

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

| 授業概要 Course summary   |
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| <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．主なトピックス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> <li>4. To understand the existence and applications of the various machine elements and to acquire the design method</li> </ol>  |

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

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