

Suggested Courses for ME Students Interested in Nuclear Engineering:

Technical Electives:

A limit of 6 credits of List #2 technical electives can be used to satisfy the 15 credits of technical electives required to earn a BSME degree. There is no limit in List #1 technical electives. Be sure to consult the current list of approved technical electives for the year in which you plan to graduate to make sure the courses listed below are valid technical electives.

***List #1 Technical Electives:**

NSEG 3145: Fundamentals of Nuclear Engineering. Fall only.

Application of fundamental principles of neutron physics and reactor theory. Introduction to nuclear cross-section data, neutron scattering, nuclear fission, and diffusion theory. Examination of current and next generation nuclear power. Pre: MATH 2214 or MATH 2215H.

NSEG 3146: Fundamentals of Nuclear Engineering. Spring only.

Application of fundamental principles of neutron physics and reactor theory. Calculation of critical mass and dimensions of a reactor using modified one-group theory; reactivity changes in the core due to control rods, chemical boron shim, temperature changes, and fission production poisons. Determination of reactor thermal design criteria. Introduction to radiation protection and reactor accident analysis. Nuclear engineering ethics principles. Pre: NSEG 3145 or ME 3145

NSEG 3604: Radiation Detection & Shielding. Fall Only

Radioactive decay, interaction of charged particles and photons with matter, methods of radiation detection and radiation dosimetry, counting statistics, radiation protection criteria and exposure limits, external radiation protection using time, distance and shielding. Pre: PHYS 2306 Co: MATH 2214

NSEG 4204: Nuclear Fuel Cycle. Spring only.

Uranium nuclear fuel cycle: mining, conversion, enrichment, fuel manufacturing, in-core fuel management and refueling, spent fuel storage, reprocessing/recycling and final disposition as waste in a geologic repository. Introduction to nuclear safeguards and nonproliferation as applied to each step of the cycle. Pre: NSEG 3146

NSEG 5204: Nuclear Fuel Cycle. Graduate standing required. Spring only.

Uranium nuclear fuel cycle: mining, conversion, enrichment, fuel manufacturing, in-core fuel management and refueling, spent fuel storage, reprocessing/recycling and final disposition as waste in a geologic repository. Introduction to nuclear safeguards and nonproliferation as applied to each step of the cycle.

NSEG 5214: Nuclear Plant Systems & Ops. May require Graduate standing. Fall only.

Pressurized and boiling water reactors, detailed system functions and operation, reactor plant startup and shutdown procedures, reactor trip and casualty procedures, reactor transient response analysis, reactor plant licensing, ethics and integrity in the nuclear industry. PRE: NSEG 5114

NSEG 5424: Reactor Thermal Hydraulics. May require Graduate standing. Fall only.

Fundamental processes of heat generation and transport in nuclear reactors. Heat generation by fission and radiation interactions; spatial distribution of heat generation; heat transport by conduction and convection. Effects of boiling and critical heat flux. Fundamentals of reactor thermal and hydraulic design. Pre: NSEG 5114

MSE 4384: Nuclear Materials. Fall only

radiation effects on materials; material properties relevant to structural, moderator, reflector, blanket, coolant, control shielding and safety systems; processes such as nuclear fuel cycles, fuel enrichment and reprocessing; and related structural systems. Pre: (MSE 3044 or ME 3304), (MSE 3054 or ESM 3054 or ME 3614).

*Other Nuclear Engineering courses will be available as part of a new nuclear engineering minor being developed by ME faculty members. For more information, please contact Mark Pierson at mark.pierson@vt.edu.