Syllabus of <<Signal and systems>>

Number of the course：102180 Number of credits：4 Total hours：72

Instructor：Junhe Zhou Examiner：Xuefeng Yin

1. Characteristics and Objective

The aim of this course is to introduce the basic concept of the linear system and the analysis method, and to serve as the fundamentals of the later course, such as communication principles, the control theory and so on.

2. Basic Requirement

The attendees should understand the concept of the linear time invariant systems, including the continuous and the discrete linear time invariant systems. They should also have the ability to analyze the systems with the temporal domain method, i.e. the traditional method to solve the differential and difference equations. Meantime, the transformation methods to analyze these systems should also be fully grasped.

3. Basic Content

1. The introduction of the signal and systems: representative system and signals, the concept of Dirac function.
2. The Continuous linear time invariant systems: the concept of LTI system, the ordinary differential equation, the traditional method to solve them.
3. The concept of impulse response and convolution.
4. The Laplace transform: the concept and property, the method to get the Laplace transform and the inverse Laplace transform, using Laplace transform to solve ordinary differential equations, the concept of system function.
5. The Fourier transform: Concept and property, relationship between the Laplace transform and Fourier transform, the frequency response function and its properties, the Fourier series and how to obtain the coefficient of the series, analysis of the communication systems using Fourier transform, modulation and demodulation, sampling theorem.
6. Discrete linear invariant system: the concept and properties, difference equations and the traditional method to solve them, impulse response and convolution in the discrete form.
7. Z transform: Concept and properties, using Z transform to solve difference equations.
8. Discrete Fourier transform: the discrete time Fourier transform and its relationship with Z transform, discrete Fourier transform and fast Fourier transform.

4. Experiment or Computer Operation

This course will use matlab as the main tool for experiments and exercise. The experiments and excise will be carried out in class and as the homework.

5. Ability and Personality Cultivation

To train the student with the capability of modeling and analyzing the systems with the concept and methods taught in class. To train the student with the capability of the designing and analyzing such system using the computer tools. Let the student contact with the international professors to grasp the latest technology advance.

6. Preparatory Course Requirement

Advanced calculus, Circuit theory

7. Assessment and Examination

Final examination 70%, Matlab programming 20%, homework/class attendance 10%

8. Hours Distribution

|  |  |  |  |
| --- | --- | --- | --- |
| Number | Content | Arrangement of classes  | Sub-total  |
| Theory (hours)  | Experiments (Hours)  | Exercising (Hours)  | Practice on Computers (Hours)  |  |
| 1 | The introduction of the signal and systems | 5 | 0 | 1 | 0 | 6 |
| 2 | The Continuous linear time invariant systems | 8 | 2 | 1 | 1 | 12 |
| 3 | The concept of impulse response and convolution | 5 | 0 | 1 | 1 | 7 |
| 4 | The Laplace transform | 8 | 0 | 0 | 1 | 9 |
| 5 | The Fourier transform | 8 | 0 | 0 | 2 | 10 |
| 6 | Discrete linear invariant system | 6 | 2 | 1 | 2 | 11 |
| 7 | Z transform | 8 | 0 | 0 | 0 | 8 |
| 8 | Discrete Fourier transform | 8 | 0 | 0 | 1 | 9 |
| Total | 56 | 4 | 4 | 8 | 72 |

9. Textbooks and Main Reference Books

A. V. Oppenheim, Signal and systems, Prentice Hall, 3rd Ed. 2002.