

Electromagnetic Wave Engineering

Syllabus Number

3E326

Special Subjects

Elective 2 credit

MURO KOICHI

1. Course Description

The aim of the class is to be able to understand the characteristics of antennas, and to be able to propagate radio waves and calculate characteristics.

Now that mobile information terminals are essential, it will be learn about the transmission, reception and propagation of electromagnetic waves.

Specifically, we will acquire necessary skills and knowledge on DP4E.

2. Course Objectives

1. Students be able to calculate the basic characteristics of radio waves.

2. Students can explain the physical meaning of antennas, which are the key to transmitting and receiving radio waves.

3. Students be able to outline radio wave propagation and calculate transmission losses.

3. Grading Policy

Evaluation is based on 70% test, 20% report, and 10% presentation. The presentation will be a report of the matters investigated in the group work.

An example of the answer for Test 1 will be explained in the 9th class, and an example of the answer for Test 2 will be posted on the LMS. It will be give feedback on test answers that are important to the evaluation.

4. Textbook and Reference

Textbook

The teaching materials will be posted on the LMS by the teacher. The materials will be posted on the LMS at least 2 days before class.

Reference

Kazuaki Yoshimura (ISBN-13:978-4274222566) in Japanese. Ohmasha, Ltd.

5. Requirements(Assignments)

The materials used in the class will be posted on the LMS at least two days in advance, so please prepare the teaching materials thoroughly before attending the class. (about 1 hour)

Please make an out-of-lesson report by reviewing the lesson and investigating related matters. (about 2 hours) It will be student submit an out-of-lesson report.

6. Note

Lessons are mainly lecture-style, but we ask you to create an out-of-lesson report that investigates related items.

Have them investigate and present related items in group work.

Student need to take both tests 1 and 2. Absences without contact will not be credited.

Since the lesson content has changed recently, it may be reviewed depending on the situation.

7. Schedule

- [1] Guidance, wavelength and frequency of electromagnetic waves
- [2] Antenna directivity: transmission and reception strength, linear antenna.
- [3] Antenna gain: definition formula, relationship between directivity and gain
- [4] Linear antenna: Antenna type, linear antenna, Yagi-Uda antenna
- [5] Aperture antenna: horn antenna, parabolic antenna
- [6] Feedback on various antennas. Group work survey presentation.
- [7] Test 1 (lesson from 1st to 6th), Submission of out-of-lesson reports, Summary.
- [8] Radio wave classification, radio wave propagation classification, communication failure. Explanation of test 1.
- [9] Electric field strength and fundamental propagation loss in free space: Power notation, space-ground transmission loss.
- [10] Radio wave propagation on a flat ground: electric field strength, interference
- [11] Refraction of radio waves and visible distance of radio waves: refractive index, visible distance
- [12] Radio wave propagation in the non-uniform atmosphere: refraction of radio waves, radio duct
- [13] Diffraction of radio waves: diffraction, fading
- [14] Feedback on radio wave propagation. Group work survey presentation.
- [15] Test 2 (lesson from 8th to 14th), Submission of out-of-lesson reports, Summary.