

Tamkang University Academic Year 107, 1st Semester Course Syllabus

Course Title	AIRCRAFT PERFORMANCE ANALYSIS	Instructor	TYAN FENG
Course Class	TENXB3P DEPARTMENT OF AEROSPACE ENGINEERING, 3P	Details	♦ Selective ♦ One Semester ♦ 3 Credits
D e p a r t m e n t a l A i m o f E d u c a t i o n			
I . Apply scientific knowledge and engineering techniques to analyze and solve fundamental aerospace engineering problem. II. Through fundamental theory to design and implement experiments, and be able to analyze experimental data. III. Maintain the spirit of independent thinking, self-elevate, and continuous learning. IV. Uphold the responsible attitude of work ethics and team work. V . Will have access to information, using basic knowledge, diversification, and better ability to adapt to circumstances.			
D e p a r t m e n t a l c o r e c o m p e t e n c e s			
A. With basic aerospace engineering expertise. B. Able to solve basic engineering problems via fundamental theory. C. Capable of lifelong learning and research capacity for further studies. D. To work with a sense of mission and responsibility. E. Have team spirit and the ability to communicate with each other. F. With an international perspective, have the ability to connect with the world. G. Taking full advantage of information and utilization of computer-assisted problem solving skills.			
Course Introduction	The purpose of this course is to understand and predict how the airplane will actually perform in the air in order to achieve a desired performance or mission. ☐ How fast can the a/c go? ☐ How high can it go? ☐ How much (weight) can it carry? ☐ How far can it go without refueling? ☐ How steep (or how quickly) can the a/c climb?		

The Relevance among Teaching Objectives, Objective Levels and Departmental core competences

I.Objective Levels (select applicable ones) :

- | | | |
|-------------------------|--|--|
| (i) Cognitive Domain | : C1-Remembering, C2-Understanding, C3-Applying, C4-Analyzing, C5-Evaluating, C6-Creating | |
| (ii) Psychomotor Domain | : P1-Imitation, P2-Mechanism, P3-Independent Operation, P4-Linked Operation, P5-Automation, P6-Origination | |
| (iii) Affective Domain | : A1-Receiving, A2-Responding, A3-Valuing, A4-Organizing, A5-Characterizing, A6-Implementing | |

II.The Relevance among Teaching Objectives, Objective Levels and Departmental core competences :

- (i) Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objective. Each objective should correspond to the objective level(s) of ONLY ONE of the three domains.
- (ii) If more than one objective levels are applicable for each learning domain, select the highest one only. (For example, if the objective levels for Cognitive Domain include C3,C5,and C6, select C6 only and fill it in the boxes below. The same rule applies to Psychomotor Domain and Affective Domain.)
- (iii) Determine the Departmental core competences that correspond to each teaching objective. Each objective may correspond to one or more Departmental core competences at a time. (For example, if one objective corresponds to three Departmental core competences: A,AD, and BEF, list all of the three in the box.)

No.	Teaching Objectives	Relevance	
		Objective Levels	Departmental core competences
1	The general performance problem. Understand performance Characteristics, Absolute Performance Characteristics and Functional Performance Characteristics	C2	ABCDEFGG
2	Equations of Motion. Understand general information and setup the Energy Approach.	C4	ABCDEFGG
3	The basics. Setup fundamental performance equation. Understand stalling speed, maximum velocity, ceiling and gliding flight.	C4	ABCDEFGG
4	Climbing flight. Understand rate of climb angle, time to climb, shallow flight paths, load factor (n is not equal to 1), partial power and excess power considerations.	C4	ABCDEFGG
5	Range and Endurance. Use approximate, but most used methods, range integration method to determine range and endurance. Consider the effect of wind.	C4	ABCDEFGG
6	Nonsteady Flight in the Vertical Plane. Take off analysis, landing and accelerating flight.	C4	ABCDEFGG
7	Maneuvering flight. Turns in vertical plane, V n diagram, turning flight in horizontal plane, maximum sustained turning performance and the maneuvering diagram.	C4	ABCDEFGG

Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment

1	The general performance problem. Understand performance Characteristics, Absolute Performance Characteristics and Functional Performance Characteristics	Lecture, Discussion	Written test
2	Equations of Motion. Understand general information and setup the Energy Approach.	Lecture, Discussion	Written test
3	The basics. Setup fundamental performance equation. Understand stalling speed, maximum velocity, ceiling and gliding flight.	Lecture, Discussion	Written test
4	Climbing flight. Understand rate of climb angle, time to climb, shallow flight paths, load factor (n is not equal to 1), partial power and excess power considerations.	Lecture, Discussion	Written test
5	Range and Endurance. Use approximate, but most used methods, range integration method to determine range and endurance. Consider the effect of wind.	Lecture, Discussion	Written test
6	Nonsteady Flight in the Vertical Plane. Take off analysis, landing and accelerating flight.	Lecture, Discussion	Written test
7	Maneuvering flight. Turns in vertical plane, V n diagram, turning flight in horizontal plane, maximum sustained turning performance and the maneuvering diagram.	Lecture, Discussion	Written test

This course has been designed to cultivate the following essential qualities in TKU students			
Essential Qualities of TKU Students		Description	
◆ A global perspective		Helping students develop a broader perspective from which to understand international affairs and global development.	
◆ Information literacy		Becoming adept at using information technology and learning the proper way to process information.	
◆ A vision for the future		Understanding self-growth, social change, and technological development so as to gain the skills necessary to bring about one's future vision.	
◇ Moral integrity		Learning how to interact with others, practicing empathy and caring for others, and constructing moral principles with which to solve ethical problems.	
◆ Independent thinking		Encouraging students to keenly observe and seek out the source of their problems, and to think logically and critically.	
◇ A cheerful attitude and healthy lifestyle		Raising an awareness of the fine balance between one's body and soul and the environment; helping students live a meaningful life.	
◆ A spirit of teamwork and dedication		Improving one's ability to communicate and cooperate so as to integrate resources, collaborate with others, and solve problems.	
◇ A sense of aesthetic appreciation		Equipping students with the ability to sense and appreciate aesthetic beauty, to express themselves clearly, and to enjoy the creative process.	
Course Schedule			
Week	Date	Subject/Topics	Note
1	107/09/10 ~ 107/09/16	The general performance problem	
2	107/09/17 ~ 107/09/23	Equations of motion	
3	107/09/24 ~ 107/09/30	The Basics	
4	107/10/01 ~ 107/10/07	The Basics	
5	107/10/08 ~ 107/10/14	Climbing Flight	
6	107/10/15 ~ 107/10/21	Climbing Flight	
7	107/10/22 ~ 107/10/28	Range and Endurance	
8	107/10/29 ~ 107/11/04	Range and Endurance	
9	107/11/05 ~ 107/11/11	Range and Endurance	
10	107/11/12 ~ 107/11/18	Midterm Exam Week	
11	107/11/19 ~ 107/11/25	Nonsteady Flight in Vertical Plane	
12	107/11/26 ~ 107/12/02	Nonsteady Flight in Vertical Plane	

13	107/12/03 ~ 107/12/09	Nonsteady Flight in Vertical Plane	
14	107/12/10 ~ 107/12/16	Maneuvering Flight	
15	107/12/17 ~ 107/12/23	Maneuvering Flight	
16	107/12/24 ~ 107/12/30	Maneuvering Flight	
17	107/12/31 ~ 108/01/06	Additional Topics (if time allows)	
18	108/01/07 ~ 108/01/13	Final Exam Week	
Requirement	Work hard		
Teaching Facility	Computer, Projector, Other (MATLAB, ADAMS)		
Textbook(s)	Maido Saarlal, "Aircraft Performance," John Wiley & Sons, 2007		
Reference(s)	A.K. Kundu, M.A. Price and D. Roordan, "Theory and Practice of Aircraft Performance," Wiley, 2016 J.D. Anderson, "Aircraft Performance and Design," WCB McGraw-Hill, 1999. M.H. Sadraey, "Aircraft Performance, An Engineering Approach," CRC Press, 2017		
Number of Assignment(s)	8 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : % ◆ Mark of Usual : 15.0 % ◆ Midterm Exam : 35.0 % ◆ Final Exam : 50.0 % ◆ Other () : %		
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . ※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.		