



At the cross-roads of mechanical testing and computational mechanics, this Master's degree course -SMC (Complex Mechanical Structures and Systems) aims at training specialists capable of understanding material mechanical behavior and acquiring skills in computational mechanics for the purpose of designing, assessing and certifying new materials, and mechanical systems and structures and to optimize their performance levels. In this course, emphasis is put on the skill to integrate experimental and computational mechanics.

PEDAGOGY

The teaching course teams develop tools, models, experimental, theoretical and computational methodologies, that cover all the steps of the mechanical simulation and of a digital model chain and making relevant use of data (field measurements, image correlation). The course also provides students with advanced skills that enable them to identify, enrich and certify material behaviour and computational models, at various scales while taking into account uncertainty and variability.

TRAINING PROVIDES ACQUISITION OF THE FOLLOWING SKILLS

- Using mechanical testing for a more predictive simulation
- Experimental and computational techniques and tools for mechanical modelling, identification and characterization (field measurement) of materials and multi-materials (metallic, composite, polymer materials)
- Uncertainty and variability in mechanics
- Advanced techniques and tools needed for digital modelling
- Optimization and model reduction in mechanics
- Solving coupled, multi-physics problems

PROFESSIONAL OBJECTIVES

The training provided here allows SMC graduates to obtain immediate acceptance as R&D engineers, in various industrial mechanical engineering sectors notably in the transportation sector, in energy and the environment and also in academic (or industrial) research positions by pursuing studies to PhD level.

Keywords

Experiment/
simulation
correlation
Material Sciences
Computational
mechanics
Uncertainty and
Variability
Complex Mechanical
Behaviours
Multi-physics
Coupling

SMC COURSE CONTENTS/OPTIONS

Class/Course Modules (30 credits/semester)	Credits (CCs)
Semester 1	
Analysis of experimental data	6
Primer to stochastic programming	3
Tools used in scientific computation	3
Methodology for control system synthesis	3
Electric power train systems	6
Vibration mechanics	6
Finite element structural modelling	6
Digital modelling for engineering problems	6
CAD: Geometric modelling	6
Introduction to mechanical properties and materials engineering	6
Primer to analogue electronics	6
Mechanical engineering design	6
Management, economics and setting up a business concern	4
Foreign language studies	4
Semester 2	
Primer in systems engineering	6
Experimental protocols, instrumentation and information processing	6
System energy flows and transduction	5
Principles of sensors and instrumentation	6
Engineering mechanics of deformable solids	6
Electric machines	6
Electromagnetic phenomena	6
Printed circuits and micro-processors	6
Micro-processors, interfaces and basic software	6
Management, economics and setting up a business concern	4
Foreign language studies	4
Semester 3 – 1st quarter	
Advanced data analysis	3
Secure systems design	3
Modelling and propagation of uncertainty	3
Optimization	3
Complex mechanical behaviour	3
Modelling, control and observation of dynamic systems	3
Robust system design	3
Systems modelling and simulation	3
Foreign language studies	4
Semester 3 – 2nd quarter	
Stochastic modeling in mechanics	3
Identification and characterization of material behaviour	3
Multi-physics coupling, Optimization and model reduction	3
Advanced techniques in Computational Mechanics	3
Active materials	3
Foreign language studies	4
Semester 4	
Master's degree Final internship	30

Useful Information

Target population

Students with a primary background at French Baccalaureate +3 ("Bac+3") majoring in basic science, engineering sciences, science and technology ...

Admission

Year 1 : M1

Admission to first year (M1) is decided by assessment of the merits of the application file for students who have acquired a prior level at least "Bac+3" (first degree or equivalent).

Year 2 : M2

Direct admission to second year (M2) is decided by an assessment of the merits of the application file for students who have acquired a prior level at least Bac+4 (Master 1 or final year student-engineers registered at a recognized school of engineering).

Applications

The UTC Master's application file can be downloaded, as of March and should be returned, complete, to the Admission Office before mid-June (exact dates are set out on the UTC web-site) at:

www.utc.fr/master

