Engineering Statics
PHYS/ENGR 2401.001 & 2001.021 (Lecture and Lab)
Syllabus – Fall 2021

GENERAL COURSE INFORMATION
Name and Department: Dr. Harry D. Downing, Professor of Physics and Emeritus Scholar, Department of Physics, Engineering and Astronomy
Instructor Homepage: http://faculty.sfasu.edu/downingharry/downing.htm
Office: Room 207M Cole STEM Building
Student/Office Hours: M(11-12), T(1:00-2:00), W(12:30-1:30), R(11-11:50), F(12-1) or by appt.
Phone, Fax, E-mail: 468-2290 or 468-3001, Fax: 468-4448, hdowning@sfasu.edu
Class Meeting Times and Place: 9:00-9:50 MWF, 12:30-4:20 R, Room 103 Cole STEM Bldg.
Physics Homepage: http://www.sfasu.edu/academics/colleges/sciences-math/physics-engineering-astronomy/academics/physics
Appointment Maker: http://astro.sfasu.edu/downing/

Text and Materials:
Vector Mech. for Engineers: Statics/Dynamics (CONNECT ACCESS REQUIRED)
Authors: Beer, Johnston, Mazurek, Cornwell, Self

It is necessary that you acquire this edition of the text. Homework and reading will be assigned assuming the student has this text. Hard copies of homework assignments will not be handed out to the student.

Other materials needed in the course:
- Engineering paper that is grid ruled (assignment submission)
- Scientific calculator or better (for homework)
- Ruler, compass, any other drafting tools for FBD sketches

COURSE DESCRIPTION
Basic theory of engineering mechanics using calculus involving the description of forces, moments and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; and moments of inertia. Prerequisite(s): MATH 2313 and PHYS 2325. Co-requisite(s): ENGR 2001L or PHYS 2001L. PHYS 2001 & ENGR 2001 are cross-listed.

This is the intermediate level course in statics that employs various problem-solving methods and the laws of mechanics to analyze and obtain solutions to fundamental problems in engineering and physics. The material covered and the associated laboratory exercises warrant this lecture and lab as being worthy of 4 semester hours credit.
PROGRAM LEARNING OUTCOMES (for PHYS Majors)

- Knowledge: The student will demonstrate knowledge and comprehension of the basic and applied fields of physics.
- Problem Solving: The student will develop independent problem-solving skills.
- Written Communications: The student will develop effective written communication skills by clear and concise problem solving, well-structured laboratory reports, and accepted formatting of research papers.
- Oral Communications: The student will develop effective oral communication skills in oral presentations of problem solution, seminars, and oral presentations at scientific meetings.

PROGRAM LEARNING OUTCOMES (for ENGR Majors)
See “Course Learning Outcomes” in the ABET syllabus at the end of this document.

GENERAL EDUCATION CORE CURRICULUM OBJECTIVES/OUTCOMES
This course is not included in the general education core curriculum.

STUDENT LEARNING OUTCOMES (for PHYS Majors)
By the end of the course, successful students will be able to:
- Demonstrate an advanced level knowledge and understanding of the laws of classical mechanics to include representing these laws in mathematical expressions with appropriate units for physical quantities.
- Show quantitative and analytical skills necessary to solving physics/engineering problems.
- Exhibit effective written communication skills in presentations of physics/engineering homework problems.
- Exhibit effective oral communication skills in presentations of physics/engineering problems to one’s peers.

STUDENT LEARNING OUTCOMES (for ENGR Majors)
See “Student Outcomes” in the ABET syllabus at the end of this document.

COURSE OBJECTIVES
The main objective of this course in mechanics is to develop in the engineering/physics student the ability to analyze any problem in a simple and logical manner and to apply to its solution a few, well-understood, basic principles. A cooperative problem-solving approach is taken where students develop time management skills and teaming skills.

COURSE REQUIREMENTS/GRADING POLICY
- Poor performance on any test will result in a personal visit to the instructor’s office or via Zoom.
- The tests will be done in symbolic form, therefore, no calculators will be allowed.
- All students must do one conference with the course instructor during the semester regardless of what their test scores are. This conference will be part of your lab grade. Will be done F2F or via Zoom at the beginning of the semester.
- Homework will be worth 1/8th of your overall grade.
- Oral presentations, attendance, and performance during the problem sessions (PHYS/ENGR lab) will be 1/8th of your overall grade.
Exams
There will be three exams and a final, each covering a specific set of lecture, text, and homework material that will be communicated to the student in class. The final exam will be comprehensive to the material covered in the course. The tentative dates of these exams are listed in the course outline shown in this document. Students will have one week after each exam to review the exams and discuss the grades. No make-up exams will be given except in the case of an excused absence. An official written notice is required for an excused absence within three days of the exam. Any makeup exam must be taken within three days of the missed exam. The style of exam as well as allowed materials for the four exams will be communicated to the student in class.

Pre-Lecture Assignments
Students will be tasked to complete reading assignments using LearnSmart on the McGraw-Hill Connect website (see URL below). Each reading assignment will be posted well before the lecture in which the material is covered. It is the responsibility of the student to complete these reading assignments BEFORE the appropriate class or the deadline shown. The grades for these assignments are based only on completion. Keep in mind that the quickest way to complete these assignments (~10-20 min) is to read the sections of the text first. For more information:
https://connect.mheducation.com/class/h-downing-fall-2020-9-am-mwf

Format for ENGR 2401 Homework
Your homework will be of professional quality and professionally presented. The problems will be complete in themselves to the extent that any competent person, without reference to any material other than what you present, can determine the following: (a) the problem you are solving, (b) your method of solution, and (c) your answer.
Some homework will be assigned from the required text for the course and should be uploaded to the appropriate D2L dropbox. Some may be assigned in McGraw-Hill’s Connect website. Homework assignments will be given to you in class along with the due dates. When completing homework for uploading, the following guidelines must be followed:
1. Always restate the problem and draw a diagram if needed – make sure to label appropriately
2. Make sure to outline what values are given and the values you are trying to solve for
3. Use engineering style paper that is grid ruled, or equivalent electronic version
4. Use only one side of the paper (typically the side facing you on the pad)
5. Include your name and page number on each page
6. Use a ruler to set up your diagrams or in drawing elements, or appropriate electronic equivalent
7. Show the progression of your solution, clearly identify appropriate units when necessary
8. Indicate final answers by placing a surrounding box, don’t forget the units!!
9. Scan your homework document clearly for submission through D2L
The above criteria, as well as accuracy of the information, will be used to grade your homework.

Accuracy of homework answers: McGraw-Hill Connect website, due dates to be posted.
Process & completeness of homework answers: Scanned HW pages and submitted via D2L Dropbox

Homework Grade: 40% Accuracy 30% Process 30% Completeness

Treat this as if I am your client and you need to impress me with your engineering calculations. Homework due dates and times will be communicated to the student in class. No late homework will be accepted unless you have an excused absence.
In Class Assignments and Presentations
All in class assignments, if any, must be completed by the end of the class period. This may include working out example or homework problems on the “board” or separate assignments given throughout the class. The student may also be asked to present completed homework to the rest of the class in a “flipped class” manner. This is done to assess the communication and presentation skills of the student. The grade for these assignments and participation will be averaged with the homework to give 25% of your final grade. It is the discretion of the instructor to grant additional time if deemed necessary.

Grading Policy

Exam 1  15%
Exam 2  15%
Exam 3  15%
Homework, assignments, in-class activities  25%
Pre-Lecture assignments  10%
Final Exam  20%

Letter grades are based on the following ranges:

A  90.0 – 100%  B  80.0 - 89.9%  C  70.0 - 79.9%  D  60.0 - 69.9%  F  < 60.0%

The grade is based on three exams, one comprehensive final exam, homework which will be assigned in class, as well as in-class assignments. Exams will be graded on a 100 point scale, including the final, and homework will be averaged with in-class assignments for the final 25% of your grade.

HINTS FOR SUCCESS IN ENGR 2401
You will benefit much more from lecture if you read the text material before coming to class. Attend classes (Face to face, livestream, etc.) and take notes. Don’t try to copy everything I say, write on the “board,” or show in slides or video. Leave enough space in your notes to complement them through a thorough reading of the text material. I generally present material in class in the same order as the text. This makes it easier for you to augment your notes. Read the “Solving Problems on Your Own” sections preceding the problems and the “Review and Summary” section at the end of each chapter. If you have problems trying to comprehend this material, please do not hesitate to come and visit with me. I have truly enjoyed working with students, and often I have found that I am most effective with them when they have brought their questions and problems to me in my office.

The most important things you can do are read the book, attend class and be attentive, and do the homework!!!

ATTENDANCE
Absences from lab must be made up through extra homework. The first absence incurs one extra homework problem. Any further absences will incur three extra homework problems for each absence occurrence. Each of these extra homework problems must be submitted until each is completely correct. A deadline will be set for the completion of each extra problem. Failure to meet this deadline will increase the number of problems required. Failure to complete all extra homework by the end of the semester will result in a one letter grade reduction in your final grade in this course. Every four absences from lecture will count as if it were one lab absence, and lab absence rules will apply. Every four tardies (five minutes or more late) to lecture or lab will count as one lecture absence. Five unexcused absences from lecture and/or lab will result in a grade reduction of one letter grade. Seven will result in an F for the course. Absences from classes
before and after breaks will count as double absences. (They will count as single absences toward letter grade reductions.) Failing to confirm the watching of a video lecture will count as a lecture absence. To get presentation points you must be present in class when the problem is presented to the rest of the class. Students should become familiar with the policies on cheating and plagiarism.

CLASSROOM POLICIES (when face-to-face)
Masks (cloth face coverings), when required, must be worn over the nose and mouth at all times in this class and appropriate physical distancing must be observed (again when required). Students not wearing a mask and/or not observing appropriate physical distancing will be asked to leave the class. All incidents of not wearing a mask and/or not observing appropriate physical distancing will be reported to the Office of Student Rights and Responsibilities. Students who are reported for multiple infractions of not wearing a mask and/or not observing appropriate physical distancing may be subject to disciplinary actions. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover-guidance.html https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html For the benefit of your fellow students and your instructor, you are expected to practice common courtesy with regard to all course interactions.
For example:
➢ Be considerate toward your classmates and instructor and arrive to class on time.
➢ Do not leave class early and do not rustle papers in preparation to leave before class is dismissed.
➢ Avoid classroom distractions. Be attentive in class, stay awake, and do not read newspapers, etc.
➢ If you are late to class or must leave early, please inform your instructor in advance (enter or leave quietly, don’t walk across the front of the classroom (use the side aisles) and don’t walk in front of the projector).
➢ Cell phones, pagers and other communication devices must be turned off during class. Failure to do so could result in confiscation and loss of bonus points.
➢ Be kind and respectful to your fellow students and your teachers.

EMAIL COMMUNICATIONS
Make sure you always use your SFA e-mail account for network correspondence. Messages from your instructor will be sent to your SFA email account periodically. You may forward e-mail from your SFA e-mail address to another address of your choice. To do this, use this link:
http://www.sfasu.edu/mysfa/o365/forwarding-email/

Academic Integrity (4.1)
Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Collaboration on examinations, in class assignments, and homework assignments is forbidden except where specifically specified as "Team" activities. For example, homework assignments can be worked on as a team but must be completed separately. In general, one team may not collaborate with another team on "Team" activities. Students violating this policy will be subject to procedures described in the Stephen F. Austin State University Policies and Procedures Manual.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is
presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/student-academic-dishonesty-4.1.pdf

**Withheld Grades Semester Grades Policy (5.5)**
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

**Students with Disabilities**
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

**Student Code of Conduct: Policy 10.4**
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program. Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This policy applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the iCare: Early Alert Program at SFA. Information regarding the iCare program is found at http://www.sfasu.edu/judicial/earlyalert.asp or call the office at 936-468-2703.

**Mental Health and Wellness**
SFA values students’ mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support students’ mental health and wellness. Many of these resources are free, and all of them are confidential.

**On-campus Resources:**
**SFA Counseling Services**
www.sfasu.edu/counselingservices
Rusk Building, 3rd Floor
936.468.2401

**SFA Human Services Counseling Clinic**
www.sfasu.edu/humanservices/139.asp
Human Services, Room 202
936.468.1041
The class meets 3 hrs/wk for 15 weeks, and it also meets for a 2-hour final examination. This is a problem-oriented class and lab with homework problems. The lecture and lab combine for 6 hours of contact time each week and the work outside of classes each week for the combined courses averages much more than 12 hours in working homework problems, reading the book to understand the theories used in lecture and in homework problems and exams, reading the lab manual to prepare for the lab experiments done each week, writing up the lab experiments, and studying for exams which include major exams and possibly short lecture quizzes.

### Crisis Resources:
Burke 24-hour crisis line: 1.800.392.8343  
Suicide Prevention Lifeline: 1.800.273.TALK (8255)  
Crisis Text Line: Text HELLO to 741-741

### Tentative Course Outline and Calendar

**PHYS/ENGR 2401.001 & 2001.021**

**Lecture 9-9:50am MWF STEM 103**
**Lab 12:30-3:20am R STEM 103**

**Fall 2021**

**Course Calendar**

(Reading Assignments in Parentheses)

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<thead>
<tr>
<th>Chapter 1 Introduction</th>
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<tbody>
<tr>
<td><strong>MOR</strong></td>
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<tr>
<td>Problem Solving Methods</td>
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<th>Chapter 2 Statics of Particles</th>
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<tr>
<td><strong>MOR</strong></td>
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<td>Adding Forces</td>
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<td>Forces and Moments</td>
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<th>Chapter 7 Internal Forces and Moments</th>
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<td>Thanksgiving</td>
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<td>Nov. 22</td>
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<td>Ch. 9, (9.1)</td>
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| **MOR** | **TUE** | **WED** | **THU** | **FRI** |
| Thanksgiving | Thanksgiving | Thanksgiving | Thanksgiving | Thanksgiving |
| Nov. 29 | Nov. 30 | Dec. 1 | Dec. 2 | Dec. 3 |
| Ch. 9, (9.2) | Ch. 9, (9.2) | Ch. 9, (9.2) | Ch. 9, (9.2) | Ch. 9, (9.2) |

| **MOR** | **TUE** | **WED** | **THU** | **FRI** |
| Thanksgiving | Thanksgiving | Thanksgiving | Thanksgiving | Thanksgiving |
| Nov. 6 | Dec. 7 | Dec. 8 | Dec. 9 | Dec. 10 |

Final 8:00 am -10:00 pm
Stephen F. Austin State University  
ABET Syllabus:  
ENGR 2401 – Engineering Statics (Required)

**Course Description:**  
Basic theory of engineering mechanics, using calculus, involving the description of forces, moments, and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; and moments of inertia. Four semester hours, three hours lecture, three hours lab per week. Prerequisites: MATH 2313 and PHYS 2325. Lab fee required.

**Prerequisites:** PHY 2325 & MTH 2313  
**Co-Requisites:** EGR 2001L

**Credits:** 4 Hours  
(Lecture: 3 Hours, Laboratory: 1 Hours)

**Instructor:** Harry Downing

**Textbook:** *Vector Mechanics for Engineers: Statics & Dynamics*  
Authors: Beer, Johnston, Mazurek, Cornwell, Self  

**Supplemental Materials:**  
Engineering paper  
Scientific calculator or better

**Topics Covered:**  
Forces and moments in three dimensions analyzed with vector mechanics, centroids and centers of gravity, analysis of trusses, frames, and machines, beams, friction, moments of inertia of mass and area.

**Course Learning Outcomes**  
By the end of the course, a successful student will be able to:  
1. Draw a complete free-body diagrams describing position of forces and moments in terms of vector components in two and three dimensions. (SO-2)  
2. Apply appropriate equilibrium equations on a free-body diagram. (SO-1)  
3. Work in teams to solve equilibrium problems discussed in class. (SO-3)  
4. Determine resultant forces for a system acted upon by outside point and distributed forces. (SO-1)  
5. Translate systems of forces and moments to equivalent systems. (SO-1)  
6. Calculate forces in trusses and frames under equilibrium. (SO-1)  
7. Find internal forces of a structure or system in equilibrium. (SO-1)  
8. Analyze static systems that include forces from friction. (SO-1)  
9. Calculate the centroids and centers of gravity for particles with an arbitrary shape. (SO-1)  
10. Determine moment of inertia for a simple area. (SO-1)  
11. Apply parallel-axis theorem to find moment of inertia for a complicated area. (SO-1)
Student Outcomes
Graduates of the program will show:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
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
3. an ability to communicate effectively with a range of audiences
4. 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
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.