| 3. 電気電子情報工学系　Electrical, Electronics and Computer Engineering Field | | EEC-F1 |
|---|---|---|
| 授業科目名<br>Course Title | 半導体工学<br>Semiconductor Engineering | 単位数<br>Credit | **2** |
| 担当教員<br>Instructor | 塩島　謙次、アスバル　ジョエル タクラ、<br>牧野　哲征、今林　弘毅<br>SHIOJIMA Kenji,<br>ASUBAR JOEL TACLA,<br>MAKINO Takayuki,<br>IMABAYASHI Hiroki | 開講学期<br>Semester | 秋学期<br>AUTUMN<br>SEMESTER |
| キーワード<br>Keywords | Crystal structure, semiconductor, thermodynamics, thin film | 曜日/時限<br>Day & Time | |

| 授業概要　Course summary |
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| 結晶格子、金属-半導体界面、半導体デバイス、熱力学、統計力学、薄膜工学を理解する。<br>This course deals with crystal lattices, metal/semiconductor interfaces, semiconductor devices, thermodynamics, statistical mechanics, and thin film technology. |

| 到達目標　Course goal |
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| To understand crystal properties in solid, electrical properties of metal/semiconductor interfaces, semiconductor devices and materials, thermodynamics, and fabrication and characterization of thin semiconductor films. |

| 授業内容　Course description |
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| 1. Semiconductor materials (Shiojima)<br>2. Electrical properties of metal/semiconductor interfaces (Shiojima)<br>3. Fabrication process of metal/semiconductor interfaces (Shiojima)<br>4. Characterization techniques of metal/semiconductor interfaces (Shiojima)<br>5. Intrinsic Semiconductor: crystal structures, properties and energy band diagram (Asubar)<br>6. Extrinsic Semiconductor: P and N type (Asubar)<br>7. PN junction: physics and energy band diagram (Asubar)<br>8. PN junction: current and voltage characteristics (Asubar)<br>9. Thermodynamics laws (Makino)<br>10. Entropy in thermodynamics (Makino)<br>11. Classical statistical mechanics (Makino)<br>12. Quantum statistical mechanics (Makino)<br>13. Structural characteristics of semiconductor thin film (Imabayashi)<br>14. Characterization of semiconductor thin film (Imabayashi)<br>15. Applications of semiconductor thin films (Imabayashi) |

| 準備学習（予習・復習）等　Preparation / Review |
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| Those who take this course must have in-depth understanding mathematic calculations, energy band diagrams, wave equations, and thermodynamics. |

| 授業形式　Class style |
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| ゼミナール方式　（対面、または WEB 上）<br>Seminar（face-to-face or on web） |

| 成績評価の方法・基準　Method of evaluation |
|---|
| レポート、テスト |
| Report and Examination |

| 教科書・参考書等　Textbook and material |
|---|
| 半導体デバイス：Semiconductor Devices (Simon M. Sze)、Semiconductor Engineering (Kiyoshi Takahashi)、統計力学：Statistical Mechanics (Claudine Hermann, Springer Verlag)、薄膜工学：Thin-film Engineering (S. Yoshida, T. Kondo) |

| 受講要件・予備知識　Prerequisite |
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| ベクトル解析、半導体工学、熱力学、力学 |
| vector analysis, semiconductor engineering, thermodynamics, Newtonian dynamics, |

| その他の注意事項　Note |
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