AEROSPACE VEHICLE DESIGN I

MAE 4350
(2-3) 3 HOURS CREDIT

SPRING 2018

SYLLABUS

CONTENT

Analysis and design of an aerospace system such as a complete flight vehicle, a propulsion system, a structural system, or a control system; market analysis, operating studies, mission specification, civil and military certification requirements; design process, methods and tools; configuration concept selection, harmonization of individual design disciplines (aerodynamics, performance, flight mechanics, structures, cost, systems, etc.).

TOPICS COVERED


COURSE OBJECTIVES

The MAE 4350-4351 two-semester aerospace design course sequence is developed to integrate the fundamental courses taken earlier throughout the curriculum by the aerospace or mechanical engineering student. In MAE 4350 the student is required to exercise the knowledge obtained in the prerequisite courses in the determination of a well-balanced multi-disciplinary flight vehicle system and develop an understanding of the design methodology through a highly structured lecture program and laboratory program aimed at developing an overall understanding for the design of aerospace systems.

Lecture Program: Emphasis has been placed on a generic presentation of the material being applicable to subsonic to hypersonic designs. The class text selected assembles a basic flight vehicle design compendium ultimately guiding the engineering apprentice towards the state-of-the-art of product
synthesis. The lecture program is exclusively reserved for the Spring semester.

**Laboratory Program:** One important feature of this course is the inclusion of a reverse-engineering example problem (mini-project). Throughout the semester the students successively quantify a flight vehicle design case study by applying their theoretical, physical, and technical understanding. Emphasis has been placed on emulating an industry-typical disciplinary and multi-disciplinary design decision processes. Problem solving techniques range from by-hand calculations, the development of custom spreadsheet applications to specialist software execution. This laboratory program will enable the student engineer to build design proficiency for the range of design disciplines concerned. The laboratory (training) program is exclusively reserved for the Spring semester, thereby exposing the student body to the overall design process, methods library, and a variety of software applications before the Summer capstone design project is started.

**Computer Use** The computer is used extensively for design computations (disciplinary analysis, vehicle synthesis), for utilizing and building technical databases, for configuration development and geometry visualization using a CAD system, for visuals for class presentations, and for producing weekly reports and the final report. Students are urged to utilize computer facilities provided by MAE to develop their own programs based on course text and lectures.

**Prerequisites** MAE 3306 (or concurrent enrollment) and MAE 3405 (or concurrent enrollment).

**Class Schedule** Lectures and laboratory exercises during the Spring 2018 semester totaling 270 minutes per week; class times are MoWe 11:00am-11:50am and Th 02:00pm–04:50pm.

**Class Attendance** It is part of the students’ obligation to attend lectures, training exercises, and scheduled project meetings; lack of attendance results in penalty points.

**Laboratory** Utilization of the MAE Capstone Laboratory in WH 301; possible utilization of the machine shop, wind tunnel, and CAD Laboratory.

**Instructor** Bernd Chudoba, Associate Professor, UTA MAE
500 W. First St., Phone: 817 272 1436
E-Mail: chudoba@uta.edu
*Office Hours: TBD*

**Place of Class** MoWe WH 210, Th PKH 105

Lecture Notes
REFERENCES

COURSE WEBSITE
Blackboard

GRADING LECTURE
Homework (Mini-Project: reports, presentations) 30%
Mid-Term Exam 30%
Final Exam 30%
Pop-Quizzes 10%

GRADE ALLOCATION
Course grades will be earned based on the following criteria:
A = 90% - 100%
B = 80% - 89%
C = 70% - 79%
D = 60% - 69%
F = 0% - 59%

This criterion is ABSOLUTE and there is no intention to deviate from it.

PROGRAM EDUCATIONAL OBJECTIVES (MAE Outcomes; ABET A-K)
The MAE 4350 capstone course relates to the following MAE/ABET outcomes: C, G, H. The selected ABET A-K statements below describe what students are expected to know and be able to do by the time of graduation.

Outcome C: DESIGN SYSTEM, COMPONENT OR PROCESS TO MEET NEEDS

Plan to accomplish:
1) Lecture from class text and laboratory class notes on conceptual design procedures.
2) Assign laboratory design tasks addressing an aircraft case study aimed at fostering disciplinary and multi-disciplinary design proficiency for meeting specified vehicle performance & cost requirements.

Plan to demonstrate:
1) Require and grade individual laboratory reports that count as a major part of the course grade. See samples of written laboratory reports in course exhibit.
2) Require quizzes that count as part of the course grade. See samples of quizzes in course exhibit.

Key Assignment for Outcome C: Individual aircraft design laboratory reports and weekly quizzes document the project-based component or system design to meet specified performance requirements. See samples of individual written reports and quizzes covering Outcome C.

Outcome G: COMMUNICATE EFFECTIVELY
Plan to accomplish:

1) Assign laboratory tasks addressing an aircraft design case study aimed at fostering disciplinary and multi-disciplinary design decision-making. The outcome of the analysis & design tasks has to be translated into plausible design recommendations.
2) Specify organization requirements for written laboratory reports aimed at communication the engineering reasoning. Provide report template containing examples for use of methodology charts, design trade scope, tables, figures, and graphs when possible.

Plan to demonstrate:

1) Require and grade individual laboratory reports for technical correctness, plausibility, clarity and grammar that count as a major part of the course grade. See samples of written laboratory reports in course exhibit.

**Key Assignment for Outcome G:** Individual aircraft design laboratory reports document the project-based component or system design to meet specified performance requirements. The reports are graded on organization, content and grammar. See samples of individual written reports covering Outcome G.

**Outcome H: UNDERSTAND IMPACT OF ENG. SOLUTIONS IN GLOBAL & SOCIETAL CONTEXT**

Plan to accomplish:

1) Dedicate one lecture to the history of space access and space exploration. Emphasize on the catalyst effect engineering solutions have on human development in the past, presence and future.
2) Assign a homework case study discussion paper addressing the implications of the emerging space tourism industry on the (a) environment, (b) global and domestic economy, and (c) global and domestic societies and politics.

Plan to demonstrate:

1) Require a quiz to evaluate lecture notes comprehension of the history of space access and space exploration. See samples of written quizzes in course exhibit.
2) The required homework assignment paper will be graded and counts as part of the course grade. See course exhibit.

**Key Assignment for Outcome H:** The homework assignment paper is discussing the impact of engineering solutions in the global and societal context. The papers are graded on the organization and content of the cause-effect relations engineering solutions will have on the emerging space tourism industry in the global and societal context. See samples of individual written reports covering Outcome H.

**COURSE POLICIES**

**COURSE DELIVERABLES**
Failure to turn in any course-related assignment (weekly homework, weekly report, etc.) on its assigned date, and at the assigned time, will result in a grade of a 0% being assigned for that
course-related assignment. No late deliverables will be accepted for any reason; no grades of incomplete will be assigned. Each weekly homework assignment is due at the beginning of the Monday lecture a week after being assigned. Only conceptual discussion among students is allowed; sharing of results is not permitted. The weekly capstone reports are due at the beginning of the TBD project meeting documenting one week worth project work. The new entries into the project reports are indicated in red. The reports are collected by a TBD student who provides the collected reports to the instructor. Responsibility rests with the individual student to turn their report in.

ATTENDANCE, PERFORMANCE EVALUATION
Attendance is mandatory during lectures, training exercises, project group meetings, class meetings, and presentations (mid-term, final, or by guest speakers). Subjective evaluation of individual students’ performance is based on faculty impression, input from sponsors (customer satisfaction), team members (peer review), technical staff, and external judges.

UNIVERSITY POLICIES

STUDENT EVALUATION OF TEACHING
The students will be asked to complete feedback forms at the end of the semester.

ABSENCES BASED ON RELIGIOUS BELIEFS
A student who misses an examination, work assignment, or other project due to the observance of a religious holy day will be given the opportunity to complete the work missed. To be eligible for such a make-up, the students must notify his/her instructor in writing within the first 15 days of class. Failure to follow the rules provided above within the time frames listed will result in the absence being considered unexcused.

AMERICANS WITH DISABILITY ACT
The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans With Disabilities Act (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens. As faculty members, we are required by law to provide ‘reasonable accommodation’ to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels. For more information contact the Office for Students with Disabilities.

ACADEMIC DISHONESTY
It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. Any person involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the university. It is the student’s responsibility to know University policies on these matters. “Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)
**INCLEMENT WEATHER POLICY**
In the event that weather or other conditions are such that normal campus operations could be impeded, the following policy will apply for this class. If the University is closed, this class will not meet. Any assignments due or examinations scheduled will be due or rescheduled to the very next class period that the class meets. Local media should announce any closings.

**STUDENT SUCCESS**
UTA supports a variety of student success programs to help you connect with the university and achieve academic success. They include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs for more information and appropriate referrals.

**EMAIL TO FACULTY**
To contact a faculty member, use the email address shown on the top of the syllabus. Use as the ‘subject line’ MAE 4350, put your name inside the email message, start with the main point/question of the message. Emails from outside the UTA domain are subject to being treated as spam by the server and are possibly deleted.

**NOTICE**
The instructors reserve the right to make changes to the course syllabus as necessary. It is the student’s responsibility to keep up with changes to the syllabus as posted on the class website.

**COPYRIGHT**
Copyright 2008 UTA COE as to this syllabus, all lectures, and all materials. Students are prohibited from selling notes taken during this course (or being paid for taking by) any person or commercial firm without the express written permission of the professor teaching this course.

By signing this syllabus, the student acknowledges that he/she has read and understood this document.

Print Name: ____________________________________________

Signature: ___________________________________________ Date: ______________

Prepared by: Bernd Chudoba
Date: 16 January 2018

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