Instructions from Dean's Office

In response to COVID-19, the following practices are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones.

- **If you are not vaccinated, get vaccinated. Vaccines are readily available at no cost and have been demonstrated to be safe and effective against the COVID-19 virus. Visit this link for details on where to get your shot, including options that do not require an appointment: https://coronavirus.ufhealth.org/vaccinations/vaccine-availability/. Students who receive the first dose of the vaccine somewhere off-campus and/or outside of Gainesville can still receive their second dose on campus.**

- **You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated. Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.**
  - **Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.**
  - **Hand sanitizing stations will be located in every classroom.**

- **If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.**
  - **Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work.**
  - **If you are withheld from campus by the Department of Health through Screen, Test & Protect you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.**

- **Continue to regularly visit coronavirus.UFHealth.org and coronavirus.ufl.edu for up-to-date information about COVID-19 and vaccination.**

Power and Machine Design in Agriculture and Biological Engineering

ABE 4171C Section 04HC; Number 10085
Class Periods: TU & TH, 2nd and 3rd period, 8:30 to 10:25AM
Location: 110 Rogers Hall
Academic Term: Fall 2021

Instructor:
Tom Burks
Email Address: tburks@ufl.edu
Office Phone Number: 352-294-6728
Office Hours: TU or TH, 10:30AM till 11:00AM, 225 Rogers Hall

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website

- TA and Design Coach: Vinay Vijayakumar, v66vijayakumar@ufl.edu , Monday 4:00PM to 5:00PM
- BoeBot Coach: Ben Weeks, benweeks@ufl.edu , Room 218, Thursday 1:00PM till 3:00PM.

Course Description**:** *3 credits.* Design and specification of power and machine elements applied to agricultural, biological, land and water resources, or food engineering; power units, machine elements, rigid transmission, fluid power transmission, electrical systems, electronics in off-road vehicles. *Offered each fall*

Course Pre-Requisites / Co-Requisites: EGM 3520 Mechanics of Materials, and EML 3007 Thermodynamics and Heat Transfer, EGM 3400 Elements of Dynamics. It is strongly recommended that students be familiar with SolidWorks and MATLAB.

Course Objectives

- Gain ability to design, test, and analyze power and machinery systems, which can be applied to a broad range of engineering applications including, but not limited to, field production, food processing, irrigation systems, and biological systems.
- Learn theoretical concepts associated with power and machinery design. Theory will be reinforced through team design projects.
- Learn how to evaluate mechanically oriented design problems, formulate a solution, design and specify components, develop a formal report and present concepts to class. Students will develop team skills and communicate ideas in written and oral format. Project will reinforce need for ethical design practices.

Materials and Supply Fees
None

Professional Component (ABET):
This course contributes 3 credit hours toward meeting the minimum 48 credit hours of Engineering Topics in the basic-level curriculum for the Bachelor of Science Degree in Biological Engineering.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	High
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	Medium

3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
4. An ability to communicate effectively with a range of audiences	
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Low
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- *Machine Elements in Mechanical Design, 6th ed.*
- Robert L. Mott,
- Pearson Education Inc., Upper Saddle River, New Jersey
- ISBN: 978-0134441184

Required Textbooks and Software

- *Off-Road Vehicle Engineering Principles*
- Carroll E. Goering
- ASABE 2950 Niles Road, St Joseph MI.
- ISBN: 1-892769-26-3
- (Available free on-line for ASABE student members)

Required Materials

- *Kinematics and Dynamics of Mechanical Systems, 2nd ed.*
- Kevin Russel
- CRC Press, Taylor & Francis Group, Boca Raton, FL.
- ISBN: 13: 978-1-4987-2493-7 (Amazon: ebook $24.23 rent, or $54.95 purchase)

Recommended Materials

- *Matlab tutorials*
- https://www.tutorialspoint.com/matlab/index.htm
- https://www.mathworks.com/help/matlab/getting-started-with-matlab.html

Course Schedule

Lecture Schedule (Refer to Canvas for more details and assignments)

Week	Lect #	Main Lecture Topics starting TU 2nd , and TH 2nd period	Reading	Ch.	Supplement topics TU 3rd and TH 3rd period
1	1	Introduction and Materials	Mott	2	
1	2	Mobile Elect. Systems	Gustafson		*Electrical Power*
2	3	Stress and Deformation	Mott	3	*Intro BoeBot*
2	4	Electrical Power Distribution	Gustafson, Georing		
3	5	Combined Stress & Mohr's Circle	Mott	4	*BoeBot Brain (1)*
3	6	Introduction to Kinematics (1)	Russel	1, 3	Fund. In Kinematics (3)
4	7	Design for Different Loading	Mott	5	*BoeBot Shield (2)*
4	8	Math in Kinematics (2)	Russel	2	**Term Design Meeting**
5	9	Electric Motors	Mott	21	*BoeBot Assembly (3)*
5	10	Kinematic Analysis (4)			
6	11	Column and Beam	Mott	6	*BoeBot Navigation (4:1-3)*
6		Exam 1 (9/30/21)			
7	12	Belt and Chain	Mott	7	*BoeBot Navigation (4:4-6)*
7	13	Dimensional Synth. (5)	Russel	5	**Term Design Meeting**
8	14	Kinematics of Gears	Mott	8	*BoeBot Whiskers (5:1-3)*
8	15	Static Force Anal. (6)	Russel	6	
9	16	Keys and Couplings	Mott	11	*BoeBot Whiskers (5:4-6)*
9	17	Dynamic Force (7)	Russel	7	**Term Design Meeting**
10	18	Tolerances	Mott	13	*BoeBot Light Sensor (6:1-3)*
10		Exam 2 (10/28/21)			
11	19	Shaft Design 1	Mott	12	*BoeBot Light Sensor (6:4-6)*
11	20	Shaft Design 2	Mott	12	**Term Design Meeting**
12	21	Roller Contact Bearings	Mott	14	
12	22	Combustion Engines 1	Georing	1,2,3	**Term Design Meeting**
13	23	Fasteners	Mott	19	
13	24	Combustion Engines 2	Georing	4,5	**Term Design Meeting**
14	25	Welded and Bolted Frame	Mott	20	
14		Thanksgiving (11/25/21)			
15	26	Springs	Mott	18	
15	27	Combustion Engines 3 (If needed)	Georing	6,7,8	**Term Design Meeting**
16		Team Projects & BoeBot Challenge			
Finals		Exam 3 (Finals Week Schedule)			

Class Activities and Expectations

a) There will be approximately one homework assignment per week, due Monday evening at 11:59PM which is associated with prior week's lecture material. You may discuss homework, but you may not copy verbatim from another student. A scanned copy of homework maybe turned in online in canvas up to 24 hours in advance. Solutions must be executed in units given/requested. Solutions for homework will be posted to Canvas later the next day so no late homework allowed. Homework review Q&A after lecture on TH.

b) There will be a quiz associated with each lecture, open on Canvas during the day of lecture assignment, which will cover content from that lecture, examples, and/or demonstration.

c) The design project will more fully expose the students to the material being covered in the class. The project will require the student teams to write up a project report describing the work they have done and documenting all design calculations. The topics will be assigned by the instructor with student team input.

d) Three mid-term exams will be given. Exams will be open book and notes with a one and a half hour duration The time limit is fixed, so you must work effectively to complete all questions which will be multiple choice, design, short answer, and T/F type questions.

e) There will be a five page double spaced paper required that will cover contemporary issues in engineering

design of automated systems according to student interest area. The paper will focus on the multi-disciplinary nature of automated machines, their evolution, as well as the impact that automation is having on the economy and global society.

f) Students will work in teams to complete exercises using the BoeBot Arduino robot platform. Each team will keep a PDF folder of exercises completed that will be turned in at the end of the semester. Students will then compete in a BoeBot challenge where speed, navigation accuracy will be tested in competition with other student teams.

Attendance Policy, and Make-Up Policy

a) Attendance is not mandatory daily, but accumulated absence will significantly impact grade. Four discretionary absences allowed, each additional absence will cost 2/100 of course score. Excused absence due to COVID or quarantine will not count against student's absence total.
b) No make-up exams will be given except for valid medical reasons or unless prior arrangements are made.
c) Laptops and cellphones may be used to review lecture slides, video and take quizzes. Please no texting or email during exam times.
d) Lecture based quizzes will be given that can be taken out of class if necessary, but may be at a disadvantage due to material covered in class. Material will be available in lecture notes if you decide to take quizzes out of class.
e) Students may drop one homework and two quizzes from their lowest score.
f) Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

Evaluation of Grades

Assignment	**Qty**	**Percentage of Final Grade**
Absence	4 Allowed	Four Free, each additional 2/100 Deduction
Homework Sets	15 to 20	15% (drop lowest)
Lecture Quizzes	15 to 20	5% (drop 2 lowest)
Midterm Exams	3	20% Each
Team Project	1	10%
BoeBot Folder	1	5%
Review Paper	1	5%
		100%

Grading Policy

The following is given as an example only.

Percent	**Grade**	**Grade Points**
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.