MECA 380: Measurements and Instrumentation

Discussion (SSKU 120):
- Section1 MW 2-2:50pm
- Section2 MW 3-3:50pm
Instructor: Daisuke Aoyagi

Lab (OCNL 431):
- Section3 M 5-7:50pm
- Section4 T 11am-1:50pm
- Section5 W 5-7:50pm
- Section6 R 11am-1:50pm
- Section7 F 2-4:50pm
Instructor: Daisuke Aoyagi
Instructor: Josh Miranda
Instructor: Daisuke Aoyagi
Instructor: Daisuke Aoyagi
Instructor: Ramesh Varahamurti

Instructors:
- Daisuke Aoyagi: daoyagi@csuchico.edu, 898-4619
  Office Hrs.: M-F 4-5pm at OCNL 428
- Josh Miranda: jdmiranda@csuchico.edu, 898-4960
  Office Hrs.: M 1-2, 4-5, MW 8-8:30pm at OCNL 423
- Ramesh Varahamurti: rvarahamurti@csuchico.edu, 898-6353
  Office Hours: M 2-4, TW 2-3pm at OCNL 418

Prerequisites:
CSCI 111 or MECH 208 (Intro computer programming)
EECE 211/L (Linear Circuits I)

Course Usage of Blackboard Learn
The course syllabus and other material will be posted on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the Chico State Portal.

Course Description
“Measurement of steady-state and dynamic phenomena using common laboratory instruments. Calibration of instruments, dynamic response of instruments, and statistical treatment of data.”

Student Learning Objectives
Upon successful completion of this course, students will be able to:
1. Measure static and dynamic signals using common laboratory instruments
2. Understand basics of calibration of instruments and statistical treatment of data
3. Use a computer-controlled system to automate measurement process
4. Write technical reports

Textbook
Software (recommended)
National Instruments LabVIEW (Student Edition $20~)
Mathworks MATLAB (Student version Base $49, Suite $99)
Microsoft Excel 2007 or later

Assignments and Grading
Midterms (10%/each) Closed-book, open-notes/printouts, no cellphone or other electronic devices (except scientific calculator)
Lab Conduct and Assessed by lab instructor and peer evaluation.
Participation (20%) * Lab attendance is required.
LabVIEW assignments Group assignment for each series of lab activities.
(20%) Graded by lab instructor using a rubric
Lab “Notebook” (20%) All relevant electronic files, including “informal” lab reports.
in electronic format Zipped and submitted via Blackboard Learn.
Technical writing Formal test plan and report for the last series of lab activities.
assignment (20%)
(Note: subject to change with fair notice.)

Course Topics / Tentative Schedule
(Note: subject to change with fair notice.)

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture/Discussion Topics</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, Basic concepts of measurements</td>
<td>0. Intro to LabVIEW</td>
</tr>
<tr>
<td>2</td>
<td>Temp. Measurements, Static Calibration, Curve fit</td>
<td>1. Thermistor (A)</td>
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<tr>
<td>3</td>
<td>Standards, Significant digits, Static and dynamic signals</td>
<td>1. Thermistor (B)</td>
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<tr>
<td>4</td>
<td>Frequency Analysis, Fourier Transform, FFT</td>
<td>1. Thermistor (C)</td>
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<tr>
<td>5</td>
<td>Measurement system behavior, Linear systems</td>
<td>2. Frequency Response Test</td>
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<tr>
<td>6</td>
<td>1st-order system, impulse and step response</td>
<td>2. Frequency Response Test</td>
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<tr>
<td>7</td>
<td>Frequency response, Midterm 1</td>
<td>2. Frequency Response Test</td>
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<tr>
<td>8</td>
<td>(Spring Break)</td>
<td>(Spring Break)</td>
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<tr>
<td>9</td>
<td>2nd-order system, impulse, step, and frequency response</td>
<td>3. Strain gauge “bonding”</td>
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<tr>
<td>10</td>
<td>Strain (and resistance) measurements, Loading errors</td>
<td>3. Strain gauge “soldering”</td>
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<tr>
<td>12</td>
<td>z-test, t-test, Uncertainty analysis, Error propagation</td>
<td>3. Strain gauge data collection</td>
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<tr>
<td>13</td>
<td>Accelerometers, MEMS sensors</td>
<td>3. Strain gauge data collection</td>
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### Lecture/Discussion Topics

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture/Discussion Topics</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Digital sampling, Data acquisition systems</td>
<td>4. Strain and Acceleration</td>
</tr>
<tr>
<td>15</td>
<td>Midterm 2, Technical writing</td>
<td>4. Strain and Acceleration</td>
</tr>
<tr>
<td>16</td>
<td>Analog measurements, Single-ended and differential connections</td>
<td>4. Strain and Acceleration</td>
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<tr>
<td>finals</td>
<td>Final Technical Writing Assignment Due</td>
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### Dropping and Adding

You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc., found in the [CSU Chico University Catalog](#). You should be aware of the new deadlines and penalties for adding and dropping classes.

### University Policies and Campus Resources

#### Academic Integrity

Students are expected to be familiar with the University’s Academic Integrity Policy. Your own commitment to learning, as evidenced by your enrollment at California State University, Chico, and the University’s Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Judicial Affairs. The policy on academic integrity and other resources related to student conduct can be found on the [Student Judicial Affairs web site](#).

#### Student Services

Student services are designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. Students can find support for services such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development. Student services information can be found on the [current students page of the CSU Chico web site](#).

#### Americans with Disabilities Act

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

**Accessibility Resource Center**

530-898-5959

Student Services Center 170

[arcdept@csuchico.edu](mailto:arcdept@csuchico.edu)
Student Learning Center
The mission of the Student Learning Center (SLC) is to provide services that will assist CSU, Chico students to become independent learners. The SLC prepares and supports students in their college course work by offering a variety of programs and resources to meet student needs. The SLC facilitates the academic transition and retention of students from high schools and community colleges by providing study strategy information, content subject tutoring, and supplemental instruction. The University Writing Center has been combined with the Student Learning Center. You can also visit the Student Learning Center web site.