# Tamkang University Academic Year 105, 2nd Semester Course Syllabus

| Course Title | ENGINEERING MATHEMATICS | Instructor | TYAN FENG |
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| Course Class | TENXB2A<br>DEPARTMENT OF AEROSPACE ENGINEERING, 2A | Details | ◆ Required<br>◆ 2nd Semester<br>◆ 3 Credits |

### Departmental Aim of Education

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.

### Departmental core competences

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 | This course will give an introduction to linear algebra that is useful in various fields. Starting with matrix arithmetic, several topics will be covered in the lectures, including determinants, introduction of vector space, bases and dimensions, inner and outer product, similarity and diagonalization, and so on. Computer programming will be applied to this course so that students knows 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 for the evaluation. |
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# 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-Charaterizing,    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 | Have students understand the meaning and the techniques of differential equations | C3 | ABCDEFG |
| 2 | understand how to solve the differential equations by using power series and Laplace transformation | C3 | ABCDEFG |
| 3 | understand how to use computer to solve linear problems in engineering | P3 | ABCDEFG |
| 4 | develop the ability of analyzing engineering problems with mathematics | P3 | ABCDEFG |
| 5 | Have students understand the meaning and the techniques of differential equations. | C3 | ABCDEFG |

## Teaching Objectives, Teaching Methods and Assessment

| No. | Teaching Objectives | Teaching Methods | Assessment |
| --- | --- | --- | --- |
| 1 | Have students understand the meaning and the techniques of differential equations | Lecture, Discussion | Written test, homework |
| 2 | understand how to solve the differential equations by using power series and Laplace transformation | Lecture, Discussion | Written test, homework |
| 3 | understand how to use computer to solve linear problems in engineering | Lecture, Discussion | Written test, homework |

| 4 | develop the ability of analyzing engineering problems with mathematics | Lecture, Discussion | Written test, homework |
|---|---|---|---|
| 5 | Have students understand the meaning and the techniques of differential equations. | Lecture | 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 | 106/02/13 ~ 106/02/19 | vector space | |
| 2 | 106/02/20 ~ 106/02/26 | vector space | |
| 3 | 106/02/27 ~ 106/03/05 | Matrices and Linear Equations | |
| 4 | 106/03/06 ~ 106/03/12 | Matrices and Linear Equations | |
| 5 | 106/03/13 ~ 106/03/19 | The Eigenvalue Problem | |
| 6 | 106/03/20 ~ 106/03/26 | The Eigenvalue Problem | |
| 7 | 106/03/27 ~ 106/04/02 | Differential Calculus of Functions of Several Variables | |
| 8 | 106/04/03 ~ 106/04/09 | Differential Calculus of Functions of Several Variables | |

| 9 | 106/04/10 ~ 106/04/16 | Vectors in 3D-Space | |
|---|---|---|---|
| 10 | 106/04/17 ~ 106/04/23 | Midterm Exam Week | |
| 11 | 106/04/24 ~ 106/04/30 | Vectors in 3D-Space | |
| 12 | 106/05/01 ~ 106/05/07 | Curves, Surfaces and Volumes | |
| 13 | 106/05/08 ~ 106/05/14 | Curves, Surfaces and Volumes | |
| 14 | 106/05/15 ~ 106/05/21 | Scalar and Vector Field Theory | |
| 15 | 106/05/22 ~ 106/05/28 | Scalar and Vector Field Theory | |
| 16 | 106/05/29 ~ 106/06/04 | Fourier Series, Fourier Integral and Fourier Transform | |
| 17 | 106/06/05 ~ 106/06/11 | Fourier Series, Fourier Integral and Fourier Transform | |
| 18 | 106/06/12 ~ 106/06/18 | Final Exam Week | |

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| Requirement | Work hard. |
| Teaching Facility | Computer, Projector |
| Textbook(s) | T.B.D. |
| Reference(s) | C.R. Wylie, &quot;Advanced Engineering Mathematics,&quot;; 6thed, 1995<br>Gareth Williams, "Linear Algebra with Applications,"; 8th ed, Johns &amp;amp; Bartlett Learning, 2014<br>Gilbert Strang, "Introduction to Linear Algebra," 4th ed., Wellesley Cambridge Press, 2009 |
| Number of Assignment(s) | **8** (Filled in by assignment instructor only) |
| Grading Policy | ◆ Attendance： % ◆ Mark of Usual： % ◆ Midterm Exam： 35.0 %<br>◆ Final Exam： 50.0 %<br>◆ Other〈Homework〉：15.0 % |
| 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 .<br>**※Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.** |