MAE 465 - FLIGHT CONTROLS - Fall 2018
Department of Mechanical and Aerospace Engineering

INSTRUCTOR: Marcello R. Napolitano. Office: 941 ESB
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NOTE: I do not use ‘mix’ account!

OFFICE HOURS: M-W: 2:00 PM – 3:00 PM. In other hours assistance to students will be provided whenever possible after prior appointment via e-mail. Technical assistance will also be provided via e-mail.

CREDIT: 3 hrs.

PREREQUISITES
- Prerequisite for AEs: MAE 365.
- Co-requisite for MEs: MAE 460 or instructor consent

TEXTBOOK: None. Several large handouts will be provided by the instructor.

REFERENCE TEXTBOOK

GOALS:
This course serves as an elective extending the knowledge of basic flight mechanics to design of basic flight control systems. The students are required to use Simulink, a useful software packages for the design of control systems. Following the design process, some of the control schemes will be tested on a PC-based flight simulation code based in a Matlab/Simulink environment.

LEARNING OUTCOMES:
Students are expected to learn to design simple autopilot and stability augmentation systems as well as acquiring general knowledge of the task of designing control schemes for modern flight control systems.

GRADING PROCEDURE:
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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Quizzes</td>
<td>10%</td>
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<tr>
<td>Homework</td>
<td>30%</td>
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<tr>
<td>Midterm exams (2)</td>
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<tr>
<td>Final</td>
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The final grade in this course will be assigned using the scale: 90-100 = A; 80-89 = B; 70-79 = C; 60-69 = D, <60 = F. Class attendance is mandatory; attendance sheets will be taken. Some curving will be done at the end of the semester on the final grade.
TOPICS
1 - Review of the open-loop aircraft dynamics using transfer functions.
2 - Review of the Root Locus technique.
4 - Introduction to different architectures and classification of different flight control systems.
5 - Examples of design of stability augmentation and automatic flight control systems in the s-domain. Introduction to the implementation of control laws in a flight simulation code.
6 - State variable analysis. Mathematical modeling of the open-loop aircraft dynamics: state, control, observation (A,B,C) matrices in continuous time.
7 - Discrete state variable analysis.
8 - Controllability and observability.
9 - State feedback (pole placement) controllers and their application to the design of flight control systems.
10 - Observers and their application to the design of flight control systems.
11 – Introduction to Kalman Filters.

CLASS POLICIES
- The class format will be in the form of lectures; student participation through feedback and questions is strongly requested and encouraged by the instructor. Extra curriculum activities (such as text messaging, use of laptops, reading the DA, cross-words, Sudoku, consumption of meals, etc..) will not be tolerated during the class; students engaging in these activities will be asked to leave the classroom.
- It is expected that the students will review AND study the material between classes. This is necessary due to the fact that the topics in this course are strongly correlated. Additionally, there will be unannounced quizzes on the material of the previous lecture(s). For this purpose the students are strongly encouraged to take good notes; additionally, the instructor will provide a substantial amount of handouts which, along with the textbook, are designed with the specific purpose of assisting the students in the learning process outside the classroom.
- It is expected that homework are to be prepared in a professional manner with a detailed documentation of the work. Homework is supposed to represent the work by an individual student; cooperation between students while working on homework is neither encouraged nor tolerated. Students are encouraged to consult available WVU material on the definition of ‘plagiarism’. A “zero” score will be assigned to all the parties involved in the homework in the first occurrence of a ‘plagiarism’ issue; a “zero” score for all the semester’s homework will be assigned to all the parties involved in the second occurrence. Homework is due AT THE BEGINNING of the class period on the due date. Late homework is not accepted.
- A make-up test shall be given only if the student can show valid reason as per WVU rules. This has to be established before the regularly scheduled test.
- ‘Programmable’ calculators and text storing devices will NOT be allowed during tests and quizzes. Students are required to use ONLY calculators without programming and text storage capabilities.

STATEMENT ON SOCIAL JUSTICE
WVU is committed to social justice. The instructor of this course concurs with WVU's commitment and expects to maintain a positive learning environment based upon open communication and mutual respect and nondiscrimination. Our University does not discriminate on the basis of race, sex, age disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise us and make appropriate arrangements with Disability Services (293-6700).