## Course Content

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<tr>
<th>Course Title (English)</th>
<th>Fourier Transform and Fourier Optics</th>
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<tbody>
<tr>
<td>Course Title (Chinese)</td>
<td>傅氏轉換與傅氏光學</td>
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<td>Credit</td>
<td>3</td>
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<tr>
<td>Instructor</td>
<td>Prof. Yu-Hsiang Cheng 鄭宇翔 教授</td>
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### Outline

**I. Fourier transform and related topics:**
1. Definition, basic properties, and theorems of Fourier transforms
2. Measure of width, the uncertainty relation, the central limit theorem
3. Linear filters and transfer functions, sampling theory, DFT and FFT
4. Hilbert transform and other transforms
5. Two-dimensional Fourier transforms and two-dimensional systems
6. Reconstruction from projections, Abel transform and Radon transform

**II. Fourier optics:**
1. Scalar diffraction theory, angular spectrum of plane waves
2. Fresnel and Fraunhofer diffraction
3. Fourier transforming and imaging properties of lenses
4. Frequency analysis of optical imaging systems
5. Spatial filtering and optical information processing
6. Introduction to holography (or wavefront-reconstruction imaging)

### Goal

In this course, we will investigate the properties of Fourier transform and their physical meaning. Students will learn how to treat problems in the frequency domain and apply the 2D Fourier transform to understand wave propagation, diffraction, imaging, image processing, etc.
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- English
- Chinese