# Tamkang University Academic Year 112, 2nd Semester Course Syllabus

| Course Title | SIGNALS AND SYSTEMS | Instructor | TYAN FENG |
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| Course Class | TENXB2P<br>DEPARTMENT OF AEROSPACE ENGINEERING, 2P | Details | ◆ General Course<br>◆ Selective<br>◆ One Semester |
| Relevance to SDGs | SDG4 Quality education<br>SDG10 Reducing inequalities | | |

## 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.

## Subject Departmental core competences

A. With basic aerospace engineering expertise.(ratio:20.00)

B. Able to solve basic engineering problems via fundamental theory.(ratio:30.00)

C. Capable of lifelong learning and research capacity for further studies.(ratio:20.00)

D. To work with a sense of mission and responsibility.(ratio:10.00)

E. Have team spirit and the ability to communicate with each other.(ratio:10.00)

F. With an international perspective, have the ability to connect with the world.(ratio:5.00)

G. Taking full advantage of information and utilization of computer-assisted problem solving skills.(ratio:5.00)

## Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)

2. Information literacy. (ratio:30.00)

3. A vision for the future. (ratio:10.00)

4. Moral integrity. (ratio:5.00)

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)

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| Course Introduction | The course presents and integrates the basic concepts for both continuous-time and discrete-time signals and systems. Signal and system representations are developed for both time and frequency domains. These representations are related through the Fourier transform and its generalizations, which are explored in detail. Filtering and filter design, modulation, and sampling for both analog and digital systems, as well as an exposition and demonstration of the basic concepts of feedback systems for both analog and digital systems, are discussed and illustrated. |

**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 | 1. Introduce basic concepts of signals, systems, linear time-invariant systems. | Cognitive |
| 2 | 2. Understand Laplace transform, related applications and frequency response. | Cognitive |
| 3 | 3. Introduce digital filters. | Cognitive |
| 4 | 4. Understand continuous time and discrete time Fourier transform. | Cognitive |
| 5 | 5. Understand discrete time sampling and spectral analysis. | Cognitive |

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

| No. | Core Competences | Essential Virtues | Teaching Methods | Assessment |
|---|---|---|---|---|
| 1 | ABCDEFG | 12345678 | Lecture | Testing, Study Assignments |
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| 2 | ABCDEFG | 12345678 | Lecture | Testing, Study Assignments |
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| 3 | ABCDEFG | 1234567 | Lecture | Testing, Study Assignments |
| 4 | ABCDEFG | 1234567 | Lecture | Testing, Study Assignments |
| 5 | ABCDEFG | 12345678 | Lecture | Testing, Study Assignments |

## Course Schedule

| Week | Date | Course Contents | Note |
|------|------|-----------------|------|
| 1 | 113/02/19 ~ 113/02/25 | Introduction to signals | |
| 2 | 113/02/26 ~ 113/03/03 | Introduction to systems, Linear, time-invariant systems | |
| 3 | 113/03/04 ~ 113/03/10 | Laplace transform | |
| 4 | 113/03/11 ~ 113/03/17 | Sinusoidal steady state, frequency response | |
| 5 | 113/03/18 ~ 113/03/24 | Signal Processing -- CT filtering | |
| 6 | 113/03/25 ~ 113/03/31 | Stability of feedback systems | |
| 7 | 113/04/01 ~ 113/04/07 | Z transform | |
| 8 | 113/04/08 ~ 113/04/14 | DT filters | |
| 9 | 113/04/15 ~ 113/04/21 | Midterm Exam Week | |
| 10 | 113/04/22 ~ 113/04/28 | CT and DT convolution | |
| 11 | 113/04/29 ~ 113/05/05 | Impulse responses, image processing | |
| 12 | 113/05/06 ~ 113/05/12 | CT Fourier transform, CT Fourier series | |
| 13 | 113/05/13 ~ 113/05/19 | Sampling CT signals, Reconstruction of sampled signlas | |
| 14 | 113/05/20 ~ 113/05/26 | DT Fourier transform, DT Fourier series | |
| 15 | 113/05/27 ~ 113/06/02 | Modulation, AM broadcast radio | |
| 16 | 113/06/03 ~ 113/06/09 | Speech production and spectral analysis | |
| 17 | 113/06/10 ~ 113/06/16 | Digital autio | |
| 18 | 113/06/17 ~ 113/06/23 | Final Exam Week | |

| Requirement | 1. Make yourself be familiar with MATLAB.<br>2. Work hard.<br>3. No late homework. |
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| Textbooks and Teaching Materials | Self-made teaching materials:Presentations, Handouts<br>Using teaching materials from other writers:Textbooks, Presentations, Luis F. Chaparro |
| References | 1. Luis F. Chaparro and Aydin Akan, " Signals and Systems Using MATLAB 3rd ed" , Academic Press, 2019<br>2. Oktay Alkin, "Signals and Systems, A MATLAB Integrated Approach," CRC Press, 2014 |
| 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.** |