Information

- Venue
  - The courses will be held at INSTN locations in Saclay (20 km southwest of Paris), Cadarache (45 km from Aix-en-Provence) and Marcoule (60 km from Orange).

- Registration deadline
  - November 28, 2018

- Registration fee
  - Professors: €700 for the first course, €1,200 for each additional course.
  - Students: €450 for each course.
  - CEA, ENEN member institutions: special rates.
  - Fee covers lectures, documentation and lunches.

- Contacts
  - Programme manager: Claude Renault - claude.reneult@cea.fr
  - General coordination and information: Nadia Nowacki - nadia.nowacki@cea.fr

Main Lecturers

Lecturers are experienced in teaching several Masters of Science and Engineering programs. Their alongside superior PhD students in their research activities.

Catherine Basset - Research Director at CEA, has been developing advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. Her expertise concerns the development of advanced software tools for nuclear applications. She is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and she is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Jean Michel Barreau - Ixi Director of Nuclear Accident Protection at ITER, has been working for more than 35 years in the field of fusion research. He has been actively involved in the development and improvement of a new generation of thermal hydraulics models and in the conceptualization of a new generation of integral safety systems for ITER. He has been a key figure in the development of the new generation of safety codes for fusion reactors and in the conceptualization of new safety systems for ITER. He is currently working on the development of new safety codes for ITER and in the conceptualization of new safety systems for ITER.

Christophe Brechet - LLB International Expert on nuclear accidents at CEA, has been working on the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Dr. Olivier Cauzy - Director at CEA, has been involved in several research projects concerning the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Jean-Marc Clément - International Expert on nuclear accidents at CEA, has been working on the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Maxime Fouquier - has been a Research Engineer at CEA for 5 years. He is currently working on the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Stephanie Gignoux - received her Ph.D. degree from Mines ParisTech, Paris, France, and is currently an Associate Professor at the CEA, Cadarache. She is one of the leaders of the "Long Term Behaviour of Hydride Clays" FP7 project. She has been involved in several research projects concerning the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Eric Harmand - Associate Professor at CEA. He is currently working on the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Michel Henry - Research Director at CEA. He is a nuclear safety specialist with more than 30 years of experience in the field. His expertise concerns the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Jean-Pierre Maley - NEXUS Director at CEA and Professor at ULB, Brussels. He is currently working on the development of advanced fluid models for the CD-CAST software code for more than 20 years, and has been a member of the core technical team of the TEAM/ source code, the most widely used simulation tools for neutronics and multi-scale radiation transport. His expertise concerns the development of advanced software tools for nuclear applications. He is currently working on the development of new CAST tools for advanced fuel cycle and multi-scale simulation platforms and he is leading the team of SEAL project, which aims at developing a 3D neutronics code for advanced reactor design and analysis.

Plant view of ASTRO SFR prototype.
OUTLINE PROGRAMME OF COURSES

For each course technical visits of CEA facilities are planned.

- Reactor Core Physics: Deterministic and Monte Carlo Methods of Gas Fast-cooled Reactor (GFR)
  (C. Dig, J. Tannant, F.K. Vido)
  - Chain reaction and neutron balance
  - Neutron slowing-down and resonance absorption, self-shielding modeling
  - The neutron transport equation and calculation schemes: the steady-state integro-differential transport equation. The neutron diffusion equation. Verification and validation of neutronics code package: process, sensitivity and uncertainty studies
  - The Monte Carlo method for solving the transport equation
  - Monte Carlo techniques: fixed source, variance reduction, criticality, perturbation calculations, adjoint calculation, applications to shielding

- Thermal Hydraulics and Safety
  (D. Bleton, J. M. Bonnet, E. Studen)
  - Basic modeling of two-phase flow
  - Two-phase flow phenomena in LWRs
  - Multi-scale approach of LWR thermal hydraulics
  - System code modelling of reactor thermal hydraulics, including advanced modelling
  - Simulation of LWR design basis accidents
  - Application of two-phase CFD to reactor thermal hydraulic issues
  - Multiphase phenomena and modelling of severe accidents in LWRs
  - Hydrogen risk (production, dispersion, combustion, mitigation)

- Materials for Nuclear Reactors, Fuels and Structures
  (J-L. Brachet, E. Clout, J. Garner, F. Gondal, E. Meslin)
  - Mechanisms of irradiation damage: neutrons, photons, electrons
  - Behaviour of materials under irradiation: ferritic steels for reactor pressure vessel, austenitic stainless steels for internals or fuel cladding (FB), Z alloys for fuel cladding and fuel assemblies (LWR)
  - Fuel materials (UO2, PuO2): irradiation-induced effects
  - Materials for high-temperature conditions: SiC, SiC, low-swelling alloys
  - Materials for fusion: low activation materials, resistance to high-energy neutrons, breeding blankets

- Nuclear Fuels for Light Water Reactors and Fast Reactors
  (D. Pannet, J. Perrot)
  - Nuclear fuels fundamentals
  - Fuel element thermal performance and temperature effects

ABOUT THE SCHOOL

- The National Institute for Nuclear Science and Technology (INSTN) is organizing the International School in Nuclear Engineering, aiming at promoting knowledge in the field of nuclear sciences at a high education level.
- The 2009 edition will offer 6 one-week advanced courses in nuclear engineering to be held in France (Cadarache, Marcoule, or Sadey), in January and February 2009.
- The courses are designed for young researchers, PhD students, post-doctorates and engineers, already having a Master of Science in nuclear engineering as a background. The courses will present the international state of the art in the main topics of nuclear engineering: reactor core physics, thermal hydraulics, materials, fuels, fast cycle, nuclear waste.
- 3 ECTS will be awarded for each successfully completed course (one week).
- Lecturers are internationally known experts mostly from CEA, the leading research organisation in France for nuclear energy.