

2. 機械・システム工学系 Mechanical and System Engineering Field			MSE-F2
授業科目名 Course Title	材料加工及び設計工学 Engineering Material Processing and Design	単位数 Credit	2
担当教員 Instructor	旭吉 雅健 HIYOSHI Noritake 山下 順広 YAMASHITA Yorihiro 大津 雅亮 OTSU Masaaki 岡田 将人 OKADA Masato 本田 知己 HONDA Tomomi 今 智彦 KON Tomohiko	開講学期 Semester	秋学期 Fall
キーワード Keywords	creep-fatigue, metal forming, mechanical machining, machine design	曜日/時限	水曜/5 限

授業概要 Course summary
<p>本講義では、材料学、塑性加工学、機械加工学、機械要素設計の基本概念を紹介する。主なトピックは以下に示すとおりである。</p> <ul style="list-style-type: none"> <li>➤ 金属疲労と高温強度の基礎</li> <li>➤ 付加製造の各種手法と特徴</li> <li>➤ 塑性加工の分類と特徴、各種塑性加工法</li> <li>➤ 機械加工の分類と特徴、各種機械加工法</li> <li>➤ 機械要素の分類、機械要素設計の基礎、各種機械要素の設計法</li> </ul> <p>This course provides an introduction to the basic concept of the engineering materials, metal forming processes, machining processes and design of machine elements. This course includes the following topics:</p> <ul style="list-style-type: none"> <li>➤ Fatigue and high temperature strength.</li> <li>➤ Various methods and characteristics of additive manufacturing</li> <li>➤ Classification and features of the metal forming process and details of various metal forming processes.</li> <li>➤ Classification and features of the machining process and details of various non-traditional machining processes.</li> <li>➤ Classification of machine elements, Fundamental of machine design, Design method of various machine elements.</li> </ul>
到達目標 Course goal
<ol style="list-style-type: none"> <li>1. 金属の疲労現象や高温強度評価手法の基礎を理解する。</li> <li>2. 付加製造の各種手法について理解し、原理を説明できる。</li> <li>3. 塑性加工、機械加工による金属加工法を理解して、様々な機械部品の製造にどのような加工法が用いられているかを説明できるようになる。</li> <li>4. どのような機械要素があり、どのように使用されているかを理解して、機械要素を使用するための設計法を習得する。</li> </ol> <ol style="list-style-type: none"> <li>1. The fundamentals of cyclic fatigue and high temperature strength for metal materials are provided.</li> <li>2. Understand various methods of additive manufacturing and be able to explain the principles.</li> <li>3. To understand the materials processing such as metal forming and machining, and to be possible to explain which materials processing methods are used for manufacturing various machine parts.</li> </ol>

4. To understand the existence and applications of the various machine elements and to acquire the design method of the various machine elements. To understand the design method of the sliding/rolling surface that affect the performance and life of machine elements.
授業内容 Course description
1st week: 授業のガイダンスと金属疲労の基礎 Guidance of this class, and fundamentals of fatigue 2nd week: 高温クリープの基礎 Problems at elevated temperatures for metal materials 3rd week: 付加製造の各種手法の概要 Outlines of various methods of additive manufacturing 4th week: 金属 AM の基礎と原理 Fundamentals and principles of metal additive manufacturing 5th week: 圧延加工の分類・特徴 Classification and features of rolling process 6th week: 鍛造加工の分類・特徴 Classification and features of forging process 7th week: 押出し加工・引抜き加工の分類・特徴 Classification and features of extrusion and drawing process 8th week: 機械加工の原理と歴史 Principle and history of machining 9th week: 機械加工の分類・特徴 1 Classification and features of machining 1 10th week: 機械加工の分類・特徴 2 Classification and features of machining 2 11th week: 機械要素の分類・特徴 Classification and features of machine elements 12th week: 様々な機械要素の設計法 1 Design method of various machine elements 1 13th week: 様々な機械要素の設計法 2 Design method of various machine elements 2 14th week: 転がり軸受の基礎 Fundamentals of rolling bearing 15th week: 転がり軸受の設計法 Design and selection of rolling bearing
準備学習（予習・復習）等 Preparation / Review
予習 Preparation 特になし Unnecessity 復習 Review 授業内容の追加学習 Review and exploration about study content
授業形式 Class style
講義（演習を含む） Lectures with practice 対面授業／オンデマンド授業 In-person class / on-demand class
成績評価の方法・基準 Method of evaluation
出席，レポート Attendance and report
教科書・参考書等 Textbook and material
配布資料 Printed materials prepared by instructors
受講要件・予備知識 Prerequisite
その他の注意事項 Note