

MKT4111 MECHATRONICS SYSTEM DESIGN COURSE GUIDE



Republic of Turkey Yıldız Technical University
Department of Mechatronics Engineering

This guide has been prepared for students taking the Mechatronics System Design course, in order to introduce the course delivery and evaluation procedures for the 2026-2027 Fall term.

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Course Communication Channels

1. Google Classroom: dvkgfab

1. GENERAL OVERVIEW

The objective of the Mechatronics System Design course, the course outcomes, references and the course evaluation procedures are presented under this heading.

Start-of-Term Procedures

Students must enter their group and project information within the period specified in the course calendar. The final registration date and the relevant implementation details will be announced through an announcement published on Google Classroom. Students are required to follow the Google Classroom announcements throughout the course.

1.1 Objective

The aim of this course is to enable students to design a meaningful mechatronic system by using the knowledge and skills they acquired in previous courses with contemporary tools. It provides students with the opportunity to gain project management skills within the framework of industry standards, starting from the objective and definition of the project to be carried out and continuing through the process up to the development of a working prototype. It is intended to provide students with the means to determine, follow and document a roadmap required for design with technical documentation, and to express these studies through presentation techniques. It aims to apply a project-based approach in order to learn requirements analysis, functional design, conceptual design and 3D modeling.

1.2 Course Outcomes

- Being able to define mechatronic system requirements,
- Being able to reduce complex systems to simply designable subsystems,
- Being able to model, analyze and design systems,
- Being able to evaluate the performance of the designed system through simulations,
- Being able to demonstrate strong communication skills through the design report and presentations,
- Being able to acquire project management skills,
- Being able to carry out literature research.

- Equipping students with the skills required to design and develop a mechatronic system.
- Applying theoretical concepts through a project-based approach in order to solve engineering problems.
- Developing a complete mechatronic system from requirements analysis to functional design, 3D modeling and simulation

1.3 Core Learning Objectives

- Performing "Requirements Analysis" and "SWOT Analysis" for system requirements.
- Developing and analyzing functional diagrams and subfunctions.
- Using QFD (Quality Function Deployment) analysis to link requirements to quality characteristics.
- Being able to decide on the best conceptual design by generating more than one "Conceptual Design".
- Using solid modeling software for 3D modeling, simulation and optimization.

1.4 References

- 1) Bishop, Mechatronics Handbook, 2ed, CRC Press, 2007.
- 2) Bolton, Mechatronics: A multidisciplinary design approach, 4ed, Prentice-Hall, 2009.
- 3) Alciatore, Introduction to Mechatronics and Measurement Systems, McGraw Hill, 2011

1.5 Course Evaluation Criteria



In this section, the evaluation methods of the Mechatronics System Design course are presented.

1.5.1 Mechatronics System Design Preliminary Project Application

Timing: Week 3

The exact submission date and time will be specified in the relevant announcement published on Google Classroom.

Report Language: The language registered in the OBS system.

Evaluation: The Mechatronics System Design preliminary project application documents are evaluated by the course coordination. At the end of the evaluation process, the views of the course coordination are shared with the students. In line with the recommendations, the preliminary project application form is updated by the team and approved by the Supervising Faculty Member.

Submission: The preliminary project application form and the detailed Work Plan document prepared with contemporary tools are prepared by filling in the shared template and are uploaded to the specified assignment area on Google Classroom.

Report Content: The preliminary project application document contains the definition and abstract of your project as well as the project component (mechanical, electrical-electronic, software, control) information to be carried out by the team. In addition, your detailed work-time plan prepared with a contemporary project planning tool such as MS Office Planner, Trello, Asana, etc., and the task distribution must also be submitted.

Table 1. MSD Preliminary Project Application Evaluation Criteria

#	Criterion	Weight
1	Project Definition and Scope: - The clarity of the project title, abstract and keywords. - The clear articulation of the problem and the objectives.	30

2	Technical Content and Originality: - The potential of the proposed mechanical, electronic, software and control components to form a mechatronic system. - The originality of the project and the conformity of its scope with the objectives of the course.	40
3	Project Planning - The level of detail and realism of the plan presented with the project planning tool. - The clarity of the task distribution and its balance among the team members.	30

1.5.2 Video Preliminary Presentation and Preliminary Report

Timing: Week 5

The exact submission date and time will be specified in the relevant announcement published on Google Classroom.

Language: The Video Preliminary Presentation and the Preliminary Report are prepared in the course language registered in the OBS system.

Evaluation: The Video Preliminary Presentation is evaluated with a weight of %10 by the Jury Members, and the Preliminary Report is evaluated with a weight of %10 by the Supervising Faculty Member. The evaluation criteria are shown in Table 2 and Table 3, respectively; please follow the announcements for updates.

Venue / Duration: E2 Block / A Block. Video duration: 7 minutes. The video is submitted in advance on Google Classroom. During the evaluation, the team opens the video it uploaded in front of the jury. After the video screening, 5 minutes of questions and answers take place.

Submission:

- **Preliminary Report:** Prepared in PDF format, using the specified template document, and uploaded to the specified assignment area on Google Classroom.
- **Video:** Uploaded in advance to the specified assignment area on Google Classroom.

Content: The second stage of the project proposal process consists of the Video Preliminary Presentation and Preliminary Report submissions, in which students present their projects both orally and in writing in a professional format. The video preliminary presentation is an oral defense in which the project team presents fundamental headings such as the problem definition, literature research, technical requirements, functional structure and project plan. The Preliminary Report, which supports this presentation, is a comprehensive technical document that details the objective, innovative aspect, method, management plan and potential outputs of the project. These two stages aim to evaluate the academic and technical maturity of the project in a holistic manner. The general report content is listed, and announcements should be followed for the detailed content.

Table 2. MSD Preliminary Video Presentation Criteria

#	Criterion	Weight
1	A contemporary mechatronic project definition	5
2	The definition, motivation, objectives and scope of the project	10
3	Detailed literature review and research of similar products/projects/solutions and stakeholder expectations (needs)	20
4	Technical requirements	15

5	The functional structure of the proposed system	15
6	Targeted project outputs	15
7	Project work-time plan and task distribution	10
8	Demonstration of professional presentation skills	10

Table 3. MSD Preliminary Report Evaluation Criteria

#	Criterion	Weight
1	Project Definition and Value - The scope and clarity of the abstract. - The comprehensibility of the project objective and its concrete targets. - The explanation of the innovative aspect of the project, its technological value and its differences from similar studies with concrete data.	30
2	Method - The suitability and elaboration of the analytical/experimental methods selected to achieve the objectives. - The support of the method with references in the literature. - The logical relation of the method with the work packages.	35
3	Project Management - The realism and level of detail of the Timeline and its inclusion of measurable success criteria. - The correct identification of potential risks and the presentation of applicable Plan B responses to these risks.	15
4	Industry-Oriented Outputs and Dissemination Impact - Discussion of the potential industrial applications, economic value and commercialization potential of the project outputs. - Analysis of the possible contributions of the project to the national knowledge base, the environment and society.	15
5	General Report Format and Writing Quality - Full compliance of the report with the specified template. - Compliance with academic language use, writing and grammar rules.	5

1.5.3 Interim Report

Timing: Week 10

The exact submission date and time will be specified in the relevant announcement published on Google Classroom.

Language: The Interim Report is prepared in the course language registered in the OBS system.

Submission: The Mechatronics System Design interim report, prepared using the template in the undergraduate thesis preparation guide document, must be uploaded in PDF format to the appropriate assignment section on Google Classroom.

Content: This report must comprehensively present a detailed analysis of the project problem and stakeholder needs, the measurable system requirements arising from these analyses, and the initial mechanical, electronic and control system designs developed to meet these requirements. The evaluation measures the depth of the project's understanding of the problem, the competence in defining requirements and the engineering design skills in a holistic manner, with the aim of providing students with critical feedback before the final stage.

Evaluation: The reports will be evaluated by the Supervising Faculty Member. The evaluation criteria are shown in Table 4; please follow the announcements for updates.

Table 4. MSD Interim Report Evaluation Criteria

#	Criterion	Weight
1	Introduction and Project Abstract: Clear and comprehensible presentation of the project title, objectives and general definition.	15
2	Requirements Analysis: Detailed summarization of the problem addressed by the project, the current challenges, the stakeholders and the needs arising from these analyses.	20
3	System Requirements: Successful transformation of the identified needs into measurable and verifiable technical system requirements.	15
4	System Design: Detailed design of the mechanical, electronic, algorithmic and control subsystems that meet the identified requirements in accordance with engineering principles.	50

1.5.4 Mechatronics System Design Final Reports

Timing: Monday of Week 14

Submission: The final Mechatronics System Design final report, prepared in the format specified in the undergraduate thesis preparation guide document and revised in line with the recommendations of the Supervising Faculty Member, is uploaded to the specified assignment area on Google Classroom. The report prepared for the plagiarism check is also submitted through Google Classroom.

Plagiarism Check: The final reports are subjected to a similarity check on Turnitin. The acceptable maximum similarity rate is %20.

Language: The language registered in the OBS system.

Evaluation: The technical content, technical accuracy and presentation quality of the Final Report are evaluated by the faculty member who is the team supervisor. The report format, on the other hand, is evaluated separately by the Course Assistant within the scope of the Final Report Format Evaluation. The technical content evaluation criteria are shown in Table 5; please follow the announcements for updates.

Table 5. MSD Final Report Evaluation Criteria

#	Criterion	Weight
1	Introduction and Project Abstract: Clear and comprehensible presentation of the project title, objectives and general definition.	5
2	Requirements Analysis: Detailed summarization of the problem addressed by the project, the current challenges, the stakeholders and the needs arising from these analyses.	5
3	System Requirements: Successful transformation of the identified needs into measurable and verifiable technical system requirements.	10
4	System Design: Detailed design of the mechanical, electronic, algorithmic and control subsystems that meet the identified requirements in accordance with engineering principles.	30
5	Analysis and Simulation: Presentation of the analysis and simulation studies carried out using modern engineering tools in order to validate the performance of the designed system.	20
6	Optimization and Safety Precautions: Integration into the design of optimization studies aimed at improving system performance and of the precautions that ensure user/system safety.	10
7	Test and Verification Plan: Detailed planning of the tests, measurement methods and simulation-based verification steps to be carried out in order to prove that the system meets its requirements.	15
8	Conclusion: Summary of the key technical features of the achieved final design, interpretation of the design choices with their justifications, and specification of future developments	5

1.5.5 Final Report Format Evaluation

Date / Process Information: Conducted together with the Final Report submission.

Submission: The Final Report is uploaded to the specified assignment area on Google Classroom; the format evaluation is carried out through this submission.

Evaluation: The evaluator is the Course Assistant. This evaluation is separate from the technical content evaluation of the Final Report and measures only the compliance with the defined report format. Its weight in the semester grade is %10.

Explanation: The content quality of the report is not within the scope of this evaluation. Each of the four criteria is evaluated on a 25-point basis.

Table 6. MSD Final Report Format Evaluation Criteria

#	Criterion	Points
1	References and heading selections, use of the template format	25
2	Format compliance of the front matter of the report (cover, table of contents, abstract, list of figures, etc.)	25
3	Format compliance of figure, equation and table captions	25
4	Format compliance of the page layout and fonts	25

	Total	100
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1.5.6 Mechatronics System Design Final Presentation

Timing: Monday of Week 15

Venue / Duration: E2 Block / A Block - 10-minute presentation + 5 minutes of questions and answers.

Language : The language registered in the OBS system.

Evaluation: It is evaluated by a jury composed of the faculty members of the Mechatronics Engineering Department. The average of the grades given by at least 2 faculty members on the jury, excluding the project supervisor, is accepted as the final presentation grade. The evaluation criteria are shown in Table 7; please follow the announcements for updates.

Submission: The final presentation document is uploaded to the specified assignment area on Google Classroom.

Presentation Content: The suitability of the mechatronic project, the presentation of sufficient technical requirements shaped by stakeholder expectations, the demonstration of a design that satisfies the technical requirements, and the addressing of the jury recommendations from the interim presentations.

Table 7. MSD Final Jury Evaluation Criteria

#	Criterion	Weight
1	Presentation Skills: The ability to express the presentation content orally and the adequacy of the answers given to the questions	15
2	Targeted and Achieved Outputs: Conformity with the schedule and the realism of the schedule	10
3	Project Components - Mechanical Design - Conceptual Design - Sizing - Mechanical Analysis - Material Selection - System Simulation and Safety Precautions - Originality, innovation and novel approaches - Electronic Design - Component Selection - Schematic Design - Simulation - Electronic Card Design - System Simulation and Safety Precautions - Originality, innovation and novel approaches - Software/Algorithm - Flowchart - Pseudocode - Code Structure - Determination of performance criteria - System Simulation and Safety Precautions - Originality, innovation and novel approaches - Control - Modeling - Controller Selection - Simulation - Controller Optimization - System Simulation and Safety Precautions - Originality, innovation and novel approaches	75*

* Indicates the maximum score that can be obtained from the specified evaluation criterion, and the sum of the sub-criteria specified below it exceeds the maximum score.

The make-up report and presentation processes are carried out in accordance with the course calendar and the make-up announcement that will be published on Google Classroom.

1.6 Grading Percentages and Letter Grade Ranges

The evaluation calendar is presented in Table 8, and the letter grade ranges in Table 9.

Table 8. Grading Percentages

Evaluation	Timing	MSD %	Evaluator
Preliminary Project Application	Week 3	%5	Course Coordination
Video Preliminary Presentation	Week 5	%10	Jury Members
Preliminary Report	Week 5	%10	Supervising Faculty Member
Project Interim Report	Week 10	%20	Supervising Faculty Member
Final Jury Evaluation Final Report Format Evaluation Final Supervisor Evaluation	Monday of Week 14 (Report) Monday of Week 15 (Presentation)	%20	Jury Member
		%10	Course Assistant
		%25	Supervising Faculty Member

In the event that at least one submission is made after the deadline of any submission specified in the calendar/announcements during the term, 5 points are deducted from the student's final grade at the end of the term. This penalty is applied only once during the term. In the event of more than one late submission, the penalties do not accumulate; the total penalty is at most 5 points.

Table 9. Letter Grade Ranges

Letter Grade	Range	
AA	90	100
BA	85	89
BB	80	84
CB	70	79
CC	60	69
DC	50	59
DD	40	49
FD	30	39
FF	0	29