Tamkang University Academic Year 101, 2nd Semester
Course Syllabus

<table>
<tr><td>Course Title</td><td colspan="2">Engineering mathematics (II)</td><td>Instructor</td><td colspan="2">Dr. Tyan, Feng</td></tr>
<tr><td colspan="2">Department/Year/Class</td><td colspan="4">Course Details</td></tr>
<tr><td colspan="2">Aerospace engineering/
2013Spring/
Class 2A</td><td>■Required
□Selective</td><td colspan="2">□0（One Semester）
□1（1st Semester）
■2（2nd Semester）
□3（3rd Semester）</td><td>Credits</td><td>3</td></tr>
<tr><td colspan="3">Aim of Education</td><td colspan="3">Core Competences</td></tr>
<tr><td colspan="3">1. Be capable of applying scientific knowledge and engineering technique to analyze and solve the fundamental problems of the aeronautics and aerospace engineering.
2. Be able to implement fundamental principles to design and conduct experiments, as well as to analyze and interpret data.
3. To possess the spirit of independent thinking, self-elevating and continuous learning.
4. To have the work ethic and a cooperative attitude and responsibility of team work.
5. To equip with the ability of mastering information, implementing basic knowledge, generating diversified development and good environmental adaptability.</td><td colspan="3">A. To equip with basic aerospace engineering knowledge and expertise.
B. Be able to implement the fundamental principles to solve basic engineering problems
C. To possess the ability of performing life-long learning and research.
D. To carry a sense of mission and responsibility in work.
E. To have the spirit of teamwork and the ability to communicate with each other.
F. To have an international perspective, and the ability to cope with the progress of the world.
G. Be able to master information, and capable of utilizing computer to assist solving problems.</td></tr>
<tr><td>Course Introduction (50 to 100 words)</td><td colspan="5">This course will give an introduction to linear algebra which is useful in various fields. Starting with matrix arithmetic, several topics will be covered in the lectures, including determinants, LU factorization, introduction of vector space, linear transformations, bases and dimensions, inner and outer product, similarity and matrix diagonalization, and so on.
Computer programming will be applied to this course so that students know how to make use of the computer technology as well as linear algebra to solve for engineering problems. Homework, midterm examination and final examination will be used to evaluate student’s performance mainly.</td></tr>
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The Relevance among Teaching Objectives, Objective Levels and 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 Charaterizing、A6 Implementing

II. The Relevance among Teaching Objectives, Objective Levels and Core Competences：

(I)Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objectives. 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 core competences that correspond to each teaching objective. Each objective may correspond to one or more core competences at a time. (For example, if one objective corresponds to three core competences: A, AD, and BEF, list all of the three in the box.)

Teaching objectives	**Relevance**	
	Objective Levels	**Core Competences**
1. Be familiar with the basic arithmetic of matrix operation.	C4,P2,A2	AB
2. Understand the basic arithmetic of linear system theory.	C4,P2,A2	ABCD
3. Understand how to use computer to solve linear problems in engineering.	C4,P3,A4	ABEG
4. Develop the ability of analyzing engineering problems with mathematics.	C6,P3,A4	ACEF
5.		
6		

Teaching Objectives, Teaching Methods and Assessment

Teaching Objectives	Teaching Methods	Assessment
1. Be familiar with the basic arithmetic of matrix operation.	lecture and Q&A	homework, midterm exam, final exam
2. Understand the basic arithmetic of linear system theory.	lecture and Q&A	homework, midterm exam, final exam
3. Understand how to use computer to solve linear problems in engineering.	lecture and Q&A	homework, midterm exam, final exam
4. Develop the ability of analyzing engineering problems with mathematics.	lecture and Q&A	homework, midterm exam, final exam
5		
6		
7.		

This course has been designed to cultivate the following essential qualities of TKU students.	
Essential Qualities of TKU Students	Description
■global perspectives ■a vision for the future ■information literacy ■ethical and moral principles ■independent thinking □an awareness of healthy living ■effective teamwork	1. Introduce those fine teaching materials downloaded from the web sites of the top universities of the world (e.g. Cornell, Stanford, National Singapore University, Hong Kong University, etc.) to the class. 2. Play course related videos downloaded from MIT open courses (e.g. MIT course number 18.06) and some other resources. 3. Collect problem sets from all the top universities through internet, and create test bank. 4. Adopt the latest and best textbook.
□an appreciation of the arts	1. Introduce the application of linear algebra to practical aerospace related engineering problems that they may encounter in the future, e.g. digital image compression, flight vehicle structural analysis, computational fluid dynamics, and modern control theory, etc.
	1. Use software “MATLAB” to help student to understand the vector and matrix operations. 2. Use Latex (beamer), Acrobat to create slides (pdf files) for the course.
	1. Enter the class on time or a litter earlier. 2. Slippers are not allowed in class. 3. No food and drink in class. 4. Students are required to sign the HONOR CODE in exams.
	1. Invite students to explain their rationales on solving problems. 2. Always ask students “why?”.
	N/A
	1. Invite students to discuss and solve problems together as a team in class.
	N/A

Course Schedule			
Week	Date	Subject/Topics	Note
1	2/18	Vector Space	
2	2/25	Vector Space	
3	3/4	Matrices and Linear Equations	
4	3/11	Matrices and Linear Equations,	
5	3/18	The Eigenvalue Problem	
6	3/25	The Eigenvalue Problem	
7	4/1	Differential Calculus of Functions of Several Variables	
8	4/8	Differential Calculus of Functions of Several Variables	
9	4/15	Vectors in 3D-Space	
10	4/22	Midterm Exam Week	
11	4/29	Vectors in 3D-Space	
12	5/6	Curves, Surfaces and Volumes	
13	5/13	Curves, Surfaces and Volumes	
14	5/20	Scalar and Vector Field Theory	
15	5/27	Scalar and Vector Field Theory	
16	6/3	Fourier Series, Fourier Integral and Fourier Transform	
17	6/10	Fourier Series, Fourier Integral and Fourier Transform	
18	6/17	Final Exam Week	

Requirement	1. Make yourself be acquainted with MATLAB. 2. In the midterm and final exam, you are allowed to bring one cheat sheet of the A4 size. In this piece of paper you can write down anything that may help you. 3. Work diligently.
Teaching Facility	■Computer ■Overhead Projector ■Other（Software: MATLAB）
Textbook(s)	1. Gilbert Strang, “Introduction to Linear Algebra,” 4th ed, Wellesley Cambridge Press 2. Michael D. Greenberg, “Advanced Engineering Mathematics,” 2nd ed, Prentice Hall
Suggested Readings	1. William G. McCallum, “Calculus: Multivariable," 4th ed., John-Wiley & Sons, 2004. 2. J. Gilbert and L. Gilbert, “Linear Algebra and Matrix Theory,” 2nd ed., Thomson, 2004 3. Murray Spiegel, “Schaum's Outline of Advanced Mathematics for Engineers and Scientists," McGraw Hill, 26th printing, 1999. 4. C. R. Wylie and L. C. Barrett, “Advanced Engineering Mathematics," 6th ed., McGraw-Hill, 1995.
Number of Assignment(s)	8-10 homeworks. (NO late homeworks !!)
Grading Policy	■homework：15％ ■midterm exam：35 ％ ■final exam：50 ％

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/index.asp. **※Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**

Form No.：ATRX-Q03-001-FM201-05