Doctoral school SPIM - science course 2015-2016

Acronym : SPIM-VV	*Verification and validation of simulations*
Required prior knowledge	Masters degree in physical or engineering sciences
Form of examinaton	Oral presentation of project results
Keywords	Verification, validation, virtual prototyping, calibration, robust design
Learning outcomes	Virtual prototyping has become a cost-effective tool to provide decision support in the design of complex engineering systems. This short-course provides students both theoretical and practical training in various aspects of Verification and Validation (V&V) activities whose objective is to establish the scientific credibility of numerical simulations. Participants will learn how to identify the most influential model parameters, quantify and propagate uncertainties, leverage experimental studies to increase the accuracy and confidence in their model-based predictions, and propose future designs that insure acceptable performance in the face of uncertainty in the model and its environment.
Content	The course material will focus on four important V&V activities: 1) Sensitivity and effects analysis Answers the question: "which model parameters have a dominant contribution to the overall observed variability of the predictions?". Both local and global techiques will be presented along with their advantages and short-comings. 2) Uncertainty quantification Studies the impact of different sources of uncertainty – aleatoric and epistemic – on the simulated outcomes of interest. Examples of both probabilistic and non probabilistic uncertainty models will be presented as well as strategies for efficiently propagating uncertainty through the model to the outputs. 3) Model calibration Helps to improve the test-analysis correlation between physical measurements and numerical predictions by methodically modifying the model structure and/or parametrization. Three different paradigms for model calibration are presented, with their advantages and short-comings, including deterministic, stochastic, and robust approaches. 4) Robust design Answers the question: "how can I guarantee that a design meets a performance requirement, given that the numerical simulations introduce uncertainty and depend heavily on assumptions?". Three robust design paradigms are presented, included Reliability-based Design Optimization (RBDO), Robust Design Optimization (RDO), and Robust Reliability Design Optimization (RRDO). The course will begin with a theoretical presentation of the above methods followed by two separate lab sessions. The first will allow participants to gain experience in the different V&V activities by applying in-house software to academic examples. The second will engage each student to formulate the different activities in the framework of his or her own research project followed by a short presentation of their project results.
Instructor(s)	COGAN Scott (CR CNRS), FOLTETE Emmanuel (PR), OUISSE Morvan (PR)
Number of participants	Beetwen 8 and 20 participants
Hours	14h (Lecture cours: 4h + Exercices: 0h + Pract. Work, TP-projet:10h)
Calendar number of sessions, dates and times	
Location (room, building, adress, city)	
Registration Procedures	by email to formations.doctorales@univ-fcomte.fr Your message MUST specify your Full name, graduate school, research team, the style of training and the sessions you wish to register. If you are outside the UFC also indicate your year of thesis, the name of your manager and your home university. Registrations will be taken into account until three weeks before the date of formation within the limits of available seats. You will receive an acknowledgment of your request, then a notice by email approximately one week prior to training. WARNING: The courses are expensive, by registering, you agree to participate. If you are exceptionally ultimately unable to participate, be sure to inform as soon as possible.
Comments	Participants who have validated this course (registration to a session and validation rules as above) and who have completed the online survey will receive a certificate via email in the days / weeks following the training. This training is open to doctoral students from other graduate schools. This course will be taught in English or French (depending on age) with course materials in English

Les inscriptions seront ouvertes lorsque les dates seront fixées