CS-803

Summer School on Numerical Modelling for Applied Superconductivity

Dutoit Bertrand

Cursus	Sem.	Type
Computer and Communication Sciences		Opt.
Electrical Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Written & Oral
Workload	60h
Hours	**52**
Courses	28
Exercises	14
TP	10
Number of positions	

Frequency

Only this year

Remark

Postponed until further notice - Registration only via https://www.epfl.ch/labs/appliedsc/school/

Summary

The program of the School aims al providing the students with the main concepts and methodologies for developing a numerical model of superconducting devices. The students will learn numerical modelling techniques for different physical aspects of superconducting applications and have practice.

Content

Day 1 Mark Ainslie (University of Cambridge, UK) -From materials to applications
-Numerical modelling of applications: state of the art and open challenges
Day 1 Bernardo Bordini (CERN, Switzerland) -Introduction to superconductor modelling ·
- Critical state model, power law and other E-J laws

Computer exercise
- Identification of parameters of a Jc(B, T,) parameterization starting from experimental data.

Day 1 Students -Flash presentation of their posters
Day 2 Cristophe Geuzaine (University of Liège, Belgium, TBC) -Numerical methods Computer exercise
- Mesh, basis functions for FEM (nodal, edge).
- Solving 1-D problems with FEM.

Day 2 Satoshi Awaji (Tohoku University, Japan) -Introduction to high field magnets
Computer exercise
-Design of a high field magne! with prescribed field intensity, bore diameter and field quality
Day 3 Luca Bottura (CERN, Geneva, Switzerland) -Electrothermal studies of L TS: conductors, stability, quench protection Computer exercise
- Calculation of stability margin of a cable.
- Calculation of quench initiation and propagation.
- Calculation of magnet dump.

Day 3 Marco Breschi (University of Bologna, Italy) -Electrothermal studies of HTS: local dissipation issues, quench in HTS Computer exercise
- Calculation of minimum quench energy of an HTS tape.
- Calculation of quench propagation in a coil.
- Comparison between analytical formulae and numerical results.

Day 4 Thierry Schild (ITER 1/0, Cadarache, France, TBC) -Design principles for high field MRI magnets
Computer exercise
-Example of design of a high field magne! for MRI.

Day 4 Francesco Grilli (Karlsruhe Institute of Technology, Germany) -AC losses and field homogeneity in HTS coils: shielding currents Computer exercise
- Calculation of the current/field distributions of a coil through an excitation cycle.
- Calculation of the AC loss of an HTS tape and comparison with analytical results.
- Comparison of the AC loss between non-striated and striated 2G tapes.

Day 5 Daniela Boso (University of Padova, Italy, TBC) -Mechanics generalities (elasticity, stress-strain in composite, thermal
shrinking, ...)
Day 5 Thibault Lecrevisse (Atomic Energy and Alternative Energies Commission, France, Saclay, TBC) Specificities of mechanics in high field magnets
Computer exercise
-Example of calculation of stress and strain in a high field magne!.

Note

Mark Ainslie; Bernardo Bordini; Cristophe Geuzaine; Satoshi Awaji; Luca Bottura; Marco Breschi; Thierry Schild; Frë

Keywords

Applied Superconductivity, Numerical modelling, High magnetic field, Hybrid magnet

Resources

Bibliography

https://www.epfl.ch/labs/appliedsc/schooV