GAZİ UNIVERSITY
ENGINEERING FACULTY
DEPARTMENT OF MECHANICAL ENGINEERING

2025-2026 ACADEMIC YEAR SPRING SEMESTER

ME422 MECHANICAL ENGINEERING LABORATORY

COURSE CONTENT

Students will perform experiments in the fields of statics, dynamics, strength of materials, control and data acquisition. In line with the basic mechanical engineering topics to be given, students in groups will perform experiments on various mechanical engineering topics and calculate certain system parameters using experimental methods. Each student will submit detailed experiment reports for each experimental study.

ATTENDANCE REQUIREMENT

It is mandatory to take at least 7 (seven) of the total 8 (eight) experiments. **For students who did not attend the lecture held before the experiments, this rule has been updated to require participation in all 8 (eight) experiments.**

Make-up laboratory sessions will be organized for students who are unable to attend their experiments due to valid reasons, such as health issues or participation in TEKNOFEST. To be eligible for these sessions, students must provide official documentation verifying their excuse. Please be advised that no make-up opportunities will be provided for absences that are undocumented or fall outside of these specified categories.

GRADING

Each experiment has equal score. The end of year course success grade consists of the average of these 8 (eight) test grades. (The final grade of the student who has taken seven experiments will be calculated based on eight experiments.)

TEXTBOOK

- J. P. Holman, Experimental Methods for Engineers, Seventh Edition, Mc-Graw Hill, 2001.

REFERENCE BOOKS

- Cobb, G.W., Introduction to design and analysis of experiments, Springer, 1998.
- Montgomery, D.C., Design and analysis of experiment, 4th ed., John Wiley and Sons, 1997.
- Beckwith T.G. et al., Mechanical measurements, Addison-Wesley, 1995.

COURSE GUIDELINES

1. There are a total of 8 (eight) experiments. It is mandatory to take **at least 7 (seven)** of these tests. Otherwise, the student will be deemed to have failed the course.
2. To participate in the experiments, the following points should be taken into consideration:
   - **a.** Only students performing the experiment will enter the laboratories.
   - **b.** You must arrive to the experiment on time. Latecomers will not be allowed to take the quiz and the subsequent experiment.
   - **c.** The experiment will be conducted with the announced experimental group and on the announced day and time.
   - **d.** Each student will come to the experiment with the relevant experiment sheet. Students who do not have an experiment sheet will not be admitted to the experiment. Leaflets, experimental groups and other information about the experiments should be downloaded from the Announcements section of the Department website (http://mf-mm.gazi.edu.tr/) and the experiment leaflets should be printed out in advance and brought to the experiments.

e. Experiments are to be performed in two iterations. The initial iteration will be executed by the assistant, and the subsequent iteration will follow the directives of a weekly designated student team leader.

f. The rules to be applied by the research assistant responsible will be fully followed during the experiment.

If the above-mentioned conditions are not met, the student will be deemed unsuccessful in that experiment.

3. The instructions must be read carefully and fully understood before the experiment. Before all experiments, the responsible research assistant will be able to ask questions about the experiment.

4. Students will be given a general overview of how to conduct the experiment (introduction to the equipment, values to be measured, points to note, etc.) and will be asked to conduct the experiment themselves. Students will select a team leader from each group. After receiving instructions from the assistant regarding the experiment, the team leader will instruct the group on how to conduct the experiment. For every experiment a different team leader will be selected.

5. **Experiment Main Reports will be prepared personally and delivered to the research assistant who conducted the experiment, upon signature, by 17:30 on the Monday following the day of the experiment at the latest.**

6. **In addition to submitting a hard copy, you must scan your experiment report and send it as a single .pdf file to the relevant assistant's email address.**

7. Test reports not submitted on time will not be evaluated.

8. This main report should include the following topics respectively.

- Cover Page
- Contents
- Symbols
- Abstract
- Introduction
- Theory and Data Collection
- Devices and Sensors
- Experimental Procedure
- Measurement Results and Calculations
- Discussion and Conclusion
- Tables
- Figures
- Experimental devices
- Results
- References
- Attachments

EXPERIMENTS AND LABORATORIES

EXPERIMENT 1: Design of Experiments
T.A. : *KORAY AHMET KÖSE* (Oda: 232, Derslik Binası Opet Tarafı)
LABORATORY : D-218
E-MAIL : koraykose@gazi.edu.tr

EXPERIMENT 2: Calibration of Thermocouples
T.A. : *GÜNCE ŞAHİN* (Oda: Otomatik Kontrol Laboratuvarı)
LABORATORY : Deneysel ve Sayısal Isı Transferi Laboratuvarı
E-MAIL : guncesahin@gazi.edu.tr

EXPERIMENT 3: Investigation of the Effect of Cutting Speed on Surface Roughness
T.A. : *MAHMUT ŞAMİL KAYA* (Oda: Mekanik Mukavemet Laboratuvarı)
LABORATORY : Mekanik Mukavemet Laboratuvarı
E-MAIL : m.samilkaya@gazi.edu.tr

EXPERIMENT 4: Modulus of Elasticity and Rigidity Determination in Materials with Bending and Torsion Tests
T.A. : *İBRAHİM ÜLKE* (Oda:Eklemeli İmalat Teknolojileri Araştırma Laboratuvarı)
LABORATORY : Eklemeli İmalat Teknolojileri Araştırma Laboratuvarı
E-MAIL : ibrahimulke@gazi.edu.tr

EXPERIMENT 5: Forced Vibration of an Undamped One-Degree-of-Freedom System Due to Harmonic Excitation
T.A. : *GÖRKEM AĞÖREN* (Oda: Otomatik Kontrol Laboratuvarı)
LABORATORY : Mekanizmalar ve Makine Dinamiği Laboratuvarı
E-MAIL : gorkemagoren@gazi.edu.tr

EXPERIMENT 6: The Forced Vortex
T.A. : *MURAT ERBAŞ* (Oda: Isı Bilimleri Laboratuvarı)
LABORATORY : Akışkanlar Mekaniği Laboratuvarı
E-MAIL : merbas@gazi.edu.tr

EXPERIMENT 7: Determination of Drag Force on Cylindrical Surfaces
T.A. : *YASİN DEMİRER* (Oda: Akışkanlar Mekaniği Laboratuvarı)
LABORATORY : Deneysel ve Sayısal Isı Transferi Laboratuvarı
E-MAIL : yasin.demirer@gazi.edu.tr

EXPERIMENT 8: Heat Transfer by Natural Convection
T.A. : *GÜVEN HASRET YILMAZ* (Office: Akışkanlar Mekaniği Laboratuvarı)
LABORATORY : Akışkanlar Mekaniği Laboratuvarı
E-MAIL : ghyilmaz@gazi.edu.tr

EXPERIMENT GROUPS

GROUP 1E

C191132013	DURSUN ARDA EŞİYOK
181152501	HÜSEYİN TAMCI
191152034	MELİKE TAŞCİ
201152004	ENES FURKAN BUDAK
201152018	FATİH GÖKTUG DERTLİ
201152022	CEREN ÜNSAL

GROUP 2E

201152036	İSMAİL EKMEL UYSAL
201152037	BAYRAM ÇAPRAK
201152042	ALİ EREN KIRCA
201152047	MUSTAFA UZUN
21115052001	ZİYA DİNÇER
21115052004	BAHADIR KURT

GROUP 3E

21115052005	ELİF HANOĞLU
21115052007	URKAN BAYAZİT
21115052008	BUSE NAZ PEKTAŞ
21115052009	SEVİLAY BAYRAKLI
21115052011	YAKUP ATAK
21115052012	EMİRHAN DEMİR

GROUP 4E

21115052013	VEYSEL KARANİ ÇETİN
21115052016	HAYRULLAH BEKCİ
21115052018	ŞEVKET ERTEKİN
21115052019	BERKİN DANACIOĞLU
21115052020	ABDULAZİZ AKBANA
21115052021	ALİ AYBERK YILDIRIM

GROUP 5E

21115052023	ÖZGÜR TAHİROĞLU
21115052024	OKAN GÜRSOY
21115052025	BAHAR SILA ŞAKAR
21115052026	TALHA EMRE GÜLAY
21115052027	FATİH UMUT ÖZDEMİR
21115052029	MAHMUT CAN ÇADIRCI

GROUP 6E

21115052031	BARAN AKBAŞ
21115052033	ALİ AYDAL
21115052036	KADİR MERT
21115052037	MERVE NAZ ÇAĞATAY
21115052039	HACER ELANUR ARSLAN
21115052040	SEDEF YERLİKAYA

GROUP 7E

21115052041	EREN GÜLTEKİN
21115052043	SELİN POTUKOĞLU
21115052046	ENSAR ATEŞ
21115052047	SENA NUR TÜRKERİ
21115052048	ABDULLAH KARABULUT
21115052049	GAMZE TUANA TAKIŞ

GROUP 8E

21115052051	MELİH GÖKÇE
21115052053	ALIEU JASSEH
21115052402	HAMZA DARWESH
21115052403	ABDALMONIEEM ALHASSAN ABDALBAGI
21115052414	AMRO SABRY ABDELWAHAB MOHAMED
21115052701	YAĞMUR SAĞLAM
22115052402	MATIN IBRAHIMLI

GROUP 9E

22115052002	BURAK KÜÇÜK
22115052034	EGEHAN ACAR
22115052042	TAHA ÇAHAN
22115052046	ALPEREN RAGIP SÖYLER
22115052403	RAMLA MOHAMED KULMIE WARSAME
22115052751	TALHA SOLAK
22115052752	EMİRHAN BEYRİBEY

GROUP 10

181150060	AHMET KAAN ÖZBEK
191150073	OSMAN TABAROĞULLARI
191150090	BİRGÜL YILMAZ
201150002	MEVLÜT CAN ÇELİK
201150015	MEHMET BEDİR
201150020	AHMET TAŞKAPI

GROUP 11

201150023	MELİH ESENER
201150030	ZEYNEP YAĞMUR ASLAN
201150044	ARCA ÖZDEMİR
201150050	JANSET ALTAY
201150052	AHMET SAİD KIZIKLI
201150063	YURDAGÜL ÇİTRAK

GROUP 12

201150073	BURAK BAŞ
201150074	YUSUF TALHA KORUN
201150084	SEDAT NAZLICAN
201150089	İSMAİL ETHEM CERAN
21115050002	MESUT İLERİ
21115050003	TUĞRAHAN YILDIZ

GROUP 13

21115050006	MEHMET KORAY KAYMAK
21115050008	BİLGE NUR YÜKSEL
21115050012	MUHAMMED ÇÖKLÜ
21115050013	ALİ ALPTUĞ KAYHAN
21115050014	FURKANCAN DEREBAŞI
21115050015	SEYYİD AHMET ÜNAL

GROUP 14

21115050016	SEVGİ PINAR GEBEN
21115050019	CANSU ATEŞ
21115050021	MERT ÖZULUCAN
21115050023	CEMAL GÖRKEM ARAS
21115050024	YİĞİT ÖZSOY
21115050025	YILDIRAY GEZER

GROUP 15

21115050026	EMRE BURAK ÇELİK
21115050027	HİMMET KAPLAN
21115050028	MERT CAN TÜRKMEN
21115050030	YUSUF TAKAK
21115050032	ALİHAN ÖZDOĞAN
21115050034	BERKAY TURAÇ

GROUP 16

21115050037	SAİD TALHA GÖRPÜZ
21115050039	FATİH ALTUNTAŞ
21115050040	OSMAN ÇAKIN
21115050041	ZEYNEP ÖZCAN
21115050042	MUHAMMET MUSTAFA UMUNÇ
21115050043	ALİ İHSAN AL

GROUP 17

21115050044	BARAN BİLAL BEYDOĞAN
21115050045	UMUT TAYFAR
21115050046	SİBEL ŞEYMA YEŞİLYURT
21115050047	MERT TANRIVERDİ
21115050048	MERT ALİ AKTAŞ
21115050049	VESİLE SİNEM GÜMÜŞHAN

GROUP 18

21115050052	OĞULCAN BOLAT
21115050054	FURKAN YİĞİT UĞURLU
21115050055	EMİRHAN KIZILAY
21115050057	ASIM AYBARS ORUÇ
21115050058	İSMAİL ERDEM
21115050060	MEVA ÇELİK

GROUP 19

21115050062	METİN ARPACIKTAŞ
21115050063	EMİR AKGÜL
21115050064	AHMED RIDVAN GÖKMEN
21115050066	KORAY KAYA
21115050067	BEKİR RUFAİ KARATAŞ
21115050068	BERAT GÜMRÜKÇÜ

GROUP 20

21115050070	ENES BİLGEN
21115050076	FADİME BORAN
21115050081	MUSTAFA AÇIKKAR
21115050083	MUHAMMED TALHA ŞAŞI
21115050084	MERVE EFE
21115050085	ULAŞ SİNAN YAZTÜRK

GROUP 21

21115050086	AHMET BOZYİĞİT
21115050089	UMUT ÇALIŞKAN
21115050091	ZEYNEPNUR KARAMAN
21115050092	EMRE ERTAN
21115050093	TUNA SEZER EYÜBOĞLU
21115050402	MEHMET AKTÜRK

GROUP 22

21115050403	ARDA GÖKMEN GÜNDOĞAN
21115050408	UMUTCAN KAPLAN
21115050409	HAMZA FİKRİ YILDIRIM
21115050410	HAZEL NUR ŞENTÜRK
21115050701	BERKAY NALBANT
21115050753	İHSAN OZAN ÇAKIR

GROUP 23

21115050756	RÜYA HÜMEYRA KARAMAN
21115050907	NEMAT MAMMADLI
22115050002	KAYA YÜKSEL
22115050008	TOLGA YALIM
22115050011	BERKEHAN BAHAR
22115050018	EGE ÖZERK
22115050037	TOLGA ŞAN

GROUP 24

22115050044	METEHAN GÜZEL
22115050047	TAYLAN ÖZGÜR KUŞ
22115050059	ARDA ÇOBAN
22115050064	ALİ KEMAL YALÇIN
22115050076	ONUR TOPCU
22115050402	FATEMEH RANJBARİ
22115050752	EGE TURALI

INSTRUCTORS

Asst. Prof. MUSTAFA KAŞ
Dr. Oğuz Faik SEVEN

SCHEDULE

EXP 1. Design of Experiments								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G1E**	**G2E**	**G3E**	**G4E**	**G5E**	**G6E**	**G7E**	**G8E**
14.00	**G9E**	**G10**	**G11**	**G12**	**G13**	**G14**	**G15**	**G16**
14.30	**G17**	**G18**	**G19**	**G20**	**G21**	**G22**	**G23**	**G24**

EXP 2. Calibration of Thermocouples								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G8E**	**G1E**	**G2E**	**G3E**	**G4E**	**G5E**	**G6E**	**G7E**
14.00	**G16**	**G9E**	**G10**	**G11**	**G12**	**G13**	**G14**	**G15**
14.30	**G24**	**G17**	**G18**	**G19**	**G20**	**G21**	**G22**	**G23**

EXP 3. Investigation of the Effect of Cutting Speed on Surface Roughness								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G7E**	**G8E**	**G1E**	**G2E**	**G3E**	**G4E**	**G5E**	**G6E**
14.00	**G15**	**G16**	**G9E**	**G10**	**G11**	**G12**	**G13**	**G14**
14.30	**G23**	**G24**	**G17**	**G18**	**G19**	**G20**	**G21**	**G22**

EXP 4. Modulus of Elasticity and Rigidity Determination in Materials with Bending and Torsion Tests								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G6E**	**G7E**	**G8E**	**G1E**	**G2E**	**G3E**	**G4E**	**G5E**
14.00	**G14**	**G15**	**G16**	**G9E**	**G10**	**G11**	**G12**	**G13**
14.30	**G22**	**G23**	**G24**	**G17**	**G18**	**G19**	**G20**	**G21**

EXP 5. Forced Vibration of an Undamped One-Degree-of-Freedom System Due to Harmonic Excitation								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G5E**	**G6E**	**G7E**	**G8E**	**G1E**	**G2E**	**G3E**	**G4E**
14.00	**G13**	**G14**	**G15**	**G16**	**G9E**	**G10**	**G11**	**G12**
14.30	**G21**	**G22**	**G23**	**G24**	**G17**	**G18**	**G19**	**G20**

EXP 6. The Forced Vortex								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G4E**	**G5E**	**G6E**	**G7E**	**G8E**	**G1E**	**G2E**	**G3E**
14.00	**G12**	**G13**	**G14**	**G15**	**G16**	**G9E**	**G10**	**G11**
14.30	**G20**	**G21**	**G22**	**G23**	**G24**	**G17**	**G18**	**G19**

EXP 7. Determination of Drag Force on Cylindrical Surfaces								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G3E**	**G4E**	**G5E**	**G6E**	**G7E**	**G8E**	**G1E**	**G2E**
14.00	**G11**	**G12**	**G13**	**G14**	**G15**	**G16**	**G9E**	**G10**
14.30	**G19**	**G20**	**G21**	**G22**	**G23**	**G24**	**G17**	**G18**

EXP 8. Heat Transfer by Natural Convection								
SESSION	**27.Feb**	**6.Mar**	**13.Mar**	**27.Mar**	**3.Apr**	**17.Apr**	**24.Apr**	**8.May**
13.30	**G2E**	**G3E**	**G4E**	**G5E**	**G6E**	**G7E**	**G8E**	**G1E**
14.00	**G10**	**G11**	**G12**	**G13**	**G14**	**G15**	**G16**	**G9E**
14.30	**G18**	**G19**	**G20**	**G21**	**G22**	**G23**	**G24**	**G17**

REPORT GUIDELINES

Experiment reports should be prepared in a standard format that can be easily followed by both technical and non-technical individuals. Adhering to the following points during the writing process will be sufficient to achieve such a format:

- Reports should be hand-written.
- Only one side of the paper should be used.
- Pages should be numbered starting from the cover page. Figures, Tables, and equations should also be numbered separately within themselves.
- The main report should be organized as follows:
  - Cover page
  - Table of contents
  - Symbols
  - Abstract
  - Introduction
  - Theory and data collection process
  - Equipment
  - Experimental Procedure
  - Measurement results and required calculations
  - Discussion and Conclusion
  - Tables
  - Figures (Experimental equipment, Results)
  - References
  - Appendix

Note 1: **A handwritten Report** containing the relevant sections mentioned above must be prepared after the experiment. The report should be submitted to the research assistant who conducted the experiment, with a signature, by **5:30 PM** on the Monday following the experiment. Any report not submitted on time will result in a failure.

Note 2: Part-time working students can contact the relevant research assistants to schedule the experiment at a mutually suitable time. However, they must provide official documentation proving their employment.

Cover Page: The cover page should include the name of the experiment, the experiment number, the name and student number of the student who prepared the report, the date the experiment was conducted, the date the report is presented, the group number, the names and student numbers of all group members, the name of the responsible researcher, and the name of the institution where the experiment was conducted. The title page should strictly follow the format given on the last page.

Table of Contents: This section should list the contents of the report with page numbers and headings.

Symbols: All symbols and units used in the report should be explained in this section. Symbols should be listed alphabetically first in Latin (a, b,..., z), and then in Greek (α, β, ...) alphabets.

Abstract: A brief explanation of the significant features of the work, typically between 50-100 words, should be provided in this section.

Introduction: The introduction is where the framework of the reported work is outlined. Therefore, it should include the necessary information without being excessive. This allows the reader to recall or familiarize themselves with the topic. Additionally, the introduction should explain the reason for conducting the experiment and the objectives to be achieved. Lastly, the experiment's features and other complementary information should be provided. No results should be included in the introduction.

Theory and Data Collection Process: The theoretical foundation of the calculations or comparisons made should be provided in this section. The fundamental relations and assumptions should be outlined, followed by an explanation of how the final results were obtained. Equations should be numbered in the order they appear. Additional equations and derivations not necessary for the fundamental calculations should be placed in the appendix.

Equipment: Descriptions and specifications of the equipment used in the experiment should be provided in this section. Diagrams of the equipment should be included in the "Figures" section at the end of the report. Merely including figures and stating "The equipment used in the experiment is shown in Figure 2" is insufficient.

Procedure of the Experiment: The procedure should be described in detail and clearly in this section. Reference to equipment diagrams can be made during the explanation by specifying their numbers.

Measurement Results and Required Calculations: Measurement results should be presented in tables and/or graphs. Results typically consist of two parts: the results obtained by applying theoretical relations to the experiment and the results obtained from the experiment. The accuracy of the results should be investigated, and deviations, average deviations, and distribution curves should be included in the tables, if possible. When preparing tables, instead of calculating for each measurement, detailed explanations of calculations for one chosen value should be provided, and only the results for other values should be presented.

Discussion and Conclusion: In the discussion section, attention should be paid to how well the objectives mentioned in the introduction were achieved. How the objectives were met or why they were not met should be clearly stated. If there is a significant difference between the goal and the results, the reason should be investigated before attributing it to measurement nature or assumptions. A conclusion should be stated clearly in one sentence.

Tables: All values presented in tables should be included in this section. Each table should be numbered and titled.

Figures: Graphs, photographs, and schematic representations of equipment should be included in this section. Every figure should be numbered and titled. If multiple curves are present on the same graph, the data corresponding to each curve should be indicated.

References: References used during the experiment and mentioned in the report (books, articles, theses) should be listed in the following format:

Books	: Author's name, title, edition, publisher, year, pages used.
Articles	: Author's name, title, journal, volume number, issue number, page numbers, year.
Thesis	: Author's name, title, degree, university, department, year.

Appendix: Information that is not necessary for the main report but may be helpful for the topic's detail should be included in the appendix. For example, detailed derivations of special equations, explanations of the theory in detail, etc.

Example of Cover Page:

*The parts written in red will include the relevant person and experiment details.
** The title of the experiment should be written in 24-point Cambria font, while the remaining parts should be written in 12-point Cambria font, centered.

GAZİ UNIVERSITY
ENGINEERING FACULTY
DEPARTMENT OF MECHANICAL ENGINEERING

ME422 MECHANICAL ENGINEERING LABORATORY

EXPERIMENT #: 3

INVESTIGATION OF THE EFFECT OF CUTTING SPEED ON SURFACE ROUGHNESS

PREPARED BY
"STUDENT ID"
"NAME-SURNAME"

SIGNATURE

DATE OF THE EXPERIMENT
"DATE"

GRUP #: "...."

TEAM LEADER-INSTRUCTION GIVER
"STUDENT ID" "NAME-SURNAME"

OTHER MEMBERS OF THE EXPERIMENTAL GROUP-INSTRUCTION RECEIVERS
"STUDENT ID" "NAME-SURNAME"
"STUDENT ID" "NAME-SURNAME"
"STUDENT ID" "NAME-SURNAME"
"STUDENT ID" "NAME-SURNAME"
"STUDENT ID" "NAME-SURNAME"

RESPONSIBLE TEACHING ASSISTANT
"TITLE-NAME-SURNAME"