FLORIDA POLYTECHNIC UNIVERSITY

Syllabus: Mechanical Lab Design 1

Spring semester 2026

Course Information

- **Course Number and Title**: EGN 3015C Mechanical Lab Design 1, Section 01
- **Credit Hours:** 3 (2 lecture/1 lab)
- **Current Academic Term**: Spring 2026

Instructor Information

- **Instructor**: Rishikesh Srinivasaraghavan Govindarajan (Dr. S. G.)
- **Office Location**: WEB 1026
- **Office Hours**: MW: 11:00 am - 12:00 pm, T: 11:00 am - 12:00 pm
- **E-mail**: rsrinivas@floridapoly.edu or by appointment

Course Details

- **Class Meeting Day, Time & Location**: TR, 08:00-09:50 AM, WEB-1002 (2 – 110 minute sessions)
- **Official Catalog Course Description**: This course aims to build on skills learned in preceding courses and put them to use towards designing and executing mechanical engineering laboratories. Student teams will investigate and then develop demonstrable laboratory apparatuses of mechanical engineering principles and phenomena including heat transfer, fluids, vibrations, and control systems. Students will be guided through the process with educational primers on principles that will be investigated while being taught general design practices and processes. The course will include functional representations, concept evaluation, planning, and require extensive written communication and documentation. Teams will utilize LabVIEW and data acquisition (DAQ) cards for the development of the mechanical systems laboratories. This course will enhance students' knowledge of design processes as well as core mechanical engineering topics and prepare them to tackle future open-ended problems in their capstone design course.
    - **Course Prerequisites:** EGN 3321 Dynamics, EGN 3331 Strength of Materials, EGN 2002C Skills and Design 2, **Co-Requisite:** none
    - **Communication/Computation Skills Requirement (6A-10.030)**: No

- **Required Texts**: Theory and Design for Mechanical Measurements, by Figliola & Beasley, ISBN: 978-1119723455, Publisher: Wiley.
    - **Equipment and Materials**: Canvas, computer or tablet, Microsoft Office, LabVIEW, MATLAB, Arduino IDE, calculator, FL Poly email.
    - **Note:** Only use of the following calculator models as used on the Fundamentals of Engineering (FE) Exam will be allowed:
        - **Casio**: All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
        - **Hewlett Packard:** The HP 33s and HP 35s models, but no others
        - **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments

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calculator must have “TI-30X” or “TI-36X” in its model name.)

- **Course Objectives**:
  The objective of this course is to design laboratory systems for mechanical engineering. For this purpose, the course covers a variety of mechanical engineering principles and phenomena including heat transfer, fluids, vibrations, and control systems, as well as instrumentation with computer-based data acquisition. Engineering design principles and project management techniques are added as well to help design processes and manage multiple systems.

  Bloom’s taxonomy points to three domains of educational activities of learning that laboratories cover: Cognitive (knowledge related), psychomotor (physical skills), and affective (behavior and attitudes). The first domain includes: Creating, evaluating, analyzing, applying, understanding, and remembering which are discussed while using instrumentation, developing and evaluating models, learning about experiments, data analysis and designing experiments. The second domain is mostly related to ability to manipulate apparatus and sensory or perception awareness. The last domain, mostly behavior and attitudes, include components such as creativity, learning from failure, lab safety, teamwork and communication. An effective engineer is a person who has been exposed to these three domains.

  Highlights are as follows:
    - The engineering design process
    - Project management (including planning and scheduling)
    - Functional decomposition and concept variant analysis
    - Design of Experiments
    - Simulation and prototyping
    - Computer-based data acquisition
    - Verification and validation
    - Mechanical measurements and instrumentation
    - Topics in mechanical engineering (heat transfer, fluids, vibration, and controls)
    - Professional communication skills, e.g., written report, oral presentation, poster, and/or multimedia.
    - Professional skills in teaming, leadership, and team management

- **Course Learning Outcomes**
  Students will be able to demonstrate the ability to do the following:

(a) Define what is: instrumentation, measurement, voltage divider, Wheatstone bridge, operational amplifier, data acquisition, and calibration.
(b) Explain how a voltage divider and the Wheatstone bridge works, how data acquisition works, signal amplification and calibration work.
(c) Implement circuitry for data acquisition using temperature, pressure, and strain measurement.
(d) Analyze the calibration of position, differential pressure, and strain sensors.
(e) Demonstrate the ability to apply course concepts to develop, implement, and present a team project design for a laboratory apparatus using available equipment.

- **Alignment with Program Outcomes**:

SLO Table

Course Learning Outcome	Learning Level (Bloom's / ABET Assessment Example)	Program Learning Outcome (ABET, GenEd, Other)
(a) Define what is an instrumentation, measurement, voltage divider, Wheatstone bridge, operational amplifier, data acquisition, and calibration. (b) Explain how a voltage divider and the Wheatstone bridge works, how data acquisition works, signal amplification and calibration.	**Knowledge**- Ability to recall previously learned material **Application**- Ability to use learned material in new situations **ABET Assessment** – homework, exams	ABET 1 – an ability to identify formulate, and solve complex engineering problems by applying principles of engineering, science, and math.
(c) Implement circuitry for data acquisition using temperature, pressure, and strain measurement. (d) Analyze the calibration of position, differential pressure, and strain sensors.	**Analysis**- Ability to separate material into component parts and show relationships between parts **ABET Assessment** – lab reports	ABET 6 – An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(e) Demonstrate the ability to apply course concepts to develop, implement, and present a team project design for a laboratory apparatus using available equipment.	**Knowledge**- Ability to recall previously learned material **Application**- Ability to use learned material in new situations **Comprehension**- Ability to grasp meaning, explain, and restate ideas **Evaluation** - Ability to judge the worth of material against stated criteria **ABET Assessment** – project	ABET 2 - An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(e) Demonstrate the ability to apply course concepts to develop, implement, and present a team project design for a laboratory apparatus using available equipment.	**Application** – Ability to use learned material in new situations. **ABET Assessment-** presentations, project report, lab reports	ABET 3- an ability to communicate effectively with a range of audiences
(e) Demonstrate the ability to apply course concepts to develop, implement, and present a team project design for a laboratory apparatus using available equipment.	**Knowledge**- Ability to recall previously learned material **ABET Assessment-** project report	ABET 7 - an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Policies

Attendance

Students are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP). It is the student's responsibility to notify the instructor in advance of any anticipated absence. In the case of an unanticipated absence, students should provide notice within a reasonable time, ideally by the next scheduled class meeting.

Late Work/Make-up

Make-up opportunities will be provided solely for examinations and only in exceptional circumstances at the discretion of the instructor. Please note that make-up will not be granted for in-class activities under any circumstances. Homework assignments may be submitted within a two-day grace period following the stated due date, with a penalty of 5 points per day deducted for late submissions. Submissions beyond

two-day grace period will not be accepted without permission from the instructor, which will be granted only for an acceptable exemption. Students are expected to notify the instructor well in advance of any anticipated exam absence or, if prior notification is not possible, to provide a valid justification promptly thereafter.

Email Policy

All email communication must be sent via Canvas or from the student's official Florida Poly email account to the instructor's Florida Poly email address. Students should allow up to 36 hours on weekdays for a response before sending a follow-up message. All emails must be composed in a professional format, including a greeting and a clear and organized message. The subject line should begin with "[Mech Lab (Section #) – SP26] to facilitate a timely response.

Office Hours

Office hours will be conducted exclusively in person. Students are expected to arrive prepared with specific questions or work that has been attempted in advance. Bringing unattempted problems and requesting immediate solutions is not acceptable. Students who are unable to attend during the designated hours may arrange an appointment by email.

Grading Policy

- Only neatly presented/ written work will be evaluated; points may be deducted for poor organization or lack of legibility.
- A correct final answer without a corresponding outline of the work will receive no credit.
- Incorrect work must be clearly crossed out.
- When multiple solutions are provided for the same problem, the solution containing the most number of errors will be graded.
- All homework and project deliverables must be submitted through Canvas to receive credit.

Lab Policy

Students must comply with all policies governing laboratory safety, preparation, meeting procedures, and writing requirements. Any revisions to these policies will be communicated and discussed with students prior to laboratory activities.

Other Policies

- Deliverables and due dates for the design projects will be announced in class and provided in handouts. Late or missed submissions will be subject to the same policies as homework.
- Unless otherwise specified, such as for group presentations, videos or other collaborative assignments, all submissions must be completed and submitted individually by each student.

Grading Scale: The grading scale that will be used in the course. (See also University Grading Policy).

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Grading Scale (%)	
93-100	A
90-92	A-
86-89	B+
83-85	B
80-82	B-
76-79	C+
70-75	C
65-69	D+
60-65	D
0-59	F

Grade Breakdown	
Presentations (group work)	5%
Project Report (group work)	10%
Lab Reports (group work)	30%
Activities (individual work)	10%
Attendance and Class Participation	5%
Peer Evaluation	5%
Midterm	15%
Final Exam	20%
Total	100%

Note: *Grades will be posted to Canvas for reference only, and students should make sure they are recorded correctly. However, there is no guarantee that the percentages or projected grades provided there are correct. The instructor will calculate final percentages and will determine final grades regardless of Canvas calculations. Also, Percentages that fall between grades will be rounded up.*

Attendance & Class participation (5% of the total grade)

- **ATTENDANCE** at all class meetings is mandatory and will be held at the start of every class. Please be prompt as attendance will be concluded once the lecture starts.
- **LATE:** If you do arrive late, it is your responsibility to check in with the instructor at the conclusion of class to be marked late rather than absent. A maximum of three (3) absences will be allowed before you lose points from your attendance grade. Extenuating circumstances will be evaluated on a case-by-case basis.
- **ABSENCE** requires documentation by Canvas message or email to the instructor prior to the absence is mandatory, except for extreme circumstances. Further documentation may be required. If there is no Canvas message or email generated by the student to the instructor, an absence is recorded.
- In-class activities also account for class participation grades. They might consist of short activities during class (such as quizzes) or laboratory preparation material. Submissions without the author's name will have points deducted.

Activities (10% of the total grade)

- Completion of assignments, quizzes, and problem sets posted on Canvas. Homework assignments are intended to enhance learning, provide practice opportunities, promote 'habits of mind', and allow students to demonstrate what they have learned after materials are covered in class. Submissions without the author's name will have points deducted.
- Quizzes will evaluate the material discussed to prepare for exams. Quizzes cannot have make-up opportunities.
- Submissions beyond the 2-day grace period will not be accepted.

Lab Reports (30% of the total grade)

- This is a group assignment to be submitted in Canvas based on the individual portions of the lab activities developed through the semester.

Project Reports (10% of the total grade)

- The class requires to investigate a laboratory apparatus to be developed as a team effort. A progress report, a final report, and a laboratory manual will be submitted based on the report presentations (PowerPoint) the team develops during the semester.

Presentations (5% of the total grade)

- Teams will present their laboratory investigation in a final presentation towards the end of the semester. This presentation may also include a summary of project progress, similar in style to a professional project briefing, and will serve to complement the written reports. All team members must be present and actively participate in the presentation to receive full credit.

Peer Evaluation (5%)

- Teamwork allows the opportunity to provide feedback regarding the team contribution and professionalism, as well as to

get in the habit of assessing colleagues' work within an organization. A paper form (or a Canvas form) will be distributed near the end of the semester for this assessment.

Midterm (15%)

- **Exam Policy**: A student missing an exam will be given the opportunity to make up for the exam only if he/she presents satisfactory evidence that his/her absence was unavoidable. It is the obligation of the student to notify the instructor prior to the exam or within twenty-four hours of the time of absence, at which time, arrangements will be made for a make-up exam.

Final Exam (20%)

- **Exam Policy**: A student missing an exam will be given the opportunity to make up for the exam only if he/she presents satisfactory evidence that his/her absence was unavoidable. It is the obligation of the student to notify the instructor prior to the exam or within twenty-four hours of the time of absence, at which time, arrangements will be made for a make-up exam.

NOTE: **Changes in syllabus and assignment sheets may be modified as deemed appropriate. All changes will be announced in class.

Course Schedule - *Subject to change per course policies.*
Tentative Schedule (Subject to Change)

Week	Date	Topics(s)	Deliverable(s)/Note(s)/Action(s)
1	Jan 13/15	Course Introduction, Lab Policy Project Management, Work Breakdown, Concept Development/Selection Introduction to Systems Engineering	Team Dynamics Group Selection Homework: Excel, Arduino, LabVIEW
2	Jan 20/22	***Chapter 1:*** Basic Concepts Strength of Materials Review	Lab Report – Cantilever Beam
3	Jan 27/29	**Chapter 4**: Probability & Statistics	Activity - Beam Measurement
4	Feb 3/5	**Chapter 5**: Uncertainty Analysis	Activity - Area Moment of Inertia
5	Feb 10/12	***Chapter 7***: Data Acquisition	Homework, Lab Report
6	Feb 17/19	***Chapter 7***: Data Acquisition	Homework, Lab Report
7	Feb 24/26	**Exam Review** **Midterm Exam (during class time)**	
8	Mar 3/5	***Chapter 8***: Temperature Measurements	Activity – Thermistor readings
9	Mar 10/12	***Chapter 9***: Pressure and Velocity Measurements	Homework, Lab Report
10	Mar 17/19	********Spring Break********	
11	Mar 24/26	***Chapter 11***: Strain Measurement	Lab Report - Mass Measurement
12	Mar 31 Apr 2	***Chapter 11***: Strain Measurement Review of Strength of Materials	Lab Report – Strain Measurement
13	Apr 7/9	Team Project	Activity – Drag force and velocity calculations
14	Apr 14/16	Team Project	Activity – Stress Analysis and Test Results
15	Apr 21/23	Team Project and Project Presentations Exam Review	Activity - Testing
16	Apr 28	***Final Exam (during class time)***	Final Report due

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University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is* ***prohibited****.*

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
    - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit floridapoly.edu/writing center.