

# Image Science

Syllabus Number

4C309

Special Subjects

Elective 2 credit

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## 1. Course Description

Students will learn the followings in this course,

- (1) Physical and mathematical principles for image treatise (geometrical optics, theory of image formation)
- (2) Basic computational implementations of above theories.

## 2. Course Objectives

In this course we shall learn the basics of image science which will further lead us to deeper understanding and full utilization of modern advanced imaging technologies.

## 3. Grading Policy

You will be graded by your quiz results and submitted reports (total 50%) and final examination marks (50%). Quiz results and reports are returned within 2 weeks after submission.

## 4. Textbook and Reference

Textbook

Text and supplementary materials are provided online on LMS.

## 5. Requirements(Assignments)

Read the corresponding part of the text carefully (~1 hour).

It is recommended to verify the mathematical expressions and programs in the text and supplied materials in the review process (~2hours).

## 6. Note

None.

## 7. Schedule

- [1] Introduction: how 2D images are formed physically
- [2] Physics of light 1 (Maxwell equations)
- [3] Physics of light 2 (Wave equation and polarization)
- [4] Physics of light 3 (Theoretical models in optics)
- [5] Geometrical optics 1 (Concept of rays and their properties)
- [6] Geometrical optics 2 (Refraction, reflection, absorption)
- [7] Linear algebra 1 (Simultaneous equations and matrices)
- [8] Linear algebra 2 (Simultaneous equations and matrices)
- [9] Matrix operation 1 (Octave basics)
- [10] Matrix operation 2 (Matrix operations in Octave)
- [11] Theory of image formation 1 (Ray transfer matrix, free space propagation)
- [12] Theory of image formation 2 (Functions of lenses)
- [13] Theory of image formation 3 (Mechanics of image formation)
- [14] Theory of image formation 4 (binocular parallax and stereo vision)
- [15] Summary and final examination