



THEMATIC PROGRAM IN MATHEMATICAL PHYSICS

*SPECTRAL THEORY, SEMI-CLASSICAL ANALYSIS,
AND CONDENSED MATTER PHYSICS*

Mini-Courses

November 2020 - March 2021

International Conference

Mathematics of Condensed Matter and Beyond (MCMB)

February 22-25, 2021

Monthly Seminars

Seminar by Dr. Claus Führer (Lund University, Sweden)

Title: Differential Algebraic Equations are Ordinary Differential Equations - with many surprises and numerical challenges.

Date and Time: **March 18, 2021**

Registration Link: <https://aub.webex.com/aub/onstage/g.php?PRID=92562d505b009fd8994f9c68a4638d88>

Abstract:

In this seminar, an overview is given that introduces to the theory of differential-algebraic equations (DAEs) and numerical solution methods. The theory of DAEs extends classical ODE theory with aspects from differential-geometry, first integrals, impasse points, well-posedness. This is reflected by the problems occurring when trying to solve them practically. DAEs are mathematical modeling tools to describe problems in chemical engineering, electrical circuits, etc. Also, they can be the equations resulting from space discretized partial differential equations. A particular interesting view on DAEs is their relation to variational formulations of the equation of motions in rigid body mechanics. This talk starts from this application, introduces to linear DAEs and their linear algebra counterpart, the generalized eigenvalue problem, and addresses initialization problems and sensitivity results before turning to the algorithmic part. What is left over to do after more than 50 year's of research on DAEs? Some research ideas will be addressed at the end of the talk.

