ME408 – Aircraft Performance and Design

Fall 2013 Course Outline

1) Instructor Information

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2) Course Objectives

a) Expose students to the key elements of conceptual 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 students selecting the Design, Build and Fly (DBF) option in ME461 (Spring 2014). ME408 is a pre-requisite for ME461 DBF.

3) References

Main Text Book: "Design of Aircraft", Corke, Thomas C., Prentice Hall, 2003

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

Reference: Jane's All the Worlds Aircraft.

4) ME408 Class Calendar and Homework, Fall 2013

See Excel File, "ME408 Class Calendar and Homework Assignments.xlsx"

ME408 Fall 2013 Class Schedule (as of 9/3/2013)					
(Subject to change)					
Week	**Class**	**Date**	**Day**	**Lecture Topic**	**Homework Problems Due**
1	1	9/3/2013	Tu	Intro, Syllabus, Class Projects, Chapter 1 - Introduction	
1	2	9/5/2013	Thu	Chapter 2 - Preliminary Estimate of Takeoff Weight	
2	3	9/10/2013	Tu	Chapter 2 - Preliminary Estimate of Takeoff Weight	
2	4	9/12/2013	Thu	Chapter 3 - Wing Loading Selection	2.3, 2.4, 2.5
3	5	9/17/2013	Tu	Chapter 3 - Wing Loading Selection	
3	6	9/19/2013	Thu	Team Presentations - Chapters 1-3	
4	7	9/24/2013	Tu	Chapter 4 - Main Wing Design	3.8, 3.9, 3.10
4	8	9/26/2013	Thu	Chapter 4 - Main Wing Design	
5	9	10/1/2013	Tu	Chapter 5 - Fuselage Design	4.5, 4.6, 4.7
5	10	10/3/2013	Thu	Chapter 5 - Fuselage Design	
6	11	10/8/2013	Tu	Chapter 6 - Horizontal and Vertical Tail Design	5.2, 5.5, 5.6
6		10/10/2013	Thu	NO CLASS (Holiday)	
7	12	10/15/2013	Tu	Chapter 6 - Horizontal and Vertical Tail Design	
7	13	10/17/2013	Thu	Team Presentations - Chapters 4-6	
8	14	10/22/2013	Tu	Chapter 7 - Engine Selection	6.6, 6.7 and 6.10
8	15	10/24/2013	Thu	Chapter 7 - Engine Selection	
9	16	10/29/2013	Tu	Chapter 8 - Take-Off and Landing	7.7, 7.9, 7.10
9	17	10/31/2013	Thu	Chapter 9 - Enhanced Lift Design	8.1, 8.2, 8.3
10	18	11/5/2013	Tu	Chapter 9 - Enhanced Lift Design	
10	19	11/7/2013	Thu	Team Presentations - Chapters 7-9	
11	20	11/12/2013	Tu	Chapter 10 - Structural Design and Material Selection	9.1, 9.10, 9.11
11	21	11/14/2013	Thu	Chapter 10 - Structural Design and Material Selection	
12	22	11/19/2013	Tu	Chapter 11 - Static Stability and Control	10.1, 10.7, 10.9
12		11/21/2013	Thu	NO CLASS (Holiday)	
13	23	11/26/2013	Tu	Chapter 11 - Static Stability and Control	
13	24	11/28/2013	Thu	Chapter 12 - Cost Estimate	11.1, 11.5, 11.10
14	25	12/3/2013	Tu	Chapter 13 - Design Summary and Trade Study	12.4, 12.6, 12.7
14	26	12/5/2013	Thu	Chapter 13 - Design Summary and Trade Study	
15	27	12/10/2013	Tu	Team Presentations - FINAL	13.4, 13.5, 13.7
15	28	12/12/2013	Thu	Team Presentations - FINAL	
16		12/17/2013	Tu	NO CLASS (No Final Exam)	
16		12/19/2013	Thu	NO CLASS (No Final Exam)	

5) Team Projects

ME408 Team Projects are Aircraft Design Projects that run parallel to the course material.

a) Projects.
There are seven (7) projects to choose from (see Power point file, "ME408 Fall 2013 Project Descriptions.pptx" for details);

-Wide Body Commercial Transport
-Light Sport Aircraft (LSA)
-Four Seat Light Plane
-Two Seat Aerobatic Plane
-Air Superiority Fighter
-Trans Oceanic Business Jet
-High Altitude Long Endurance Unmanned Aerial Vehicle (HALE UAV)

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

b) Team Make-up and Trades
The # of team members for any given team is at least three (3), but no more than four (4) team members. 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 or perhaps to give a student the option of working on more than one (1) project during the semester. The trade must be one-for-one and both teams involved in the trade must be in full concurrence that the trade is approved. Once the details of the trade have been determined, all parties should consult with the Instructor to finalize the trade. There are two opportunities to request a trade; Tuesday 9/24 and Tuesday 10/22, after which time the team make-up will be fixed for the rest of the Semester.

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;

Tuesday, 9/24	Chapters 1-3
Tuesday, 10/22	Chapters 4-6
Tuesday, 11/12	Chapters 7-9
Thursday, 12/12	Chapters 10-13 and Final Design Presentation

Each team will generate a Power Point presentation to be shown during an oral report of approximately 20 min in length. Accompanying the oral report presentation will be a written report in MS Word. Details on how the presentations will be graded and the expected content of the presentations will be given in class prior to each presentation. Generally, students can consult the Corke Text Appendices B and C for examples of what's expected in the written reports. Each member of the team will receive the same grade for a given presentation. Recommendation: Create the written report first, then the oral report Power Point presentation.

d) 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 evidence that a team member is not contributing to the team, based on the other team members input, then the grades of that team member will be adjusted. The evaluations will be conducted mid-term and towards the end of the semester.

6) Grades

The individual course grades for this course will be based on a 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	Max Possible Points
Oral Presentation 1	5
Written Report 1	10
Oral Presentation 2	5
Written Report 2	10
Oral Presentation 3	5
Written Report 3	10
Oral Presentation 4	10
Final Written Report	25
Weekly Homework	20 = 2 + (0.5 pts/problem)*(36 problems)
BONUS – Best Design in Class	5

Best Design in Class – There is a 5 point bonus for the team that completes the best design in class. The Instructor will decide which team has the best design. All team members contributing to the design for at least ½ of the semester will receive the bonus points.

7) Weekly Homework

Students can consult Excel File, "ME408 Class Calendar and Homework Assignments.xlsx" for specific homework problems and the due dates. The problems must be electronically time stamped either by e-mail or by uploading to Blackboard Learn by 6PM on the due date. Problems delivered late can receive 1/2 credit.

8) Blackboard Learn

Blackboard Learn will be used to share the Corke Excel worksheets and reference material, upload homework solutions and to perform peer evaluations.