

## Tamkang University Academic Year 113, 2nd Semester Course Syllabus

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|--|---|------------|---|
| Course Title   | ENGINEERING MATHEMATICS   | Instructor | TYAN FENG   |
| Course Class   | TENXB2B<br>DEPARTMENT OF AEROSPACE ENGINEERING, 2B                      | Details    | <ul style="list-style-type: none"> <li>◆ General Course</li> <li>◆ Required</li> <li>◆ 2nd Semester</li> <li>◆ 3 Credits</li> </ul> |
| Relevance to SDGs  | SDG4 Quality education<br>SDG9 Industry, Innovation, and Infrastructure |            |   |
| Departmental Aim of Education  |   |            |   |
| <ul style="list-style-type: none"> <li>I. Apply scientific knowledge and engineering techniques to analyze and solve fundamental aerospace engineering problem.</li> <li>II. Through fundamental theory to design and implement experiments, and be able to analyze experimental data.</li> <li>III. Maintain the spirit of independent thinking, self-elevate, and continuous learning.</li> <li>IV. Uphold the responsible attitude of work ethics and team work.</li> <li>V. Will have access to information, using basic knowledge, diversification, and better ability to adapt to circumstances.</li> </ul>  |   |            |   |
| Subject Departmental core competences  |   |            |   |
| <ul style="list-style-type: none"> <li>A. With basic aerospace engineering expertise.(ratio:30.00)</li> <li>B. Able to solve basic engineering problems via fundamental theory.(ratio:30.00)</li> <li>C. Capable of lifelong learning and research capacity for further studies.(ratio:20.00)</li> <li>D. To work with a sense of mission and responsibility.(ratio:5.00)</li> <li>E. Have team spirit and the ability to communicate with each other.(ratio:5.00)</li> <li>F. With an international perspective, have the ability to connect with the world.(ratio:5.00)</li> <li>G. Taking full advantage of information and utilization of computer-assisted problem solving skills.(ratio:5.00)</li> </ul> |   |            |   |
| Subject Schoolwide essential virtues   |   |            |   |
| <ul style="list-style-type: none"> <li>1. A global perspective. (ratio:10.00)</li> <li>2. Information literacy. (ratio:20.00)</li> <li>3. A vision for the future. (ratio:20.00)</li> <li>4. Moral integrity. (ratio:5.00)</li> </ul>  |   |            |   |

- 5. Independent thinking. (ratio:30.00)
- 6. A cheerful attitude and healthy lifestyle. (ratio:5.00)
- 7. A spirit of teamwork and dedication. (ratio:5.00)
- 8. A sense of aesthetic appreciation. (ratio:5.00)

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 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 for the evaluation.

**The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.**

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

- I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.
- II. Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.
- III. Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

| No. | Teaching Objectives   | objective methods |
|-----|---|-------------------|
| 1   | Have students understand the meaning and the techniques of differential equations                   | Cognitive         |
| 2   | understand how to solve the differential equations by using power series and Laplace transformation | Cognitive         |
| 3   | understand how to use computer to solve linear problems in engineering                              | Cognitive         |
| 4   | develop the ability of analyzing engineering problems with mathematics                              | Cognitive         |
| 5   | Have students understand the meaning and the techniques of differential equations.                  | Cognitive         |

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

| No. | Core Competences | Essential Virtues | Teaching Methods | Assessment |
|-----|------------------|-------------------|------------------|------------|
|     |                  |                   |                  |            |

|   |          |          |                                |   |
|---|----------|----------|--------------------------------|---|
| 1 | ABCDEFGF | 12345678 | Lecture, Discussion, Practicum | Testing, Study Assignments, Discussion(including classroom and online), Practicum |
| 2 | ABCDEFGF | 12345678 | Lecture, Discussion, Practicum | Testing, Study Assignments, Discussion(including classroom and online), Practicum |
| 3 | ABCDEFGF | 12345678 | Lecture, Discussion, Practicum | Testing, Study Assignments, Discussion(including classroom and online), Practicum |
| 4 | ABCDEFGF | 12345678 | Lecture, Discussion, Practicum | Testing, Study Assignments, Discussion(including classroom and online), Practicum |
| 5 | ABCDEFGF | 12345678 | Lecture, Discussion            | Testing, Study Assignments, Discussion(including classroom and online), Practicum |

#### Course Schedule

| Week | Date                     | Course Contents   | Note |
|------|--------------------------|---|------|
| 1    | 114/02/17 ~<br>114/02/23 | vector space  |      |
| 2    | 114/02/24 ~<br>114/03/02 | vector space  |      |
| 3    | 114/03/03 ~<br>114/03/09 | Matrices and Linear Equations   |      |
| 4    | 114/03/10 ~<br>114/03/16 | Matrices and Linear Equations   |      |
| 5    | 114/03/17 ~<br>114/03/23 | The Eigenvalue Problem  |      |
| 6    | 114/03/24 ~<br>114/03/30 | The Eigenvalue Problem  |      |
| 7    | 114/03/31 ~<br>114/04/06 | Differential Calculus of Functions of Several Variables                       |      |
| 8    | 114/04/07 ~<br>114/04/13 | Differential Calculus of Functions of Several Variables                       |      |
| 9    | 114/04/14 ~<br>114/04/20 | Midterm Exam/Midterm Assessment Week (teachers can adjust the week as needed) |      |
| 10   | 114/04/21 ~<br>114/04/27 | Vectors in 3D-Space   |      |
| 11   | 114/04/28 ~<br>114/05/04 | Vectors in 3D-Space   |      |
| 12   | 114/05/05 ~<br>114/05/11 | Curves, Surfaces and Volumes  |      |

|                                  |   |  |  |
|----------------------------------|---|--|--|
| 13                               | 114/05/12 ~<br>114/05/18  | Curves, Surfaces and Volumes   |  |
| 14                               | 114/05/19 ~<br>114/05/25  | Scalar and Vector Field Theory   |  |
| 15                               | 114/05/26 ~<br>114/06/01  | Scalar and Vector Field Theory   |  |
| 16                               | 114/06/02 ~<br>114/06/08  | Fourier Series, Fourier Integral and Fourier Transform   |  |
| 17                               | 114/06/09 ~<br>114/06/15  | Final Exam/Final Assessment Week (teachers can adjust the week as needed)  |  |
| 18                               | 114/06/16 ~<br>114/06/22  | Flexible Teaching Week: Generally, no in-person classes; teachers may arrange teaching activities or final assessments, among other options. |  |
| Key capabilities                 | self-directed learning<br>Problem solving   |  |  |
| Interdisciplinary                | STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)  |  |  |
| Distinctive teaching             | Learning technologies (such as AR/VR,etc.) incorporated to physical courses   |  |  |
| Course Content                   | Logical Thinking<br>AI application<br>Sustainability issue  |  |  |
| Requirement                      | Work hard.  |  |  |
| Textbooks and Teaching Materials | Self-made teaching materials:Textbooks, Presentations, Handouts<br>Using teaching materials from other writers:Textbooks, Presentations, Handouts, Videos   |  |  |
| References                       | C.R. Wylie, &quot;Advanced Engineering Mathematics,&quot; 6th ed, 1995<br>Gareth Williams, "Linear Algebra with Applications," 8th ed, Johns & Bartlett Learning, 2014<br>Gilbert Strang, &quot;Introduction to Linear Algebra,&quot; 4th ed.,<br>Wellesley Cambridge Press, 2009 |  |  |
| Grading Policy                   | ◆ Attendance :            %    ◆ Mark of Usual :            %    ◆ Midterm Exam : 35.0 %<br>◆ Final Exam :    50.0 %<br>◆ Other <Homework> : 15.0 %   |  |  |
|                                  |   |  |  |

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| Note | <p>This syllabus may be uploaded at the website of Course Syllabus Management System at <a href="http://info.ais.tku.edu.tw/csp">http://info.ais.tku.edu.tw/csp</a> or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at <a href="http://www.acad.tku.edu.tw/CS/main.php">http://www.acad.tku.edu.tw/CS/main.php</a>.</p> <p>※ <b>Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</b></p> |
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