Fluids Engineering	講義　2単位　2学期
Fluids Engineering	

【担当教員】

SHIRAKASHI Masataka・TAKAHASHI Tsutomu

【授業内容及び授業方法】

Subject:　Fluids Engineering
Lecturer:　Masataka SHIRAKASHI & Tsutomu TAKAHASHI
Semester: 2nd Semester
Students:　for Third-year undergraduate course students of Mechanical Engineering Department

Contents

Chapter 1　Introduction
1-1 Specific aim of this lecture
1-2 Overview of science and engineering of fluid motion
1-3 What is fluid ?

Chapter 2　Derivation of　Basic Equations of Fluid Motion
2-1 Acceleration of a fluid particle (Substantial derivative)
2-2 Force acting on a fluid element
2-3 Equation of motion of a continuum (Cauchy's equation)
2-4 Deformation of fluid element in flow field
2-5 Relation between stress and strain rate
2-6 Navier-Stokes equation
2-7 Law of conservation of mass applied to flow field

Chapter 3　Approach to Solutions of N-S Equation

3-1 Incompressibility and treatment of body force
3-2 Exact solutions
3-3 Approximation methods for creeping motion
3-4　Approximation for high velocity flows (Perfect fluid approximation)

Chapter 4 Theory of Perfect Fluid Flow
4-1 Bernoulli's theorem
4-2 Two-dimensional irrotational flow
4-3 Flows given by simple functions
4-4 Conformal mapping

Chapter 5　Boundary Layer Theory
5-1 Concept of boundary layer
5-2 Boundary layer approximation
5-3 Boundary layer separation

Chapter 6 Turbulent Flow
6-1 What is turbulent flow ?
6-2 Expressions for state of turbulent flow
6-3 Theory on fully developed turbulent flow

Fracture and Fatigue Strength of Materials　　講義　2単位　2学期
Fracture and Fatigue Strength of Materials

【担当教員】

MUTOH Yoshiharu

【授業内容及び授業方法】

Subject:　Fracture and Fatigue Strength of Materials
Lecturer:　Yoshiharu Mutoh
Semester: 2nd Semester
Students:　Third year Students

Keywords: Materials Strength, Structural Materials, Fracture Toughness, Fatigue

Contents:
(1) Mechanisms of fracture and fractography
(2) Linear fracture mechanics
(3) Non-linear fracture mechanics
(4) Fracture toughness and test methods
(5) Fatigue strength
(6) Fatigue crack growth
(7) Stress corrosion cracking
(8) Damage tolerent design

Basic Magnetohydrodynamics　　講義　2単位　3学期

Basic Magnetohydrodynamics

【担当教員】

HARADA Nobuhiro

【教員室または連絡先】

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【授業目的及び達成目標】

Magnetohydrodynamics (MHD) is a basic subject which leads to novel electric power generation and electric propulsion system in future. This lecture introduces basic physical phenomena of plasma and interaction between electro-magnetic field and fluid dynamics. Further, applications of MHD power generation and MHD propulsion are discussed.

Main objectives are to understand
1) ionization and basic properties of plasma,
2) interaction between electro-magnetic field and fluid dynamics,
3) MHD electric power generation,
4) MHD electric propulsion, and
5) recent trend and new technologies related to MHD.

【授業キーワード】

magnetohydrodynamics, fluid dynamics, electro-magnetics, electric induction, Lorentz force, MHD power generation, MHD propulsion

【授業内容及び授業方法】

For basic plasma properties, ionization processes, charge neutrality, collision theory, and electrical conductivity are studied. We understand the plasma as electrically conductive fluid. Then in order to apply this plasma to novel power generation and propulsion system, basic governing equations for magnetohydrodynamics are explained. New topics of MHD power generation and MHD propulsion are presented.

【授業項目】

1) basic properties of plasma
2) ionization and electrical conductivity
3) basics of fluid dynamics and electro-magnetics
4) MHD power generation and generator performance
5) MHD propulsion and space application of MHD

【教科書】

Prints or handouts are provided.

【参考書】

"Magnetohydrodynamic Energy Conversion" (McGraw Hill)

【成績の評価方法と評価項目】

Score is based on several reports. Attendance and submission of report(s) are also taken into account.

Introduction to Instrumental Analysis for Electronic Materials　講義　2単位　3学期

Introduction to Instrumental Analysis for Electronic Materials

【担当教員】

KIMURA Munehiro

【教員室または連絡先】

Room 607, 1st building of Electrical Engineering Department, Extension 9540

【授業目的及び達成目標】

The lectures will cover the introduction of analytical instrumentation for electronic materials. The objectives are to give you (1) a basic understanding of the most frequently used analytical methods (e. g. scanning probe microscopy, ellipsometry, spectroscopy), (2) an overview to help you choose an appropriate analytical technique for a specific problem.

【授業キーワード】

instrumental analysis, scanning probe microscopy, ellipsometry, spectroscopy, resonance, second harmonic generation

【授業内容及び授業方法】

First, basic condensed matter physics will be outlined. Then, an overview of the instrumental analysis for electronic materials will be lectured. Finally, each student will prepare a literature research paper (ca. 10 pages) based on a current topic in instrumental analysis in an area of their choosing. The language in class is English.

【授業項目】

Classification of analytical methods and the types of instrumental methods
Scanning probe microscopy (STM, AFM)
Ellipsometry, X-ray diffraction, Second Harmonic Generation
Spectroscopy (FT-IR)
Resonance (ESR, NMR)

【教科書】

Text will be handed in the lecture.

【参考書】

Principles of Condensed Matter Physics / P. M. Chaikin, T. C. Lubensky, Cambridge University Press (1995).

【成績の評価方法と評価項目】

Attendance in lecture and class participation is required. Because class discussions are a major part of the class, attendance is required and record will be taken.

40% Literature research
40% Oral presentation (incl. rough draft)
20% Attendance in lecture, participation in discussion

Internship I	実習　4単位　通年
Internship I	

【担当教員】

Staff

【授業目的及び達成目標】

Purpose & Goal:
(1)To obtain practical experience of engineering and practical engineering skil
(2)To learn Japanese style working and production systems
(3)To find purposes for further study
(4)To know importance of engineer's ethic and safety

【成績の評価方法と評価項目】

Evaluation:
Based on
(1)Monthly report
(2)Presentatin at the end of training
(3)Evaluation sheet from company

【留意事項】

Term of the internship I is less than three months but more than two months.

Internship II	実習　8単位　通年
Internship II	

【担当教員】

Staff

【授業目的及び達成目標】

Purpose & Goal:
(1)To obtain practical experience of engineering and practical engineering skil
(2)To learn Japanese style working and production systems
(3)To find purposes for further study
(4)To know importance of engineer's ethic and safety

【成績の評価方法と評価項目】

Evaluation:
Based on
(1)Monthly report
(2)Presentatin at the end of training
(3)Evaluation sheet from company

【留意事項】

Term of the internship II is more than three months.