MEEN 4120 – Aerospace Fundamentals
Spring 2019

Instructor:
Dr. Cherish Qualls
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(940) 565-3446
Office: F101F
Office Hours: TTh 12:30-2:00 PM or by appointment

Class Schedule:
TTh 2:30-3:50 PM, Room: NTDP B155

Reference Textbooks: (These books are not required – the lecture notes will suffice for learning)
John D. Anderson, Jr.

Howard D. Curtis

Michael V. Cook

Catalog Course Description:
3 hours. Introduction to the fundamental knowledge used in the aerospace industry. Topics include orbital mechanics, basic aerodynamics, guidance and control methods, flight dynamics, and 6 Degree of Freedom (6-DoF) motion and simulation for aircraft and missiles.
Prerequisites: MATH 2700, MEEN 3120, MEEN 3230

Course Objectives:
1. Demonstrate ability to calculate orbital mechanics parameters
2. Determine orbital elements of a spacecraft given position and velocity data.
3. Learn to develop state-space models of aerospace vehicles.
4. Utilize concepts from Fluid Mechanics to analyze the aerodynamics of airfoils
5. Demonstrate ability to perform computer-based analysis on topics such as orbital mechanics, numerical analysis, and aerodynamics.
6. Gain knowledge of 6-DOF equations of motion for flight vehicles

ABET Criteria:
MEEN 4120 addresses the following ABET program outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Disability Policy:
All reasonable accommodation will be made to facilitate special needs. If special accommodations are required, the student must first meet with the staff of the Office of Disability Accommodation (ODA), (940) 565-4323. After meeting with that office, please contact me to discuss what accommodations will be necessary. For more information, see http://www.unt.edu/oda.

Assignments:
Homework assignments will be assigned on Thursdays. These homework assignments will not be collected. Instead, a quiz, consisting of one of the exact homework problems or a very similar problem, will be given the following Thursday. Homework assignments will consist of textbook problems as well as MATLAB problems. There are 12 quizzes. The lowest two quiz grades will be dropped. Quizzes may contain MATLAB. Make-up quizzes are NOT allowed. Quiz dates: 1/31, 2/7, 2/14, 2/21, 2/28, 3/7, 3/14, 3/21, 3/28, 4/4, 4/11, 4/18, 4/25

Projects:
There will be at least 3 projects assigned in this course. Projects will range from calculating orbital elements of a satellite to developing a working Kalman filter for an aerospace vehicle. MATLAB is required to complete the projects. All MATLAB projects must be submitted to Canvas in order to receive credit. Each MATLAB code will be run to verify it is working correctly and providing accurate results. The projects will vary in difficulty. As such, the point value of each project will change to account for the level of difficulty.
Note: codes will be submitted to Turnitin to check for copying. Codes showing more than 75% similarity will receive a score of zero.

Exams:
There are no hourly exams in this course. There is a comprehensive final exam given at the end of the course.
Final exam: Tuesday, May 7th, 1:30-3:30 pm

Grade Evaluation:
Quizzes 40%
Projects 30%
Final Exam 30%

A – 90-100%  B – 80-89%  C – 70-79%  D – 60-69%  F - < 60%
Final grades will not be curved.

Academic Dishonesty/Cell Phone Policy:
Cell phone use will not be allowed during quizzes and exams. If a student is caught using a cell phone during a quiz or exam, a score of zero will be given for that assignment. There are no exceptions to this rule.

Students are expected to do their own work on quizzes and exams. If it is determined that a student is talking during an exam, copying off of other students’ papers, sharing an equation sheet etc, a score of zero will be given for that assignment. There are no exceptions to this rule.

Students caught violating this policy two times will automatically be given an F in the course.
All students caught cheating will be reported to Academic Integrity Office.

Classroom Procedure on Exam Days

On exam days:

- Seats will be randomly assigned by the instructor
- All phones, tablets, other electronic devices must be placed in a bag
- All bags must be placed at the front of the room
- Students will only be allowed to bring in calculators and pencils for the exams. I will provide equation sheets, tables, and scratch paper.
- Students will not be allowed to leave the room during exams and quizzes. Exams/quizzes will be collected and considered finished if a student leaves the room.

Attendance:

Although not required, attendance is strongly encouraged to fully grasp the material in the course. Lecture material is pulled from many sources so it is not possible to simply read a textbook to make up for missing class. Lecture notes are not posted on Canvas in order to encourage class attendance. If you miss class, it is your responsibility to get the notes from another student in class.

Canvas:

All homework assignments will be posted on Canvas. Each student is responsible for checking Canvas on a routine basis. At times announcements will be posted on Canvas regarding test dates, quizzes, and homework. In addition, your grades will be posted on Canvas. Please check these grades for accuracy and let me know if there is a discrepancy.

Regrades:

Any requests for regrades must be made the day the assignment is returned. Once class is over, regrade requests will not be accepted. It should be noted that the entire assignment will be regraded. This may result in a score lower than what was originally assigned. Papers will be regraded at the end of the semester.

Calculator:

Graphing calculators will not be allowed during quizzes and exams. Only NCEES-approved calculators can be used. (http://ncees.org/exams/calculator/).

Acceptable calculators are:

**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 calculator must have “TI-30X” or “TI-36X” in its model name.)
**Use of Solutions Manuals/online resources like Chegg:**

It is common knowledge that solutions manuals to all widely-used textbooks are available online. I realize that students like to utilize these resources but please use them in the correct way. Simply copying what is in the solutions manual is not beneficial to you, in fact, it is detrimental to your learning and grade.

To use these resources properly you should attempt all problems on your own. If you get stuck, work on it some more. You should only go to the provided solutions once you have obtained a solution. You can then check your work and find your mistakes. Once you have found the mistakes, you should figure out why you made those errors and then learn how to fix them.

Your goal in doing the practice problems is to learn how to apply the material learned in class to a variety of problems. The only way to do this is to work through problems on your own. This not only improves your understanding but it also leads to better problem solving skills.

**Topics to be Covered (topics may or may not be covered depending on time available):**

Orbital Mechanics, Basic Aerodynamics, Flight Dynamics, Guidance, Navigation and Control Topics, Coordinate System Transformations