FatSAM

Day 1, 15th June 2026 — Fundamentals: From Mechanics to FEM

09.00-09.30	Summer School Introduction	Huseyin Aydin (TÜBİTAK) Sergio Jiménez (CIMNE)
09.30-11.00	Fundamentals of Fatigue Mechanics	Lucia Barbu (CIMNE)
11.30-13.00	Essentials of Finite Element Modelling for Nonlinear Problems	Alejandro Cornejo (CIMNE)
14.30-16.00	Introduction to Kratos Multiphysics for Solid Mechanics *	Hands-on session

Day 2, 16th June 2026 — Preparing a Fatigue Simulation I

09.00-11.00	Monotonic Behaviour: Damage and Plasticity	Sergio Jiménez (CIMNE)
11.30-13.00	Cyclic behaviour: High-Cycle Fatigue	Lucia Barbu (CIMNE)
14.30-16.00	Nonlinear Constitutive Models in Kratos Multiphysics (Part I) *	Hands-on session

Day 3, 17th June 2026 — Preparing a Fatigue Simulation II + Invited Lectures

09.00-10.30	Numerical Simulation of Additive Manufacturing Processes I	Michele Chiumenti (CIMNE)
11.00-13.00	Nonlinear Constitutive Models in Kratos Multiphysics (Part II) *	Hands-on session
14.30-16.00	Numerical Simulation of Additive Manufacturing Processes II	Andreas Lundbäck (LTU)

Day 4, 18th June 2026 — Invited Lectures

09.00-11.00	Experimental Characterisation of Fatigue Behaviour	Huseyin Aydin (TÜBİTAK) Sergi Parareda (Eurecat)
11.30-13.00	Fatigue Modelling in Structural and Contact Problems	Alireza Taherzadeh-Fard (DTU) Konstantinos Poulios (DTU)
14.30-15.30	Additional Modelling Aspects in Fatigue	Sergio Jiménez (CIMNE)
15.30-16.00	Summer School Closure	Sergio Jiménez (CIMNE)

**Note: To follow the hands-on sessions, participants will need GiD and the Kratos Multiphysics problemtype installed. We will share step-by-step instructions.*

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101159809.

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DAY 1, 15TH JUNE 2026 — FUNDAMENTALS: FROM MECHANICS TO FEM

Summer School Introduction

FatSAM project overview.	Dr. Huseyin Aydin (TÜBİTAK)
Summer school overview.	Prof. Sergio Jiménez (CIMNE)

Fundamentals of Fatigue Mechanics – Prof. Lucia Barbu (CIMNE)

Physical mechanisms of fatigue, types of fatigue, and brief experimental overview.

Essentials of Finite Element Modelling for Nonlinear Problems – Prof. Alejandro Cornejo (CIMNE)

Introduction to finite element modelling, covering governing equations, discretisation, workflow, linear/nonlinear response, and numerical solution strategies.

Hands-on: Introduction to Kratos Multiphysics for Solid Mechanics* – CIMNE researchers

Model setup, execution, and post-processing for solid mechanics.

DAY 2, 16TH JUNE 2026 — PREPARING A FATIGUE SIMULATION I

Monotonic Behaviour: Damage and Plasticity – Prof. Sergio Jiménez (CIMNE)

Fundamentals of plasticity and damage modelling, including isotropic hardening plasticity and isotropic damage constitutive laws, with practical implementation in Kratos Multiphysics.

Cyclic behaviour: High-Cycle Fatigue – Prof. Lucia Barbu (CIMNE)

High-cycle fatigue fundamentals, including constitutive modelling, time-advancing strategies, and setting up fatigue cases in Kratos Multiphysics.

Hands-on: Nonlinear Constitutive Models in Kratos (Part I)* – CIMNE researchers

Monotonic calibration, cyclic material behaviour, and running nonlinear simulations.

DAY 3, 17TH JUNE 2026 — PREPARING A FATIGUE SIMULATION II + INVITED LECTURES

Numerical Simulation of AM process I – Prof. Michele Chiumenti (CIMNE)

Numerical simulation of metal forming processes.

Hands-on: Nonlinear Constitutive Models in Kratos (Part II)* – CIMNE researchers

Cyclic material calibration, simulation and result analysis of the HCF problem.

Numerical Simulation of AM process II – Prof. Andreas Lundbäck (LTU)

Modelling of AM including material and microstructure modelling.

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DAY 4, 18TH JUNE 2026 —INVITED LECTURES

Experimental Characterisation of Fatigue Behaviour

Fatigue Characterization of AM Materials: Current Challenges and Experimental Insights.	Dr. Huseyin Aydin (TÜBİTAK)
Rapid Fatigue Testing Strategies.	Prof. Sergi Parareda (Eurecat)

Fatigue Modelling in Structural and Contact Problems

Fatigue Delamination. Numerical Modelling in FRP laminates.	Dr. Alireza Taherzadeh-Fard (DTU)
Microplasticity and Crack Initiation at Subsurface Defects in Rolling Contact Fatigue.	Prof. Konstantinos Poulios (DTU)

Additional Modelling Aspects in Fatigue – Prof. Sergio Jiménez (CIMNE)

Influence of thermal effects and residual stresses on fatigue response, including fatigue mechanisms in composite materials.

Summer School Closure – Prof. Sergio Jiménez (CIIMNE)

SUMMER SCHOOL LECTURERS

Dr. Huseyin Aydin
Principal Chief Researcher at TÜBİTAK MAM

Prof. Lucia G. Barbu
Associate Professor at ETSECCPB UPC
Researcher at CIMNE – Head Fatigue Unit

Prof. Michele Chiumenti
Full Professor at ETSECCPB UPC
Researcher at CIMNE – Head IM Group

Prof. Alejandro Cornejo
Associate Professor at ETSECCPB UPC
Researcher at CIMNE – CAMMS Group

Prof. Sergio Jiménez
Assistant Professor at ETSECCPB UPC
Researcher at CIMNE – CAMMS Group

Prof. Andreas Lundbäck
Associate Professor in Solid Mechanics Division at LTU

Prof. Sergi Parareda
Researcher at Eurecat
Associate Professor at UViC-UCC

Prof. Konstantinos Poulios
Associate Professor at DTU Civil and Mechanical Engineering

Dr. Alireza Taherzadeh-Fard
Postdoc at DTU Civil and Mechanical Engineering

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