

SCIENTIFIC AND METHOD MODULES

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| Module name | Complex Nanostructures |
| Number | 2012-T3 |
| Aims | Deepen the understanding of physics and materials properties at the nanoscale as accessible by direct imaging and quantification of materials properties using scanning tunneling (STM) and atomic force microscopy (AFM), atomic force acoustic microscopy (AFAM) as well as scanning electron (SEM) and high resolution transmission electron microscopy (TEM). |
| Basics | Physical principles behind imaging techniques, origin of contrast, resolution limits, structural, electr(on)ical, magnetic as well as mechanical properties at the nanoscale, nanoscale surface manipulation / lithography, recent progress in imaging techniques. |
| Contents | Understanding of physics behind high resolution imaging techniques, and state-of-the art capabilities for spatially-resolved materials characterization; impact of dimensionality, open surfaces and interfaces on physical and materials properties; relation of global properties to macroscopic response. |
| Methods | Introducing the most prominent direct imaging-techniques (STM, AFM, SEM, TEM) – from the fundamentals to their technical realization; lectures will be complemented by practical training / instrument demonstration in the laboratory. |
| Type | Two-day block course/ yearly recurrence with modification |
| Date (month/year) | 9.July - 10.July 2012 |
| Time | Day 1: 9.00 – 17.00 h, Day 2: 9.00 – 17.00 h, |
| Work load | 15 hours presence / 45 hours self-study |
| Examination | Oral |
| Credit points | 2 |
| Responsible scientists | Prof. Rauschenbach, Prof. Mayr |
| International guest lecturers | PD Dr. S. Wirth (MPI CPFS Dresden) Dr. B. Köhler (Fraunhofer IZFP Dresden) Dr. W. Erfurth (MPI Halle/S.) Prof. Dr. T. Höche (Fraunhofer Halle/S.) Prof. Dr. L. Kienle (Univ. Kiel) Prof. Dr. O. Eibl (Univ. Tübingen) |
| Industrial partners | --- |
| Recommendations for literature, e-learning | J.W. Edington, Practical Microscopy in Material Science, Macmillan Philips Technical Library, Vol. 1 and 2 H.-J. Güntherodt, R. Wiesendanger, Scanning Tunneling Microscopy, Springer 1992, Vol. I |
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SCHEDULE for Module 2012-T3

| Time | Lecturer | Programme | Location |
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| Day 1 Scanning tunneling, atomic force microscopy, scanning electron microscopy | | | |
| 09:00-10:30 | PD Dr. St. Wirth, MPI CPFS Dresden | Scanning tunnelling microscopy | IOM Seminarraum Geb. 32 |
| <i>Coffee break and discussion</i> | | | |
| 10:45-12:15 | Dr. B. Köhler / Dr. M. Kopycinska- Müller, Fraunhofer IZFP Dresden | Atomic force microscopy / Atomic force acoustic microscopy | IOM Seminarraum Geb. 32 |
| <i>Lunch break</i> | | | |
| 13:00-14:30 | Dr. W. Erfurth, MPI Mikrostruktur Halle/S. | Scanning Electron Microscopy | IOM Seminarraum Geb. 32 |
| <i>Coffee break and discussion</i> | | | |
| 15:00-17:00 | Dr. F. Frost (AFM) Dr. J. Gerlach (STM) Herr Hirsch (SEM) | Practical Training in the Laboratory (in groups) | IOM labs |
| Day 2 Transmission electron microscopy | | | |
| 09:00-10:30 | Prof. Dr. Th. Höche Fraunhofer-Institut Halle/S. | Fundamentals of Transmission Electron Microscopy | IOM Seminarraum Geb. 32 |
| <i>Coffee break and discussion</i> | | | |
| 10:45-12:15 | Prof. Dr. L. Kienle Univ. Kiel | Application of Transmission Electron Microscopy in Material Science | IOM Seminarraum Geb. 32 |
| <i>Lunch break</i> | | | |
| 13:00-14:30 | Prof. Dr. O. Eibl Univ. Tübingen | Fundamentals of Analytical Electron Microscopy | IOM Seminarraum Geb. 32 |
| <i>Coffee break and discussion</i> | | | |
| 15:00-17:00 | Dr. Lotnyk and staff | Practical Training in the Laboratory (in groups) | IOM labs |