Reg No: FYAD10/20252

Faculty of Health, Science and Technology
Physics

Syllabus

Characterisation of materials for Physicists

Course Code:	FYAD10
Course Title:	Characterisation of materials for Physicists *Karaktärisering av material för fysiker*
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
FYA (Physics)
TKA (Engineering Physics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2025-01-31, and is valid from the Autumn semester 2025 at Karlstad University.

Prerequisites
75 ECTS credits in Physics, including Wave Physics and Optics, 7.5 ECTS credits, Introductory Modern Physics, 7.5 ECTS credits, Electromagnetic Field Theory, 7.5 ECTS credits, and Solid State Physics, 7.5 ECTS credits, plus Materials Engineering for Engineering Science, 7.5 ECTS credits and 30 ECTS credits in Mathematics, including Complex Analysis and Transforms, 7.5 ECTS credits, and upper secondary level English 6, or equivalent

Learning Outcomes
The aim of the course is for students to acquire the basic theoretical and practical knowledge of the modern methods of materials characterisation that are used in industrial and academic research and development work. The course also prepares students for advanced studies and for degree projects in Materials Physics.

Upon completion of the course students should be able to:
- explain the physical principles of the methods studied, how the methods work, what type of information each method yields, how the equipment is generally used, and what demands are placed on specimens and specimen preparation,
- identify for each method the form the result can take (diagram, diffraction pattern, micrograph, and so on) and how to interpret it in practice, and
- in relation to a given problem, suggest a plan for research methods to be used, justify the choices, and explain what results can be expected.

Content
The course consists of several parts, one for each method treated. Instruction is in the form of lectures,
demonstrations of equipment, and laboratory work.The methods treated are optical and electron-microscopy (OM, SEM, TEM), diffraction methods (XRD, EBSD), spectroscopy (auger, XPS, EDS), scanning tunnel microscopy, atomic force microscopy, and thermal analysis.

Laboratory sessions are focused on transmission electron microscopy and atomic force microscopy.

Reading List
See separate document.

Examination
Assessment is based on a written exam, mandatory laboratory sessions, and a written laboratory report.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.