Material characterization by Magnetic Resonance Spectroscopy:
A theoretical and practical introduction course

Purpose and Scope
Magnetic Resonance Spectroscopy (MRS) is one of the most versatile and powerful characterization tools available for a wide range of specimen. MRS is an umbrella term covering several techniques that all utilize the same physical principles to investigate different things. All these techniques have in common that they are non-destructive and non-invasive. In principle there are three major research fields using MRS:

- Physics and Material Science using electron paramagnetic resonance (EPR), optically detected magnetic resonance (ODMR) and double resonance techniques to study electronic, optical and magnetic properties
- Chemistry and Biochemistry employing nuclear magnetic resonance (NMR) to investigate physical and chemical properties organic molecules
- Medicine applying magnetic resonance imaging (MRI) as a non-invasive means for the characterization of tissue

The aim of the course is to provide a theoretical introduction to all aspects of Magnetic Resonance Spectroscopy for PhD students. Further, the course will focus on MRS in physics and material science and provide detailed knowledge on what properties can be determined with the relevant techniques and give state-of-the-art examples for material systems researched at IFM. The theoretical part of the course is followed by a practical part in which the students learn how to use the experimental setups available at IFM.

Course coordinator and examiner: Jan Eric Stehr (jan.eric.stehr.liu.se)

Credit points: 6 ECTS

Course schedule: Spring 2019

Course language: English

Format
The course will consist of approximately 6 lectures (each 2 x 45 min), 2 lab sessions and 3 seminars. The course literature will be lecture notes, hand-outs from book chapters and original research papers. The examination will consist of a project work of a selected topic that will be presented during a seminar at the course and a written report of the lab sessions.