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| Course Name [科目名] | Physics of Materials |
| Instructor Name [教員] | Kenji Ikushima, Hiroko Katori, Kazuyuki Muroo |
| Office Hours and Contact Information  [オフィスアワー、連絡先] | Location: Building 4-514, 508, 532  Telephone: +81-42-388-7120, 7115, 7111  E-mail: ikushima@cc.tuat.ac.jp, h-katori@cc.tuat.ac.jp, muroo@cc.tuat.ac.jp  If you need my assistance, please give me an e-mail or telephone call. |
| Course Overview [概要] | The aim of this course is to understand physical origins of electricity, magnetism, and optical property of materials, which are applicable to investigation of newly developed materials including semiconductors and superconductors in materials science. Applications to industrial technology, for example, quantum devices and magnetic and optical memories are also focused on. |
| Course Key Words [キーワード] | Semiconductors, Device technology, Magnetism, hysteresis, Electromagnetic wave, Electric dipole interaction |
| Academic Goal [目標] | 1. able to understand the physical origins of electricity, magnetism, and optical property of materials.  2. able to understand application of physical properties of materials to materials science and industrial technology. |
| Course Schedule [授業内容] | Week 1: Introduction to electronics  Materials used in resistive, capacitive and inductive elements  Non-linear devices: semiconductors  Week 2: Commercial semiconductor devices  pn junction, Bipolar transistor, Si-MOS FET, GaAs heterojunction  Week 3: Advanced quantum devices  Artificial lattices and atoms, Superconductors, Graphenes.  Week 4: Introduction to magnetism  Brief history of magnetism, Magnetic order and hysteresis.  Week 5: Applications of soft and hard magnets  Soft magnetic materials, Permanent magnetic materials,  Static applications.  Week 6: Magnetic recording  Spin-polarized current, Magnetic sensors, Magnetic memory  Week 7: Introduction to optics  Maxwell’s equations and electromagnetic waves (light)  Week 8: Electromagnetic interaction of light with materials  Electric dipole interaction, Absorption and dispersion  Week 9: Application of electromagnetic interaction  Absorption and emission of light, Spectroscopy, Optical memory  Week 10: Final Examination |
| Textbooks, References,  and Supplementary Materials  [テキスト、参考書、その他] | S. M. Sze, “Semiconductor Devices”,  J. M. D. Coey, “Magnetism and Magnetic Materials”,  E. Hecht, “Optics” |
| Grading Philosophy  (Percentage / Criteria / Methodology)  [成績評価の方法] | Participation in discussions during the lecture, oral presentation, and final examination or reports. |
| Other  (i.e. Expectations on Classroom  Conduct and Decorum etc.)  [その他] |  |