

ME 4053 Mechanical Engineering Systems Laboratory (Required)

Catalog Description: ME 4053 Mechanical Engineering Systems Laboratory (1-3-2)
Prerequisites: ME 3057 Experimental Methodology Laboratory, ME 3345 Heat Transfer, and MATH/ISYE 3770 Statistics and Applications
Measurement and analysis of mechanical, acoustic, manufacturing, thermodynamic, fluid, and heat transfer phenomena. Emphasis on data acquisition, reduction, analysis, and report preparation.

Textbooks: Lab Manual and Lecture Notes for *ME 4053a, Thermal Energy and Fluids Laboratory*, The George W. Woodruff School of Mechanical Engineering.
Lab Manual for *ME 4053b, Mechanical Systems Lab*, The George W. Woodruff School of Mechanical Engineering.
J. A. Donnell and S. M. Jeter, *Writing Style and Standards in Undergraduate Reports*, College Publishing, 2004.

Topics Covered:

1. Principles and standard practice of written and graphical reporting
2. Oral and visual presentation techniques
3. Experimental statistics including regression and significance tests
4. Teaming, planning, and collaboration
5. Investigation of mechanical behavior such as structural vibration
6. Investigation of acoustic phenomena such as propagation and attenuation
7. Investigation of tribological systems such as elasto- hydrodynamic lubrication
8. Investigation of simple open and closed loop control systems
9. Investigation of thermodynamic properties such as vapor pressure and thermal systems such as refrigerators and heat pumps
10. Investigation of internal and/or external fluid flow with pressure, thermal, and laser-Doppler sensors
11. Investigation of heat transfer and heat exchangers
12. Investigation of fluid machines such as the centrifugal pump
13. Estimation of bias by error propagation

Course Outcomes:

Outcome 1: Instruction and practice in empirical investigation and quantitative assessment of important and representative mechanical, acoustic, control, manufacturing, thermal and fluid processes and systems.

1.1 Students will demonstrate facility in empirical investigation and quantitative assessment of important and representative thermal and mechanical processes and systems by laboratory participation, written and oral reports. Students will apply knowledge of engineering principles to perform experiments and analyze the results.

Outcome 2: Instruct and practice concepts of experimental engineering including experimental planning and practical applications of experimental statistics.

2.1 Students will demonstrate in practice concepts of experimental engineering including experimental planning and statistical methods. Students will use the state-of-the-art measurement techniques and data processing methods.

Outcome 3: Further develop the ability to organize and work in teams.

3.1 Students will successfully plan and perform experiments and plan and accomplish report preparation in teams.

Outcome 4: Instruct and practice written and graphical communication of research data and findings.

4.1 Students will prepare written reports of research data and findings with substantial graphical content.

Outcome 5: Instruct and practice oral and visual presentation of research data and findings.

5.1 Students will conduct oral presentations with visual aids, including text and graphics, of research data and findings.

Correlation between Course Outcomes and Program Educational Outcomes:

| ME 4053 | | | | | | | | | | | | |
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| | Mechanical Engineering Program Educational Outcomes | | | | | | | | | | | |
| Course Outcomes | a | b | c | d | e | f | g | h | i | j | k | l |
| Course Outcome 1.1 | X | X | | | | X | X | | | | X | X |
| Course Outcome 2.1 | X | X | | | | | | | | | X | X |
| Course Outcome 3.1 | | | | X | | | | | | | | |
| Course Outcome 4.1 | | | | | | | X | | | | | |
| Course Outcome 5.1 | | | | | | | X | | | | | |