

3. 電気電子情報工学系 Electrical, Electronics and Computer Engineering Field			EEC-F3
授業科目名 Course Title	ベクトル解析 Vector Analysis	単位数 Credit	2
担当教員 Instructor	橋本 明弘 HASHIMOTO Akihiro	開講学期 Semester	秋学期 Fall
キーワード Keywords	Scalar Field and Vector Field Scalar Product and Vector Product Differentiation, Gradient, Divergence and Rotation Line Integrals, Surface Integrals and Volume Integrals Gauss's Theorem and Stokes's Theorem		

授業概要 Course summary
<p>This course provides an introduction to the Vector Analysis. Topics include scalar and vector, scalar product and vector product, differential calculus of vector function, space curve and surface, application to mechanics, scalar field and vector field, gradient, divergence, rotation, integral calculus of vector function, divergence theorem, Stokes's theorem, Green's theorem.</p>
到達目標 Course goal
<ol style="list-style-type: none"> <li>1. Understanding for the basic concept and learning for the calculus skills of the differentiation and the integrals of vector fields.</li> <li>2. Learning for the calculus skills of the gradient, the divergence, and the rotation operation for the scalar and the vector fields and understanding of physical meaning for each operation.</li> <li>3. Learning for the calculus skills of Gauss's, Stokes's and Green's Theorems.</li> <li>4. Learning of mathematical basis for the mechanics and the electromagnetisms.</li> </ol>
授業内容 Course description
<ol style="list-style-type: none"> <li>1. Vector Analysis in Electrical and Electronic Engineering, Basic Concept of Vector and Vector Field, Component Representation of Vector</li> <li>2. Scalar Product, Vector Product, Triple Scalar Product and Triple Vector Product</li> <li>3. Differentiation of Vector Functions</li> <li>4. Transformation of Vector</li> <li>5. Electromagnetic Field by Vector Form</li> <li>6. Line Integrals of Vector Field and Scalar Potential</li> <li>7. Surface Integrals of Vector Field</li> <li>8. Gradient of Scalar Field (I): Partial Differential and Total Differential</li> <li>9. Gradient of Scalar Field (II): Physical Meaning of Gradient Operation</li> <li>10. Gradient of Scalar Field (III) :Direction Differential、 Transformation for Gradient</li> <li>11. Divergence of Vector Field (I): Flux of Vector Field, divergence and Source</li> <li>12. Divergence of Vector Field (II): Gauss's Theorem, Point Charges and Gauss's Law</li> <li>13. Rotation of Vector Field (I): Loop Integrals for Electric Fields and Circulation, Curl and Rotation</li> <li>14. Rotation of Vector Field (II): Examples of Rotation, Stokes's Theorem</li> <li>15. Rotation of Vector Field (III): Vortex Filament, Vortex Free Field and Solenoidal Field</li> <li>16. Final Examination</li> </ol>
準備学習 (予習・復習) 等 Preparation / Review
Home works at every class

授業形式 Class style
Lectures
成績評価の方法・基準 Method of evaluation
Final examination and reports
教科書・参考書等 Textbook and material
handout
受講要件・予備知識 Prerequisite
その他の注意事項 Note