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California State University, Chico
Department of Mechanical and Mechatronic Engineering and Advanced Manufacturing

MECA 380, Measurements and Instrumentation, Spring 2021

Instructor:	Jeremy A. Fishel, PhD
E-mail:	jafishel@csuchico.edu
Office hours:	Tuesdays 10-11AM and Thursdays 9-10AM. (Schedule an Appointment Link)
Lab Instructor:	Serkan Inceoglu, PhD
E-mail:	sinceoglu@csuchico.edu
Office hours:	Thursdays 6-6:50PM (Zoom Link)
Student Assistants:	Greg Gutierrez: ggutierrez30@mail.csuchico.edu Jacob Grout: jgrout@mail.csuchico.edu
Class days and times	Discussion Sections (Fishel): A. 01: Monday and Friday, 8-8:50AM B. 02: Monday and Friday, 9-9:50AM Laboratory Sections (Inceoglu): C. 03: Monday, 2-4:50PM (Gutierrez) D. 04: Tuesday, 11AM-1:50PM (Grout) E. 05: Wednesday, 2-4:50 PM (Gutierrez) F. 06: Thursday, 11AM-1:50PM (Grout)
Classroom:	Online/Synchronous (see Blackboard for Zoom meeting links)
Prerequisites:	EECE 211/211L plus either CSCI 111 or MECH 208

Course Usage of Blackboard Learn

Copies of the course syllabus and all assignments may be found on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the Chico State Portal.

Course Description and Goals

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

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Student Learning Objectives

Upon successful completion of this course, students will be able to:

- Measure static and dynamic signals using common laboratory instruments
- Program basic applications in LabVIEW
- Understand instrument calibration and statistical treatment of data
- Apply signal conditioning techniques to improve the quality of analog signals
- Understand the fundamentals of data acquisition
- Use a computer-controlled system to automate measurement processes
- Conduct experiments, analyze and interpret data
- Write convincing technical reports

Course Content Learning Outcomes

Throughout this course, students are expected to acquire core knowledge in:

- Basic Concepts of Measurement and Measurement Instruments
- Sensors and Characteristics of Sensors
- Calibration Errors and Methods to Minimize
- Experiment Design
- Temperature Measurements
- LabVIEW Fundamentals
- Application of Probability and Statistics to Measurement
- Regression, Correlation and Causation, and Correlation Coefficients
- Characterizing 1st and 2nd Order Systems
- Electrical Measurements and Basic Lab Instrumentation
- Signal Conditioning Fundamentals
- Filtering Methods
- Scaling and Linearization
- Frequency Domain and Basic Spectral Analysis
- Aliasing and Sampling Considerations
- Analog-to-Digital and Digital-to-Analog Conversions
- Strain Measurements
- Sources of Electrical Noise & Mitigation Strategies
- Determining Instrument Uncertainty

Required Texts/Readings/Equipment

Textbook (Required)

Figliola, RS and Beasley, DE, Theory and Design for Mechanical Measurements, 7th edition, Wiley, 2019. ISBN: 978-1119723455.

Note: the 5th or 6th edition of this book are acceptable alternatives. You are welcome to use either the print version, enhanced e-book version, or other digital copy or pdf. The book is available for purchase or rental from the publisher. If you decide to rent the textbook, it is recommended that you delay the start date of the rental until the first day of class.

Recommended book for learning LabVIEW

Travis, J. and Kring, J., LabVIEW for Everyone: Graphical Programming Made Easy and Fun (3rd Edition), Prentice Hall, 2006. ISBN: 978-0131856721

Recommended book for electronics
Scherz, P and Monk, S, Practical Electronics for Inventors, 4th edition, McGraw-Hill, 2016. ISBN: 9781259587542.

Computer and Software (Required)
You are required to have a PC-based laptop capable of running LabVIEW 2019 (a student software license will be provided to you for the purposes of this course). MATLAB and/or Excel are also highly recommended software for this course.

Course Hardware
You will have the option to check out data acquisition hardware and electronics to complete lab assignments. These course laboratories have been carefully designed to enhance learning and checking out hardware is highly recommended. Students who check out hardware will be required to return it in acceptable condition before receiving a grade in the course. If there are any issues, please contact the course instructors immediately.

Classroom Protocol
All class meetings this semester will be online, see Blackboard for Zoom meeting links. During class hours, students are expected to be committed to the class and paying attention (no personal web surfing, email, texting, or social media). Students are requested to turn on cameras during meetings, this has been shown to improve accountability, attention and grades and is helpful to the instructor to understand how well the class is following along. Students will receive credit for active and engaged participation in the course. If you are unable to attend a class due to an emergency, please notify the instructor as soon as possible.

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.

Assignments and Grading Policy
You will have the opportunity to submit an optional Final Project at the end of the semester to demonstrate your ability to apply what you have learned in this course. This will be a requirement for any student wishing to earn an A.

If you do not submit a Final Project, the highest grade you can earn will be a B+ and your grade will be based on:

- 20% Attendance, Conduct, Participation, and Quizzes
- 40% Lab Reports and Assignments
- 40% Exams (graded on a curve)

If you submit a Final Project, your grade will be based on:

- 15% Attendance, Conduct, Participation, and Quizzes
- 30% Lab Reports and Assignments
- 30% Exams (graded on a curve)
- 25% Final Project

The following criteria are used when grading and designing rubrics:

- A = Student clearly understands key learning concepts and how to apply them efficiently.
- B = Student generally understands key learning concepts, minor mistakes or inefficiencies in applying them.
- C = Student is familiar with key learning concepts, mistakes or errors are made when applying them unless clear instructions are given.
- D = Student lacks familiarity with key learning concepts or ability to apply them, some concepts are understood at a C or higher level.

Bonus points are regularly awarded for outstanding effort, work, and performance.

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.

IT Support Services (Optional)

Computer labs for student use are located on the first and fourth floor of the Meriam Library, Room 116 and 450, Tehama Hall Room 131, and the Bell Memorial Union (BMU) basement. You can get help using your computer from IT Support Services; contact them through the ITSS web site. Additional labs may be available to students in your department or college.

Student Services (Optional)

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.

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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

Student Learning Center (Optional)

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.

Blackboard ALLY

Chico State is committed to providing you the best learning experience possible. With this goal we have activated Blackboard ALLY in your courses. ALLY is a revolutionary product that focuses on making digital course content more accessible to all students. You will now be able to download any content in this course in the format that fits best with your learning style. PDF, HTML, .EPUB and Audio files are now available for most content items. Here is a link to more information on formats available as well as what each format offers. Should you have any questions or experience issues while using ALLY please contact the Office of Accessible Technology and Services at oats@csuchico.edu or 530-898-6532.

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A Note on Equity, Diversity, and Inclusion

It is important to me that this course is accessible to each and every one of you. If there is any reason why the format of the course creates unique difficulties to you, please find time to talk with me. This includes those that have a physical or learning disability, those who have other emotional or physiological challenges, those of you who have past experiences that make college attendance or class content anxiety producing, those of you who are first-generation students and many not understand the university system as well, those of you who feel you can't actively participate, those of you who have more responsibility than the typical college student (such as dependent parents, children, or an especially heavy workload outside of school), those of you with financial hardships, and any other situations that I cannot anticipate.

My objective in this course is to assess your ability to learn and apply knowledge related to this subject matter. This should never be a factor of anything other than your own talents and efforts. The earlier you come and see me, the more I can do to try to work with you to alleviate any unique disadvantages you may face. I would prefer that you come to speak with me in the first two weeks.

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Change History

1/22/2021	Version 1, Original Document
1/23/2021	Version 2, Minor changes to improve clarity, additional details on grading, additional optional reference books added.
2/4/2021	Version 3, Added office hours and contact information for other instructors and assistants.