科目ナンバリング	U-LAS12 10006 LE57						
授業科目名 <英訳>	Fundamental Physics B-E2 Fundamental Physics B-E2			担当者所属 職名・氏名	工学研究科　講師　AMAR, Julien Samuel		
群	自然科学科目群		分野(分類)	物理学(基礎)		使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・後期	曜時限	火3	配当学年	主として1回生	対象学生	理系向

[授業の概要・目的]

This course aims to introduce the fundamental concepts of classical electromagnetic theory, which plays a fundamental role in many areas of science and engineering.

After learning the concepts introduced in this course, students will be able to (a) understand fundamental properties of electromagnetic fields and their governing equations in the language of vector calculus, (b) solve problems involving electromagnetic fields and motion under their influence, (c) mathematically and intuitively understand the concept of electromagnetic wave, and (d) advance their mathematical skills, particularly regarding vector calculus and 2D/ 3D polar coordinate systems.

[到達目標]

(1) To explain fundamental concepts of electromagnetic theory, (2) To encourage practical problem solving and teach necessary mathematical tools, (3) To appreciate the foundational role of these concepts in theoretical and applied physics, (4) To provide a solid foundation for students to acquire advanced knowledge on the subject in future.

[授業計画と内容]

1. Introduction to electromagnetic theory, review of vector and introduction to field calculus. (Gradient, Divergence, Curl) (2 weeks)

2. Electrostatics: Coulomb's law of electrostatic interaction; superposition principle; continuous charge distributions; electrostatic field; divergence and curl of electrostatic fields; Gauss's law; electrostatic potential, work and energy in electrostatics (3 weeks)

3. Magnetostatics: Lorentz force law; interaction between electric current and magnetic field; continuity equation; steady current; Biot-Savart law and Ampere's law; divergence and curl of magnetostatic fields; concept of vector potential; (2 weeks)

4. Midterm exam and review of previous topics (1 week)

5. Electrodynamics: electromotive force and Faradays experiments, introduction and applications of Maxwell's equations, conservation laws for electrodynamic systems and Poynting vector. (3 weeks)

6. The electromagnetic wave: Wave equations, polarization, reflection refraction and transmission equations (3 weeks)

7. Feedback (1 week)

Fundamental Physics B-E2(2)へ続く↓↓↓

Fundamental Physics B-E2(2)

[履修要件]

Basic understanding of high-school physics and calculus. Some understanding of vector analysis will be helpful.

[成績評価の方法・観点]

Evaluation will be based on active participation (10%), one Mid-term in-class exam (40%), one Final in-class exam (50%)

[教科書]

David J. Griffiths 『Introduction to Electrodynamics』（Cambridge University Press）ISBN:978-1108420419

[参考書等]

（参考書）
授業中に紹介する

[授業外学修（予習・復習）等]

Following study materials and working on assignment / homework

[その他（オフィスアワー等）]

To be discussed during lectures.

[主要授業科目（学部・学科名）]