科目ナンバリング	U-LAS10 20002 LE55						
授業科目名 <英訳>	Advanced Calculus I-Vector Calculus Advanced Calculus I-Vector Calculus			担当者所属 職名・氏名	工学研究科　准教授　QURESHI, Ali Gul 経営管理大学院 教授　市川　温		
群	自然科学科目群			分野(分類)	数学(発展)	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・前期	曜時限	水5	配当学年	2回生以上	対象学生	理系向

[授業の概要・目的]

Based on the knowledge of Calculus with Exercises A/B and Linear Algebra with Exercises A/B , or Calculus A/ B and Linear Algebra A/B, this course explains calculus of multiple variables and vector calculus. The course introduces the concepts of motion and potential in more than 2 dimensions, which are based on partial differentiation and integration related with multiple dimensions (such as line integral and surface integral).

[到達目標]

To learn basics of calculus in functions of two or more variables, which are used in many other courses in natural sciences (such as Physics) and engineering.

[授業計画と内容]

1. Basic operations with vectors (5 Weeks)
- Dot and cross products; derivatives and integration of Vector Valued Functions
2. Vectors in other coordinate systems (2 Weeks)
- Frenet-Serret frame, Spherical and Cylindrical coordinate systems
3. Vector fields and potentials at n-dimensional Euclidean spaces (2 weeks)
- Operations over the vector fields (gradient, curl and divergence), scalar potential and vector potential
4. Line integrals and surface integrals (5 Weeks)
- Line integrals at 2-dimensional plane, surface integrals at 3-dimensional space, and integral theorems (Divergence theorem of Gauss, the Green's formula and the Stokes's theorem)
5. Feedback（1 Week）

[履修要件]

To understand Calculus with Exercises A/B and Linear Algebra with Exercises A/B, or Calculus A/B and Linear Algebra A/B.

[成績評価の方法・観点]

Weekly submission of class examples, class participation and homework (20%), Snap quizzes (15%), Final examination(65%)

[教科書]

授業中に指示する

[参考書等]

（参考書）

Gilbert Strang et al. 『Calculus Vol. 3』（Open Stax）（Book is available online at https://openstax.org/details/books/calculus-volume-3）
Joel R. Hass, Christopher E. Heil and Maurice D. Weir 『Thomas' Calculus, 14th ed.』（Pearson）
Erwin Kreyszig 『Advanced Engineering Mathematics, 10th ed.』（Willey）
Frank Ayres Jr. and Elliott Mendelson 『Calculus, 6th ed.』（McGraw-Hill）

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Advanced Calculus I-Vector Calculus(2)

[授業外学修（予習・復習）等]

Students are encouraged to do assigned homework related to the classes.

[その他（オフィスアワー等）]

Part of this course is scheduled to be held online. Please note that the schedule is subject to change depending on circumstances. Further details regarding the class format will be provided by the instructor during the course.

[主要授業科目（学部・学科名）]

理学部