraries.uh.edu) (libraries.uh.edu)
- [Writing Center](http://writingcenter.uh.edu) (writingcenter.uh.edu)
- [Online & Special Programs](http://uh.edu/online) (uh.edu/online)

Other Helpful Information

COVID-19 Updates: <https://uh.edu/covid-19/>

Coogs Care: <https://www.uh.edu/dsaes/coogscare/>

Laptop Checkout Requests: <https://www.uh.edu/infotech/about/planning/off-campus/index.php#do-you-need-a-laptop>

Health FAQs: <https://uh.edu/covid-19/faq/health-wellness-prevention-faqs/>

Student Health Center: <https://uh.edu/class/english/lcc/current-students/student-health-center/index.php>

Emergency Preparedness Information

Emergency Phone Numbers

713-743-3333 UH Police
911 Emergency Dispatch

Security Escort

The Security escort service is designed for the community members who have safety concerns and would like to have a Security Officer walk with them, for their safety, as they make their way across campus. Call **713-743-3333** to make arrangements.

FIRE

Evacuate

- > If the fire alarm is not sounding, activate the nearest alarm pull station.
- > Call **713-743-3333** or **911** to report the fire.
- > Notify and assist people in the immediate area.
- > As you leave, close all doors behind you to limit the movement of smoke or flames.
- > Do not re-enter the building until authorized to do so by emergency personnel.
- > Never assume an alarm is false.
- > Do not use elevators.
- > If unable to exit the building, go to nearest exit stairwell or safe area of refuge and call **713-743-3333** or **911** to report your location.
- > If trained, use a fire extinguisher if the fire is small and contained, and the room is not filled with smoke.

Two emergency exits are located:

1. Farish Hall - Northwest Stairwell (A stairs)
2. Farish Hall - Southeast Stairwell (C stairs)

Primary (Near) Meeting Area:

Green space between Farish Hall and McElhinney Hall.

Secondary (Far) Meeting Area:

Green space at Ezekiel W. Cullen water fountains.

UH Alert

UHALERT

In the event of a campus emergency, the University of Houston will activate the UH ALERT Emergency Notification System to provide critical information. UH ALERT utilizes the following methods to send UH ALERTS:

- > [UH ALERT Website \(alerts.uh.edu\)](http://alerts.uh.edu)
- > Email
- > Text Message
- > [Facebook Alerts \(facebook.com/UHALert\)](https://facebook.com/UHALert)
- > [Twitter Alerts \(twitter.com/UHALert\)](https://twitter.com/UHALert)
- > [UH Mobile App \(uh.edu/go\)](http://uh.edu/go)
- > Digital Signage
- > Outdoor Warning Siren

For more information visit the UH ALERT website.

Weather

Shelter-in-Place

- > Seek shelter indoors.
- > Check uh.edu/emergency for shelter-in-place directive for the UH campus.
- > If a Tornado Warning is issued, seek shelter indoors in an interior room away from windows, and on the lowest floor possible.

Active Shooter

Avoid, Deny, Defend

If an active shooter or violent person is in your vicinity, please attempt to take the following steps:

- > **AVOID:** If possible, exit the building immediately and call **713-743-3333** to reach UH Police, or dial **911**.
- > **DENY:** If you cannot exit, clear the hallway quickly, remain behind closed doors in a locked or barricaded room, if possible, and stay away from interior windows.
- > **DEFEND:** Do not attempt to confront or apprehend the shooter, unless it is a last resort.

See http://uh.edu/police/active_shooter.html for more information about "Avoid, Deny, Defend."