

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