# Radiation Safety Information Computational Center


**Oak Ridge National Laboratory**
**Post Office Box 2008**
**Oak Ridge, Tennessee 37831-6003**
**Managed by**
**UT-Battelle, LLC**
**for the U.S. Department of Energy**
**under contract DE-AC05-00OR22725**

**phone 865-574-6176 fax 865-241-4046**
**email PDC@ORNL.GOV**
**www http://rsicc.ornl.gov/**

**Timothy E. Valentine, Ph.D. - RSICC Director**

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**"Silence is the ultimate weapon of power." –Charles de Gaulle**

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# CHANGES TO THE RSICC CODE AND DATA COLLECTION

There were two updates to the RSICC catalog for those individuals that may be interested.

## CCC-834/SCALE 6.2

Oak Ridge National Laboratory, Oak Ridge, Tennessee, contributed a new version of the SCALE code system, which is a widely used modeling and simulation suite for nuclear safety analysis and design that is developed, maintained, tested, and managed by the Reactor and Nuclear Systems Division (RNSD) of the Oak Ridge National Laboratory (ORNL). SCALE provides a comprehensive, verified and validated, user-friendly tool set for criticality safety, reactor physics, radiation shielding, radioactive source term characterization, and sensitivity and uncertainty analysis. Since 1980, regulators, licensees, and research institutions around the world have used SCALE for safety analysis and design. SCALE provides an integrated framework with dozens of computational modules, including three deterministic and three Monte Carlo radiation transport solvers selected based on the user's desired solution strategy. SCALE includes current nuclear data libraries and problem-dependent processing tools for continuous energy and multigroup neutronics and coupled neutron-gamma calculations, as well as activation, depletion, and decay calculations. SCALE includes unique capabilities for automated variance reduction for shielding calculations, as well as sensitivity and uncertainty analysis. SCALE's graphical user interfaces assist with accurate system modeling and convenient access to desired results.

SCALE 6.2 provides many new capabilities and significant improvements of existing features.

New capabilities include:

• ENDF/B-VII.1 nuclear data libraries CE and MG with enhanced group structures,

• Neutron covariance data based on ENDF/B-VII.1 and supplemented with ORNL data,

• Covariance data for fission product yields and decay constants,

• Stochastic uncertainty and correlation quantification for any SCALE sequence with Sampler,

• Parallel calculations with KENO,

• Problem-dependent temperature corrections for CE calculations,

• CE shielding and criticality accident alarm system analysis with MAVRIC,

• CE depletion with TRITON (T5-DEPL/T6-DEPL),

• CE sensitivity/uncertainty analysis with TSUNAMI-3D,

• Simplified and efficient LWR lattice physics with Polaris,

• Large scale detailed spent fuel characterization with ORIGAMI and ORIGAMI Automator,

• Advanced fission source convergence acceleration capabilities with Sourcerer,

• Nuclear data library generation with AMPX, and

• Integrated user interface with Fulcrum.

Enhanced capabilities include:

• Accurate and efficient CE Monte Carlo methods for eigenvalue and fixed source calculations,

• Improved MG resonance self-shielding methodologies and data,

• Resonance self-shielding with modernized and efficient XSProc integrated into most sequences,

• Accelerated calculations with TRITON/NEWT (generally 4x faster than SCALE 6.1),

• Spent fuel characterization with 1470 new reactor-specific libraries for ORIGEN,

• Modernization of ORIGEN (Chebyshev Rational Approximation Method [CRAM] solver, API for high-performance depletion, new keyword input format),

• Extension of the maximum mixture number to values well beyond the previous limit of 2147 to ~2 billion,

• Nuclear data formats enabling the use of more than 999 energy groups,

• Updated standard composition library to provide more accurate use of natural abundances, and

• Numerous other enhancements for improved usability and stability.

SCALE 6.2 also includes the AMPX cross-section processing software package that has been developed and maintained at ORNL for more than 40 years and is completely independent of any other cross-section–processing software package. AMPX is used to process ENDF nuclear data evaluations, as well as other data sources that use the ENDF format, to provide nuclear data libraries for use in modern transport code packages. AMPX is primarily used to provide nuclear data libraries for the SCALE code package, but AMPX can be used to produce data libraries that can be used by other transport codes. AMPX provides CE and MG neutron and gamma cross-section data. Also, AMPX provides cross-section uncertainty or covariance data for use with sensitivity/uncertainty analysis tools. Furthermore, AMPX can be used to process ENDF/B evaluations to produce depletion and decay libraries needed by depletion codes such as ORIGEN.

The last major public release of the AMPX code package was in 1992 when AMPX-77 was released through RSICC. In the past few years, the development, maintenance, quality assurance, and deployment of AMPX has been synchronized with SCALE such that the distribution of SCALE 6.2 includes both code systems. As a result, this AMPX release represents the culmination of significant modernization to the cross-section processing code package. Although AMPX and SCALE modernization is still in progress, one of the major objectives of the code modernization effort was to bring AMPX under a formal software quality assurance plan. To achieve this objective, ORNL merged the AMPX software repository (including software configuration control) and build system with SCALE. Merging the AMPX and SCALE development infrastructure offers many advantages with the primary motivation being software quality assurance. The merger also allows AMPX to use the same continuous integration testing that SCALE now uses. Although AMPX and SCALE are now developed under the same infrastructure, both code packages can be distributed together or as separate packages. The combined code package release provides significant modeling and simulation capabilities by allowing users to generate and test nuclear data libraries for their specific radiation transport application needs.

Please visit the Scale website for more information at http://scale.ornl.gov.

This package is distributed on 9 DVDs for Windows, Linux and MacOS systems. Package C00834MNYCP01 includes executables for Linux, MacOS and Windows 7+systems; documentation and sample problems for verification. (See abstract for details). Package C00834MNYCP00 includes the items listed above plus source files and CMake build configuration scripts. Export control regulations restrict the distribution of source code. If restrictions apply, RSICC will send the executable-only version. Please order the package you prefer, and we will

honor your preference if possible. Executables require the Java runtime environment for installation. For compilation Intel ifort, icc and icpc 15, GNU/GCC 4.8.3, CMAKE 2.8.12. Reference: Fortran 90 and C/C++; Windows PCs, Linux, and MacOS X [Package ID: C00834MNYCP00 (source package) and C00834MNYCP01 (executable-only package)].

## CCC-826/SCEPTRE 1.7

Sandia National Laboratories, Albuquerque, New Mexico has contributed SCEPTRE 1.7:

Sandia Computational Engine for Particle Transport for Radiation Effects (SCEPTRE), which is a general purpose C++ code for solving the Boltzmann transport equation in serial or parallel using unstructured spatial finite elements, multigroup energy treatment, and a variety of angular treatments including discrete ordinates and spherical harmonics. SCEPTRE also contains some capability for phase-space finite elements (angle and energy), which should be considered experimental in this release. This capability with be further productized in future releases. The SCEPTRE code remains under active development, containing some well-tested production capability and also some newer, more experimental capability. SCEPTRE has a number of unique features, partially motivated by the application space for which the code was developed, providing for the transport of both neutral and charged particles (photon/electron/positron).

SCEPTRE includes capability for solving the Boltzmann equation using many different numerical and iterative methods and allows for a different transport solver to be used for each energy group, enabling the user to apply the most appropriate methods for accuracy and efficiency for each energy group/particle type in the problem. Either the first-order form of the Boltzmann equation or one of the second-order forms of the Boltzmann equation may be solved. SCEPTRE provides a wave front sweeping algorithm for the first-order form of the transport equation using Discontinuous Finite Elements (DFE). In the wave front sweeps-based solver, the entire source term including the self-scatter source is on the right-hand-side of the equation, the solution for each particle direction is determined independently, and the scattering source term is updated until convergence.

In addition to some bug fixes and code cleanup, Version 1.7 contains a number of new features. A material-mixing capability is available, so that materials from the cross section library may be combined into new materials, and a void material may be defined by specifying a 0-density material. A Transport Synthetic Acceleration (TSA) capability has been added for accelerating source iteration sweeps, which is primarily useful for electron/positron transport applications. The xml parsing has been modified such that all input parameters (energy groups, angle indices, element blocks, …) are 1-based. Coding has been added to enable fixed sources to be written to disc in either binary or netcdf format. Data structures and linear solvers for the Krylov transport solvers have been transitioned from Trilinos Epetra/AztecOO to Tpetra/Belos. This transition will enable access to Trilinos/Kokkos tools for running efficiently on advanced architectures. Finally, adjoint capability has been completed for all of the SCEPTRE solvers.

No executables are included in the package. Requires open source third party libraries Boost, NetCDF and Trilinos. Included in the package are the referenced documentation and source transmitted on CD in tar format. C++, Linux (C00826PCX8601).

# SINGLE-USER LICENSE AGREEMENT REVISED

The single-user license agreement has been revised to address concerns regarding changes in end-use and employment changes of individuals that have received packages from RSICC. In some instances individuals obtain approvals from our Federal regulators for use of software packages for very specific purposes or while employed or associated with specific organizations. To address this concern, the single-user license agreement has been modified to indicate that the license is only valid for the end-use as stated in the Licensee's request and only while associated with the organization under which the request is being made. After February 1, 2015, the individual's single-user license would no longer be valid if they change their end-use or are no longer associated with the organization for which they obtained the original license. In these cases, the individual would need to submit a new request to RSICC for the package for the new end-use or the new affiliation.

# SCIENCE EDUCATION PROGRAMS AT OAK RIDGE NATIONAL LABORATORY

Looking for an internship or post-graduate opportunity at Oak Ridge National Laboratory? The Science Education Programs at Oak Ridge National Laboratory provide paid opportunities for undergraduates, grad students, recent graduates, and faculty to participate in high-quality research alongside world-class scientists to solve real-world problems. Opportunities are available for internships and co-ops, research appointments, and sabbaticals.

You can access all available opportunities through the website at http://www.orau.org/ornl. The Talent and Opportunity System allows you to create a profile, and then answer only 5 or 6 questions for each program or job posting for which you apply.

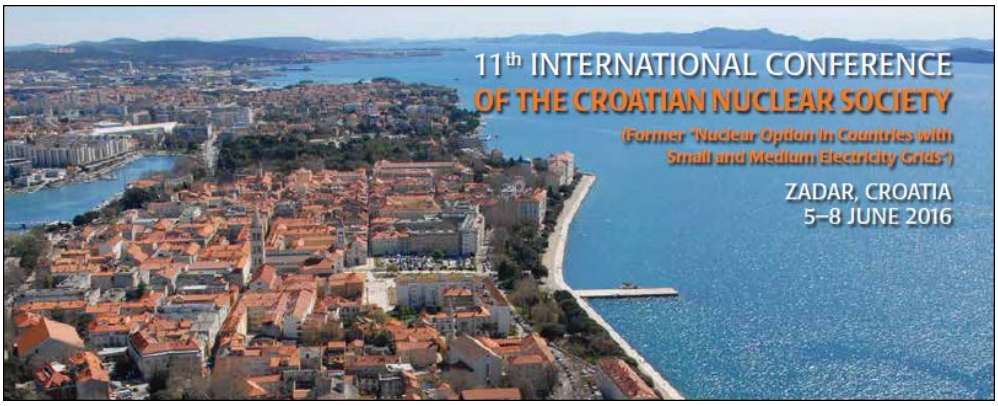
All levels of participants from undergraduates to faculty are encouraged to publish research papers with their mentors. Please browse through the Research Profiles on the different participants and their research experiences at the right hand side of the bottom of the web site listed above. Also, there is a video of research participants at ORNL sharing their thoughts on how access to world-class research facilities and staff has catapulted their careers in science and technology. You can find it on YouTube at http://ow.ly/2EQLz.

# CONFERENCES, TRAINING COURSES, SYMPOSIA

RSICC attempts to keep its customers and contributors advised of conferences, courses, and symposia in the field of radiation protection, transport, and shielding through this section of the newsletter. Should you be involved in the planning/organization of such events, feel free to send your announcements and calls for papers via email walkersy@ornl.gov with "conferences" in the subject line by the 20th of each month. Please include the announcement in its native format as an attachment to the message. Please provide a website address for the event if one is available.

Every attempt is made to ensure that the links provided in the Conference and Calendar sections of this newsletter are correct; however, if the links become unavailable, please call the point of contact for the event.

# CONFERENCES




## HND2016

The next biennial conference organized by the Croatian Nuclear Society will be organized in Zadar, Croatia, **June 5-8, 2016**. With about 200 participants this conference is covering broad range of nuclear energy related topics from science, engineering, environment to economy. All other details are available at http://www.nuclear-option.org/ and https://www.conftool.net/HND2016/.

## ANS Fusion Energy Division

The ANS 2016 TOFE conference will be held in Philadelphia PA, and hosted by the Princeton Plasma Physics laboratory from **August 22-25, 2016**. The theme is "Advancing the Globalization of Fusion Energy Technology."

More information about the conference can be found at: http://tofe2016.ans.org/.

## NENE 2016

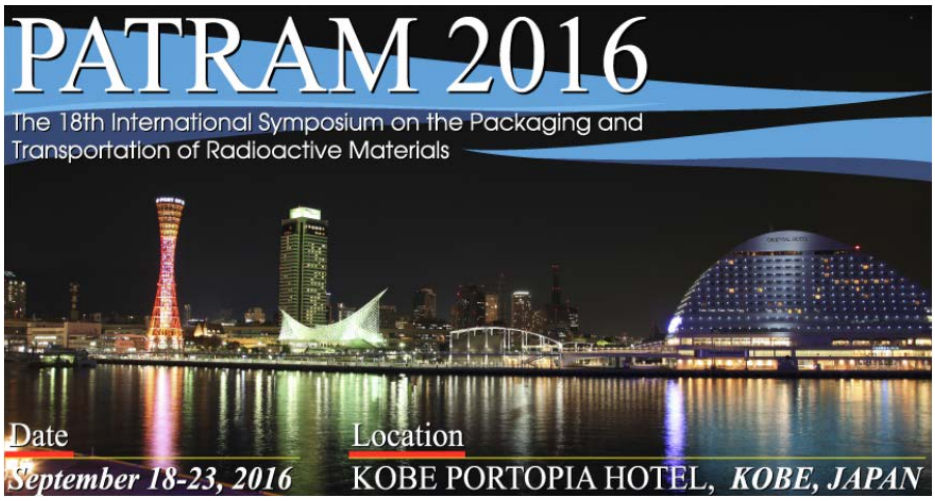
Nuclear Society of Slovenia invites you to attend the traditional already 25th meeting of professionals from nuclear research organizations, educational institutions, nuclear utilities, industrial companies and regulatory bodies, held in the sea resort of Portorož, **September 5-8, 2016**. Special attention will be paid to 50 years of the Slovenian TRIGA reactor and role of research reactors to support nuclear energy. More information is available at www.nss.si/nene2016/ and nene2016@ijs.si.


## ND2016

The next International Conference on Nuclear Data for Science and Technology will be held in Bruges, Belgium, **September 11-16, 2016**. ND2016 is the primary conference for the advancement of nuclear data in the interest of both science and technology. It addresses all important active fields of investigation: fundamental nuclear physics, astrophysics, nuclear energy, nuclear medicine, nuclear non-proliferation, safeguards and arms control. Please see their website for more details: http://www.nd2016.eu/.

## 5th International Conference on Nuclear and Renewable Energy Resources (NURER2016)

The 5th International Conference on Nuclear and Renewable Energy Resources (NURER2016) hosted by Institute of Nuclear Energy Safety Technology, Chinese Academy of Sciences, in Hefei, Anhui, China, from **September 18-21, 2016**. Please see the website for more information. http://nurer2016.org.cn/dct/page/1.




## PATRAM 2016

The 18th International Symposium on Packaging and Transportation of Radioactive Materials (PATRAM) will be held **September 18-23, 2016**, in Kobe, Japan. PATRAM brings together experts from governments, industries and research organizations worldwide to exchange information on all aspects of packaging and transport of radioactive materials around the globe. Please see their website for more details: http://www.patram2016.org/.

ICRS 13
RPSD 2016

October 3|6, 2016
Paris, France

## ICRS 13 RPSD 2016

Paris is honored to host the joint conference 13th International Conference on Radiation Shielding (ICRS-13) & 19th Topical Meeting of the Radiation Protection & Shielding Division of the American Nuclear Society -2016 (RPSD-2016), from **October 3-6, 2016.** This conference explores the scientific, technological and engineering issues associated with particle and ionizing radiation shielding in its broadest context, including nuclear energy systems, accelerator facilities, lasers, space, medical area and other radiation environments. It is one of the premier international events dedicated to this multidisciplinary radiation shielding field, regularly attracting hundreds of the world's top scientists and engineers. For more information, please visit their website: https://fr.amiando.com/icrs13-rpsd2016.html.


## Nuclear Knowledge Management

The Third International Conference on Nuclear Knowledge Management, Challenges and Approaches will be held **November 7-11, 2016** in Vienna, Austria. Detailed information can be found on their website http://www-pub.iaea.org/iaeameetings/50805/Third-International-Conference-on-Nuclear-Knowledge-Management-Challenges-and-Approaches. Please include reference number IAEA-CN-241 in all communications.

# TRAINING COURSES

**Safety Analysis Report for Packaging (SARP)**
**Shielding/Criticality Safety Generalist and Analyst Courses**
**Developed and Conducted by Oak Ridge National Laboratory**

## Radioactive Material Package Shielding Evaluation and Nuclear Criticality Safety Evaluation Training

The U.S. Department of Energy (DOE) Packaging Certification Program (PCP), Office of Packaging and Transportation, is offering Safety Analysis Report for Packaging (SARP) shielding and nuclear criticality safety (NCS) courses for SARP generalists and analysts.

The SARP Generalist Course is designed for project managers, supervisors, NCS/shielding subject matter experts (SME), or SMEs in non-NCS/shielding technical areas (e.g., structural, thermal, package design, etc.) who need to better understand how the NCS/shielding analyses fit in the broader SARP documentation. Specifically, the Generalist Course provides an overview of the regulations and guidelines for the criticality and shielding analysis for a SARP, and the course shows how the NCS/shielding chapters integrate with the other parts of the SARP. Students in the Generalist Course will review an actual SARP document after the course material is presented to emphasize the key elements of the shielding and criticality analyses. The SARP Generalist Course will be held at the National Transportation Research Center, Oak Ridge National Laboratory, Oak Ridge, TN, **June 6-10, 2016**. The registration cost for all students is $2000. Those interested can register for the course at the following website: https://public.ornl.gov/conferences/sarp2016/index.shtml.

The Analysts Course will provide detailed training on the radioactive material package shielding analyses and NCS evaluation fundamentals needed by analysts/practitioners (i.e., safety analysts and/or technical reviewers) to prepare and/or review technical analyses for the SARP documentation. The Analyst Course also provides an overview of regulations and guidelines in addition to detailed in-class exercises associated with the package shielding and NCS analyses. With regard to the in-class exercises, analysis teams will be faced with “staged” SARP examples in which a number of important decision processes in the generation of a SARP will be demonstrated and discussed. The SARP Analyst Course is scheduled for **September 12-16, 2016** at Oak Ridge National Laboratory, Oak Ridge, TN. The registration cost for all students is $2000. Information regarding the course is available at the following website: https://public.ornl.gov/conferences/sarp2016/index.shtml, and registration link.

Please contact the ORNL SARP Course Point-of-Contact if you have questions about the courses. Douglas G. Bowen, Oak Ridge National Laboratory, bowendg@ornl.gov,(865) 576-0315.

MCNP/MCNPX-PoliMi Workshop

*June 21st – 23rd, 2016*

## MCNPX-PoliMi Workshop

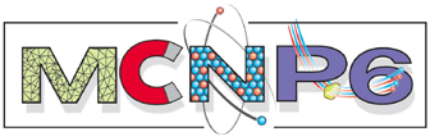
This three-day workshop, to be held **June 21-23, 2016**, at the University of Michigan, will instruct users in the MCNP and MCNPX-PoliMi codes. Day 1 will focus on the basics of MCNP simulations; days 2 and 3 will focus on applications of MCNPX-PoliMi. Full Workshop registration fees are $400 for regular attendees or $150 for student attendees; reduced rates are available for single- or two-day registrants. Seating is limited; therefore, registrations will be accepted on first-come-first-serve basis. Register online: https://www.regonline.com/mcnpxpolimiworkshop2016.
If you have any questions please email clarkesd@umich.edu.

## SATIF-13

## 13th Meeting of the task-force on Shielding Aspects of Accelerators, Targets, and Irradiation Facilities

The 13th meeting of the task force on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF-13) will take place at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) in Dresden, Germany, **October 10-12, 2016**.

Keeping the original spirit of the SATIF Meetings, which have as main objectives the promotion of the information exchange and the international co-operation among experts in the field of accelerator, target and irradiation facilities shielding, we look forward to work with you to make this event an opportunity to progress in our common research field. The web site of SATIF-13 is https://www.hzdr.de/SATIF13.




# LANL MCNP6 Class Schedule for 2016

Website: https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/classinformation.shtml

| Date | Course Name and Description | Cost |
|---|---|---|
| June 2-3, 2016<br>Los Alamos, NM | Using NJOY to Create MCNP® ACE Files & Visualize Nuclear Data<br>Non-US citizens must register by 2016-03-10 \| Thursday 10:00 - Fri 5:00 | $800<br>or $600* |
| June 6-10, 2016<br>Los Alamos, NM | Introduction to MCNP6<br>Non-US citizens must register by 2016-03-14 \| Mon 10:30 - Fri 12:00 | $1800 or<br>$1500* |
| Aug 1-5, 2016<br>Los Alamos, NM | Introduction to MCNP6<br>Non-US citizens must register by 2016-05-09 \| Mon 10:30 - Fri 12:00 | $1800 or<br>$1500* |
| Aug 8-10, 2016<br>Los Alamos, NM | Unstructured Mesh with Attila4MC<br>Non-US citizens must register by 2016-05-16 \| Mon 12:30 - Wed 4:30 | $1000 or<br>$800* |
| Aug 15-19, 2016<br>Los Alamos, NM | Criticality Calculations with MCNP6<br>Non-US citizens must register by 2016-05-20 \| Mon 10:30 - Fri 12:00 | $1800 or<br>$1500* |
| Oct 31 - Nov 4, 2016<br>Los Alamos, NM | Introduction to MCNP6<br>Non-US citizens must register by 2016-08-08 \| Mon 10:30 - Fri 12:00 | $1800 or<br>$1500* |

*** Early payment discount:** A discount of $300 per student is given when the registration payment is received in full at least 4 weeks before the start of class.

*** Classes may be cancelled or postponed if fewer than 8 students register.**
*** Maximum of 15 students per class.**
*** If a class is marked as FULL, CANCELLED, or COMPLETED, then you cannot register for it.**

**Introductory classes** are for those who have little or no experience with MCNP®. This class surveys the features of MCNP® so the beginning user will be introduced to the capabilities of the program, and will have hands-on experience at running the code to solve simple problems. Course topics include Basic Geometry, Source Definitions, Output (Tallies), Advanced Geometry (repeated structures specification), Variance Reduction Techniques, Statistical Analysis, Criticality, Plotting of Geometry and Tallies, and Neutron / Photon / Electron Physics.

**Intermediate workshops** cover the entire spectrum of MCNP®/MCNPX but proceed at a much faster pace and are more in-depth than introductory classes. These workshops are open to new users;

the first day of class is a review of basics. However, the intermediate workshops are targeted toward more experienced users and are more problem solving than lecture classes. Intermediate workshops feature flexible course content, skip topics of least interest to the participants, and provide significantly more depth than introductory classes.

**Advanced classes - Variance Reduction & Criticality** are for people with MCNP® experience who want to extend their knowledge and gain depth of understanding. Most areas of MCNP® operation will be discussed in detail, with emphasis on Advanced Geometry, Advanced Variance Reduction Techniques, and other advanced features of the program. Time will be available to discuss approaches to specific problems of interest to participants. Classes on specific topics are offered when there is sufficient interest.

**NOTE**: While MCNP® supports a number of platforms, LANL class computers are usually Windows based.

More information about the MCNP® courses at LANL is available on their website at https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/classinformation.shtml.

## MCNP6 and Visual Editor Training

Website: http://www.mcnpvised.com/index.html

| MCNP6 Intermediate Workshops 2016 | | |
|---|---|---|
| July 4-8, 2016 | MCNP6 Intermediate Workshop | Prague, Czech Republic |
| August 22-26, 2016 | MCNP6 Intermediate Workshop | Livermore, CA |
| October 17-21, 2016 | MCNP6 Intermediate Workshop | Paris, France |

Intermediate Workshops cover the entire spectrum of MCNP6® but proceed at a much faster pace and are more in-depth than Introductory Classes. These workshops are open to new users; the first day is a review of basics. However, the intermediate workshops are targeted toward more experienced users and are more problem solving than lecture classes. Intermediate workshops feature flexible course content, skip topics of least interest to the participants, and provide significantly more depth than introductory classes.

The list of workshops is tentative, as workshops may be added, removed, or modified throughout the year, depending on user interests. Workshops with fewer than 12 registrants on the early registration date are subject to cancellation or rescheduling.

In order to process non-U.S. citizens by the class date, non-U.S. citizens must register at least 6 weeks prior to the start of the training class. All non-U.S. citizens who reside in countries listed in the U.S. Code of Federal Regulations, Title 10, Part 810.8, are required to register at least 8 weeks prior to the start of the training class. These participants must be processed by the DOE and should not make travel arrangements until approval from DOE has been obtained.

Additional information about the courses can be found at the website, http://www.mcnpvised.com/train.html.

To register send an email to Randy Schwarz at randyschwarz@mcnpvised.com, indicating the workshop of interest to you.

| Visual Editor Classes 2016 | | |
|---|---|---|
| June 27-July 1, 2016 | Beginning Visual MCNP6 | Prague, Czech Republic |
| July 11-15, 2016 | Advanced Visual MCNP6 with Applications in Mesh Tallies and Variance Reduction. | Prague, Czech Republic |
| September 12-16, 2016 | Beginning Visual MCNP® | Las Vegas, NV |
| September 19-23, 2016 | Advanced Visual MCNP6 with Applications in Mesh Tallies and Variance Reduction. | Las Vegas, NV |
| October 10-14, 2016 | Beginning Visual MCNP6 | Paris, France |
| November 7-11, 2016 | Penelope | Las Vegas, NV |

Classes are taught using the most recent (beta) version of the Visual Editor Code. All class attendees must have a valid MCNP®/MCNPX RSICC license. Bring proof of receipt (letter or email) to the class.

The introductory workshops combine teaching on MCNP® basics and how to create MCNP® input files using the Visual Editor. The intermediate Visual Editor workshops focus on more advanced topics such as tallies and variance reduction using the Visual Editor.

Exercises will focus on creating input files and visualizing output data with the Visual Editor. Attendees are encouraged to bring their own input files for viewing and modifying in the Visual Editor; this is particularly important for the intermediate workshop.

The course description and registration information can be found at http://www.mcnpvised.com/index.html.

## NEA Nuclear Energy Agency

These workshops combine teaching by the authors on program physics, along with instructions on how to use the software. The courses include a large number of practical exercises.

Should you be interested in attending, information is available at:

http://www.oecd-nea.org/dbprog/trainingcourses.htm or contact: programs@oecd-nea.org.

The courses scheduled for 2016 will take place at the new address (provided in registration forms). Please note that all attendees must be registered users.

| Date | Class | Course Content | Price | Location |
|---|---|---|---|---|
| May 31-June 2, 2016 | FISPACT-II, Inventory Simulation Platform for Nuclear Observables and Materials Science | Course description<br>register | 600 EUR | Paris, France |
| June 27-July 1, 2016 | Electron-Photon Transport Modelling with PENELOPE-2014, Physics, Code Structure and Operation. | Course description<br>register | 1000 EUR | Barcelona, Spain |

Contact: programs@oecd-nea.org


# SCALE Training Courses – Summer 2016

Training is provided by developers and expert users from the SCALE team. Courses provide a review of theory, description of capabilities and limitations of the software, and hands-on experience running problems of varying levels of complexity.

All attendees MUST be licensed SCALE 6.2 users. SCALE 6.2 is available from ORNL/RSICC in the USA, the OECD/NEA Data Bank in France, and the RIST/NUCIS in Japan. All currently scheduled SCALE Courses are described below.

| Date | Course Name and Description | Location | Cost |
|---|---|---|---|
| August 8-10, 2016 | *Introduction to New Features in SCALE 6.2: This course highlights advancements in SCALE capabilities introduced in SCALE 6.2. The 5-day course is divided into two 2.5-day mini-courses that can be taken independently or as a set.*<br><br>**Mini-course 1: SCALE 6.2 Lattice Physics and Stand-alone Fuel Depletion, Activation, and Source Term Analysis** Topics include the Fulcrum graphical user interface, keyword based user input for ORIGEN that eliminates dependence on the 50-year old FIDO input format, the ORIGAMI tool for simplified characterization of spent fuel, and the Polaris code for advanced and convenient LWR lattice physics analysis. Registration is available for the full week or either 2.5-day mini course. An overview of SCALE 6.2 and introduction to Fulcrum are included in both mini courses. | ORNL<br>Oak Ridge, TN, USA | $1000* |
| August 10-12, 2016 | *Introduction to New Features in SCALE 6.2: This course highlights advancements in SCALE capabilities introduced in SCALE 6.2. The 5-day course is divided into two 2.5-day mini-courses that can be taken independently or as a set.*<br><br>**Mini-course 2: SCALE 6.2 Monte Carlo Calculations and Uncertainty Analysis** Topics include the Fulcrum graphical user interface and the Sampler tool for stochastic uncertainty quantification through perturbation of nuclear data, composition, and/or dimension input to any SCALE sequence. Advancements to the suite of Monte Carlo transport tools will be discussed, including new continuous energy capabilities in Monaco and TSUNAMI-3D, improvements and parallelization of KENO, and new continuous-energy depletion capabilities in TRITON. Registration is available for the full week or either 2.5-day mini course. An overview of SCALE 6.2 and introduction to Fulcrum are included in both mini courses. | ORNL<br>Oak Ridge, TN, USA | $1000* |

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| August 15-19, 2016 | **SCALE Criticality Safety Calculations Course** This course provides instruction on the use of the KENO Monte Carlo codes for criticality safety calculations and is appropriate for beginning through advanced users. KENO V.a is a fast and easy-to-use code that allows users to build complex geometry models using basic geometrical bodies such as cuboids, spheres, cylinders, hemispheres, and hemicylinders. KENO-VI is a 3-D generalized geometry Monte Carlo code that allows for versatile modeling of complex geometries. Both versions of KENO provide convenient, efficient methods for modeling repeated and nested geometry configurations such as lattices. Both versions of KENO use the ENDF/B-VII cross-section data distributed with SCALE to perform either continuous energy (CE) or multigroup (MG) calculations. | ORNL<br>Oak Ridge, TN, USA | $2000* |
| August 22-26, 2016 | **SCALE Sensitivity and Uncertainty Analysis for Criticality Safety Validation Course** Sensitivity and uncertainty analysis methods provide advanced techniques for code and data validation including the identification of appropriate experiments, detailed quantification of bias and bias uncertainty, identification of gaps in available experiments, and the design of new experiments. The TSUNAMI sensitivity and uncertainty analysis techniques in SCALE 6.2 provide the ability to quantify the sensitivity of system responses including keff and reactivity in multi-group and continuous energy modes. SCALE's comprehensive cross-section-covariance data library is applied to these sensitivity coefficients to determine the uncertainty in the system responses due to each nuclide and reaction. The correlation of nuclear data uncertainties between experiments and design systems provides an advanced means of determining bias and bias uncertainty for design and licensing. This 4 1/2-day training class provides a foundation for sensitivity and uncertainty analysis, instructions on the TSUNAMI-1D and -3D sequences for eigenvalue sensitivity analysis, the TSURFER data adjustment tool, and the TSAR tool for reactivity sensitivity analysis. Instruction is also provided in advanced validation techniques that apply sensitivity and uncertainty data in trending analysis as well as generalized linear least squares techniques. Attendees should be familiar with the KENO Monte Carlo code or be experienced SCALE users, although these are not necessary prerequisites. | ORNL<br>Oak Ridge, TN, USA | $2000* |
| August 29 – September 2, 2016 | **SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis Course** Isotopic depletion, activation analysis, and source term characterization using ORIGEN and the new ORIGAMI tool for convenient characterization of used nuclear fuel with radially and axially varying burnup.factors for non-uniform lattices; generation of ORIGEN reactor libraries for spent fuel characterization | ORNL<br>Oak Ridge, TN, USA | $2000* |

***Full-time university students can register at a reduced rate. Both professional and student registration fees are discounted $200 for each course over one. Discount only applies to FULL weeks of training.*

**FOREIGN NATIONAL VISITORS TO ORNL - Important! - All Foreign Nationals** must present passport and visa to ORNL guards upon arrival at the entry portals and ORNL Visitor

Center. Access to ORNL will be denied if you do not have these documents. If you are coming from a country that meets the criteria of the Visa Waiver Program, please have the correct status of Visa-Waiver BUSINESS (either VWB or B-1). You must clearly state to the immigration officer that this is a business visit. You cannot enter ORNL with a Visa-Waiver TOURIST.

For more information regarding these classes, visit their website at http://scale.ornl.gov/training_2016_aug-sept.shtml.

# SYMPOSIA

## 2016 CALENDAR

***May***

**47th Annual Meeting on Nuclear Technology (AMNT 2016)**, May 10-12, 2016, Hamburg, Germany. See website for more information http://www.nucleartech-meeting.com/welcome.html.

***June***

**2016 Society of Nuclear Medicine and Molecular Imaging (SNMMI) Annual Meeting,** June 11-15, 2016, San Diego, CA. More information to follow.

**2016 American Nuclear Society (ANS) Annual Meeting.** June 12-16, 2016. New Orleans, LA.

***July***

**61st Annual Health Physics Society (HPS) Meeting,** July 17-21, 2016, Spokane, WA. See website for more information http://hps.org/meetings/meeting39.html.

***November***

**2015 American Nuclear Society (ANS) Winter Meeting and Nuclear Technology Expo.** November 6-10, 2016, Las Vegas, NV.

# 2017 CALENDAR

***May***

**2017 International Symposium on Reactor Dosimetry, ISRD-16.** May 7-12, 2017, Santa Fe, New Mexico. See website for more information http://reactordosimetry.org.

***June***

**2017 American Nuclear Society (ANS) Annual Meeting.** June 11-15, 2017, San Francisco, CA.

***July***

**62nd Annual Health Physics Society (HPS) Meeting.** July 9-13, 2017, Raleigh, NC.

***October***

**2017 American Nuclear Society (ANS) Winter Meeting and Nuclear Technology Expo.** October 29-November 2, 2017, Washington, DC.