ME408 – Aircraft Performance and Design

Fall 2020 Course Syllabus

1) Instructor Information

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I don't have any specific office hours, however if the need arises to set up help sessions outside of regular class hours, we can discuss best options for how to do this compliantly within current BU COVID protocol. I do make every effort to respond promptly to e-mail. You can e-mail me at any time with questions.

NOTE: If you are e-mailing me with a question about your team projects during the semester, then ***PLEASE INCLUDE ALL TEAM MEMBERS ON E-MAIL DISTRIBUTION*.** THANK YOU!!

2) Course Objectives

a) Expose students to the **key elements** of conceptual, fixed-wing aircraft design: Requirements, Sizing, Performance, Wing-Fuselage-Empennage Design, Enhanced Lift, Structural Design, Stability & Control and Cost Estimation.

b) Demonstrate the fundamental, **iterative nature** of design through complete aircraft design projects that run parallel to the course material.

c) Students learn to design **multiple types** of fixed wing aircraft and gain appreciation for what drives the three basic types: Commercial Transport, General Aviation and Military.

d) Establish a foundation for the **fundamental principles** of aircraft design, especially for Aero-Concentrators who, on successful completion of ME408, may select an aircraft design related project for ME461.

3) References

a) Required Texts:

Primary Text Book; "Design of Aircraft", Corke, Thomas C., Prentice Hall, 2003

Reference Text Book; "Theory of Wing Sections", Abbott, Ira Herbert and von Doenhoff, Albert Edward, Dover Publications, 1949

Other Resources: Jane's All the Worlds Aircraft in four (4) separate volumes published yearly. Note: The BU Library has begun to purchase new volumes. Here is the latest;

Jane's All the Worlds Aircraft-Dev & Prod	2013/2014
Jane's All the Worlds Aircraft-In Service	2015/2016
Jane's All the Worlds Aircraft-Unmanned	2014/2015
Jane's All the Worlds Aircraft -Aero Engines	2015/2106

Also, the MIT Library has a good selection of Jane's volumes.

b) Other Texts

"Aircraft Design", Sadraey, Mohammad H., Wiley, 2013

"Aircraft Engine Design", Mattingly, Jack D., Heiser, William H., Daley, Daniel H., AIAA Education Series, 1987 … (Chapters 2 and 3 only).

4) Class Attendance

Often time's students will be asked to bring their laptops to class for hands-on exercises. Students are also encouraged to bring their texts to class.

The 1rst class attendance has been set at random for twelve (12) students, which is the maximum number allowed for HAR 316 class room.

Starting with the 2cnd class and through out the rest of the semester, the students will be assigned to project teams and the teams will be invited to class on an alternating basis. The intent is to give each student, save for those who have opted out of in-person classes for the entire semester, one (1) in-person class with his or her team-mates followed by a remote session.

Students will be notified which team they have been assigned to prior to the 2cnd class.

5) Grades

a) Course letter grades.

The individual course letter grades for this course will be based on the BU point system.

Points	Letter Grade	Honor Points
95+	A	4.0
90-94	A-	3.7

85-89	B+	3.3
80-84	B	3.0
75-79	B-	2.7
70-74	C+	2.3
65-69	C	2.0
60-64	C-	1.7
55-59	D	1.0
<55	F	0.0

Points will be awarded on the following basis:

Course Item	Content	Max Points	*Due Date
Team Presentation 1	Chapters 1-3	20	9/22/20
Team Presentation 2	Chapters 1-6	20	10/8/20
Team Presentation 3	Chapters 1-9	20	11/5/20
Team Presentation 4	Chapters 1-13	20	12/10/20
Homework Questions	All	20	various
BONUS	Best Design in Class	5	
Total		**105**	

*Due Dates are tentative and could change depending on how the class is progressing.

b) Team Presentations

See Section six (6) below for details.

c) Homework Problems

Homework problems will be assigned during the semester via Blackboard Learn. There will be a time limit for the students to work and submit answers to the problems. The time period given the students to complete the homework problems is usually a few days. Each assignment will be made clear in class as to when the problems are assigned and due. Each homework problem is weighted the same, so that if there are, for example, 30 homework problems assigned during the semester and a student successfully answers 22 of those problems, then that students' homework point credit towards his or her course letter grade would be;

(22/30)*(20 Available Course Letter Grade Points) = 14.7 points

6) Team Projects

a) Projects

There are twelve (12) team projects offered the students to work through out the semester. Each project is a complete, aircraft design project that runs parallel to the course lecture material. Student teams will work the project together and make four (4) presentations to the entire class during the semester.

The twelve (12) projects offered for Fall 2020 are;

Military
-Long Range Strike Bomber
-Multirole Fighter

Commercial
-Twin Jet Airliner
-New Midsize Airliner (NMA)

General Aviation
-Trans Oceanic Business Jet
-Civil Utility Aircraft Family
-Agricultural Sprayer / Aerial Firefighter
-US Light Sport Aircraft (LSA)
-Four Seat Lightplane
-Aerobatic Sport-plane

Other
-Single Seat Ultralight
-Class I Unmanned Aerial Vehicle

Each team will be expected to work the entire design project throughout the Semester.

b) Teams

Members
Each student will be placed on a team based on project selections made by the students. The first class of ME 408 is primarily a review of the twelve (12) projects offered to give students some context about each project. The first assignment is to review the design projects and submit to the Instructor (jgeiger@bu.edu) your top three or four choices. All efforts will be made to form teams with each student's top choices.

Trades
Each team will have the option of one (1) "trade" during the semester. The trade option is voluntary, not required and intended to give teams the option of improving upon team chemistry, in the event that personalities are getting in the way of team progress and morale. The trade must be one-for-one and

both teams involved in the trade must be in full concurrence that the trade is approved. If a trade cannot be worked out to the satisfaction of all concerned, then the team seeking a trade must find a way to "soldier on" with the current team members as is. Once the details of the trade have been determined, all parties should consult with the Instructor to finalize the trade.

c) Team Presentations

Each Team will present the status of their designs to the class on four (4) occasions during the semester, tentatively on the following dates;

Thursday, 9/22/20	Chapters 1-3
Tuesday, 10/8/20	Chapters 1-6
Tuesday, 11/5/20	Chapters 1-9
Tuesday, 12/12/20	Final Project Presentation, Chapters 1-13

Each presentation will be graded. Each member of the team will receive the same grade for a given presentation. NOTE: This fact that all team members receive the same grade is the reason why each team member needs to contribute to the team in a fair manner. Teams that struggle in ME 408 almost ALWAYS have a team participation issue as a root cause to their problems.

Details of the expected content for each presentation will be given during the semester prior to each presentation. Templates to use for the presentations will be supplied.

d) Mid-Term Peer Evaluations

Each team member will have a chance to anonymously rate his or her team mates on overall contribution to the team. If the evaluations show clear evidence that a team member is not contributing to the team in a fair and equitable way, based on the other team members input, then a meeting with the Instructor will be arranged and a plan outlined to improve performance. If the behavior persists throughout the semester, then the final grade of the underperforming student(s) will be modified, downward, to reflect the injurious behavior of the student overall team chemistry.

7) ME408 Class Calendar, Fall 2019

Scroll to next page. Note that all dates are tentative. We will stick to this schedule as close as possible, but may need to and will adjust the dates and/or course material if situations arise that call for it.

ME408 - Aircraft Performance and Design

Fall 2020 Class Schedule

Date	Day	Lecture Topic
9/3/2020	Thu	Intro, Syllabus, Class Projects, Chapter 1 - Introduction
9/8/2020	Tue	Chapter 2 - Preliminary Estimate of Takeoff Weight
9/10/2020	Thu	Chapter 2 - Preliminary Estimate of Takeoff Weight
9/15/2020	Tue	Chapter 3 - Wing Loading Selection
9/17/2020	Thu	Chapter 3 - Wing Loading Selection
9/22/2020	Tue	Team Presentations - Chapters 1-3
9/24/2020	Thu	Chapter 4 - Main Wing Design
9/29/2020	Tue	Chapter 5 - Fuselage Design
10/1/2020	Thu	Chapter 6 - Horizontal and Vertical Tail Design
10/6/2020	Tue	Chapter 4-6 Review
10/8/2020	Thu	Team Presentations - Chapters 1-6
10/13/2020	Tue	NO CLASS (Holiday, Substitute Monday Schedule)
10/15/2020	Thu	Chapter 7 - Engine Selection
10/20/2020	Tue	Chapter 7 - Engine Selection
10/22/2020	Thu	Chapter 8 - Take-Off and Landing
10/27/2020	Tue	Chapter 8 - Take-Off and Landing
10/29/2020	Thu	Chapter 9 - Enhanced Lift Design
11/3/2020	Tue	Chapter 9 - Enhanced Lift Design
11/5/2020	Thu	Team Presentations - Chapters 1-9
11/10/2020	Tue	Chapter 10 - Structural Design and Material Selection
11/12/2020	Thu	Chapter 10 - Structural Design and Material Selection
11/17/2020	Tue	Chapter 11 - Static Stability and Control
11/19/2020	Thu	Chapter 11 - Static Stability and Control
11/24/2020	Tue	Chapter 12 - Cost Estimate
11/26/2020	Thu	NO CLASS (Holiday)
12/1/2020	Tue	Chapter 13 - Design Summary and Trade Study
12/3/2020	Thu	Prep for Final Project Presentations
12/8/2020	Tue	Prep for Final Project Presentations
12/10/2020	Thu	Team Presentations - FINAL
12/15/2020	Tue	NO CLASS (No Final Exam)
12/17/2020	Thu	NO CLASS (No Final Exam)