

Syllabus for MATH 4991 (Mathematical Research)

Topics: Hierarchical Matrices, Navier-Stokes equations, data visualization, HLib GUI, 2- and 3-dimensional grid generation

1. **Instructor:** Sabine Le Borne, BR 319, Tel. 372 3690, email: sleborne@tntech.edu
2. **Meetings:** Thursday, 8:30-9:25, and individually as necessary
3. **Course Description:** This course introduces students to the process of performing research. By reading research papers the students will learn how to recognize and define open and significant problems, set up a research plan and, if applicable, define relevant experiments. Students will be required to work as a team, to give presentations on either their own or other people's research and to write a concluding report on their project.
4. **Prerequisites:** C or better in MATH1920 and consent of instructor.
5. **Possible texts and references:** Lecture Note No. 21/2003, "Hierarchical Matrices", by S. Börm, L. Grasedyck, W. Hackbusch, available online at <http://www.mis.mpg.de/preprints/ln/index.html>,
References on MATLAB, Latex, C-programming in BR116
WWW
6. **Topics to be covered:**
 - Chapter 2 of Lecture Note on "Hierarchical Matrices" (see above): Read, collect and discuss questions, locate respective functions in HLib implementation
 - Application background: Numerical solution of the Navier-Stokes equations
 - Maintaining a current web page on NSF and DOE project
 - Overview of recent papers on \mathcal{H} -matrices
 - Learn Latex to document results and write reports.
 - Learn tools for visualization of results (e.g. MATLAB for graphs, postscript, xfig, DX data explorer, GUI programming, etc.)
 - Define, implement, perform, and document numerical test problems and interpret the results.
 - Additional topics.
7. **Credits:** 1 credit
8. **Grading procedure:** A passing grade requires
 - an active participation in the class meetings;
 - at least one presentation on an individual project;
 - a (Latex-) report that summarizes the individual experience in this class.

Students with a disability requiring accomodations should contact the Office of Disability Services (ODS). An Accomodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112; phone 372-6119.