

Kennesaw State University

Syllabus

Southern Polytechnic College of Engineering and Engineering
Technology
Department of Robotics and Mechatronics Engineering
MTRE 4800: Mechatronics System Design
2021 Fall

Course Information

Class meeting time:

Lecture — F 08:00–09:40

Lab — M 09:30–15:15

Modality and location:

Face-to-face — KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

Engineering Technology Center room Q 105 (lecture) and Q 118 (lab)

This syllabus is posted in D2L.

Instructor Information

Zane Pucylowski (lecture)

Email: zpucylow@kennesaw.edu

Office location: Virtual and also in Engineering Technology Center after class

Office phone: (404) 216-0140

Office hours: Virtual by appointment, in person after class

Preferred method of communication: email

(Be sure to use zpucylow@kennesaw.edu and not the @kennesaw.view.usg.edu account. That is, do not use D2L to send emails to the instructor.)

Matt Marshall (lab)

Email: mqm@kennesaw.edu

Office location: Q 317

Office phone: (470) 578-5135

Office hours:

M 15:30–17:00 and T 09:30–13:00

Preferred method of communication: email

(Be sure to use `mqm@kennesaw.edu` and not the `@kennesaw.view.usg.edu` account. That is, do not use D2L to send emails to the instructor.)

Course Description

Prerequisites: EDG 1211 and MTRE 2610 and MTRE 4001 and MTRE 4002L and MTRE 4100 and (MTRE 4010 or MTRE 4200 or MTRE 4300 or MTRE 4400 or MTRE 4490) and Engineering Standing

Credit hours: 2 class hour + 6 laboratory hours = 4 credit hours

The design of mechanical and electrical devices and systems, and cost considerations are covered. The course focuses on reliability, safety, energy and environmental issues, ethics, patents, product liability, time value of money, return on investment, and breakeven analysis. The design project is a capstone for the Mechatronics Engineering program. Projects are assigned based on interest, equipment and software availability, and the specific background of the student. Projects require planning, proposal presentation, scheduling, engineering, implementation, and written and oral presentations of project results. Students are encouraged to “design and build” and utilize concepts learned from courses throughout the program.

Course Materials

Required texts: Transdisciplinary Engineering Design Process, by Atila Ertas, ISBN 13: 9781119474753

Learning Outcomes

By the end of this course, students should:

- Be able to apply mathematics, science, and engineering to a project.
- Be able to design systems, components, and processes to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Be able to function in multi-disciplinary teams.
- Be able to identify, formulate, and solve engineering problems.
- Have an understanding of professional and ethical responsibility.
- Be effective communicators through both oral and written mediums.
- Be able to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Requirements and Assignments

The primary deliverables in this course are a report defending the design process of a mechatronic system and a working prototype thereof. The actual systems can vary greatly, however, all projects must include the following elements.

- Mechanical design
- Data acquisition from sensor(s)
- A programmable computing device
- Actuation control

Teams will consist of three or four members.

Report Section 2.2 (engineering problem statement) draft To ensure the engineering problem statement is clearly specified at the outset of the project, Section 2.2 of the final report (see “template_report” on D2L) will be due the third week of lab. It will be discussed with the entire class in order to strengthen the problem statement. A final version will be due the following week, on which the team will base its design.

Textbook chapter presentation The presentation topic will be assigned by the class instructor.

System overview presentation The general concept for the mechatronic system will be described in a ten- to fifteen-minute presentation. The presentation will be reviewed by peers and instructors during lab.

Design process plan, schedule, product backlog, etc. A plan for managing the design process is required. This can be a traditional tool like the Gantt chart, or something from agile project management like the product backlog etc.

Design objectives reflection After having learned a good bit about the selected mechatronic system, the team is to submit an alternative set of design objectives that it feels is more realistic. In other words, if the team could go back and tell its beginning-of-the-semester self what to write for design objectives, what would they look like?

Report Sections 1, 2, 3.1, and 3.2 Towards the end of the term, an early draft of the report is due. It must contain Sections 1, 2, 3.1, and 3.2 as described in the “template_report” document available on D2L. As defined, the Introduction section will not be able to be fully completed since it is supposed to contain a summary of the main results etc. Likewise, it is not expected that all the subsystems of the design will be complete at that time, so this submission requires just one of them to be reported on (that’s what’s referred to by §3.2).

Ethics homework Students will be presented with an ethical dilemma in the engineering profession and develop an appropriate response to the situation.

Final presentation On demonstration day, each team will have 5–10 minutes to present their project to a non-technical audience. The presentation will include a short (no longer than 2 minutes) video documenting project progress and demonstration of the working prototype satisfying MSC.

Demonstration The general public and campus community will be invited to observe the working prototypes on demonstration day. Prototypes not meeting the minimum success criteria on demonstration day will receive a zero grade for this item.

Final report The report is one of the main deliverables for the course. It describes engineering problem and verifies (either through analysis, simulation, or testing) that the design meets the objectives. The report also provides information, such as drawings and a bill of materials, for fabricating the mechatronic system. The report is graded on both style and content.

Evaluation and Grading Policies

Grades are converted as: A 90–100, B 80–89, C 70–79, D 60–69, F 0–59. Grade items and their respective weights are given in the table below.

| Assignment | Weight |
|--|--------|
| Report §2.2 draft | 5% |
| Textbook chapter presentation | 5% |
| System overview presentation | 5% |
| Design process plan, schedule, product backlog, etc. | 5% |
| Design objectives reflection | 5% |
| Report Sections 1, 2, 3.1, and 3.2 | 10% |
| Ethics homework | 5% |
| Final presentation | 10% |
| Demonstration | 30% |
| Final report | 20% |

Items will be graded within one week of submission. Grades will be rounded up if they are at 0.5 or above. For example, an 89.6 is an A, but 79.2 is a C.

Course Policies

Course Communication: Course material will be disseminated in D2L including lecture notes, homework assignments, etc. All official course announcements, including instructions when class may be cancelled, will be posted in the D2L course news. Be sure to check D2L regularly. The University provides all KSU students with an “official” email account with the address `students.kennesaw.edu` or `kennesaw.view.usg.edu` (in D2L). As a result of federal laws protecting educational information and other data, this is the sole email account you should use to communicate with your instructor or other University officials. (As stated in Instructor Information above, for this course you should use only the `students.kennesaw.edu` address.)

Late/Missed Assignments: In general, late and improperly submitted assignments are not accepted. Extenuating circumstances can result in exceptions to this rule, but agreement must be reached with the instructor in advance of the assignment or class to be missed. Late and/or improperly submitted work in D2L drop boxes will be assigned a zero grade.

Peer review Students are expected to attend and review/give feedback on other teams’ presentations. Internal design reviews are the heart of modern engineering design.

COVID-19 illness: If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

- Cough
- Fever of 100.4 or higher
- Runny nose or new sinus congestion
- Shortness of breath or difficulty breathing
- Chills
- Sore Throat
- New loss of taste and/or smell

COVID-19 vaccines are a critical tool in “Protecting the Nest.” If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU’s official Covid-19 website.

Face coverings: Based on guidance from the University System of Georgia (USG), all vaccinated and unvaccinated individuals are encouraged to wear a face covering while inside campus facilities. Unvaccinated individuals are also strongly encouraged to continue to socially distance while inside campus facilities, when possible

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies

KSU Student Resources

This link contains information on help and resources available to students: [KSU Student Syllabus Resources](#).

Course Schedule

| MONDAY LAB | FRIDAY LECTURE |
|--|---|
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">Aug 16th</div> Group formation and preliminary discussion with class about project selection | 20th Introduction to class, project, syllabus, file sharing, etc. Reading: Chapters 1 and 2 |
| 23rd Finalize project selection Instructor describes lab expectations | 27th No Class Update your resume. Update your LinkedIn profile. Write a standard cover letter. Put into a single PDF and post on the discord career-advice channel. Reading: Chapters 3 and 13 |
| 30th Report §2.2 (engineering problem statement) draft due | <div style="border: 1px solid black; display: inline-block; padding: 2px;">Sep 3rd</div> Project management Reading: Chapters 6, 9, and 10 |
| 6th Labor Day | 10th Design process I Reading: Chapters 4, 5, 7, and 8 |
| 13th Report §2 due | 17th Class presentations on textbook topics |
| 20th System overview (§3.1) presentations | 24th “Go get your job”/“How to negotiate your job offer” |
| 27th Team-by-team meetings with instructor Finalized design objectives due | <div style="border: 1px solid black; display: inline-block; padding: 2px;">Oct 1st</div> Design process II Drawing standards |
| 4th Submit and review plan for project created with a tool such as a Product Backlog or Gantt chart | 8th Optimization |
| 11th <i>Routine feedback from instructor</i> | 15th Design factors I |

| MONDAY LAB | FRIDAY LECTURE |
|--|---|
| 18th <i>Routine feedback from instructor</i> | 22nd Design factors II |
| 25th <i>Routine feedback from instructor</i> | 29th (Virtual) Guest speaker/design reviews |
| Nov 1st Design objectives reflection assignment due | 5th Brainstorms/design reviews Reading: Chapters 11 and 12 |
| 8th Report Sections 1, 2, 3.1, and 3.2 due | 12th Money and ethics |
| 15th <i>Feedback from instructor (and possibly peers)</i> | 19th Ethics assignment due |
| 22nd Fall Break | 26th Fall Break |
| 29th Rehearsal for final presentations | Dec 3rd Final presentations and demonstrations |
| 6th Final report due by 9:30 AM | 10th <i>no class</i> |