NUCLEAR ENGINEERING

The State of South Carolina has significant involvement in the nuclear industry. Some 56% of South Carolina’s electric power generation comes from nuclear power. Within a 120 mile radius of the State’s capital city of Columbia, eleven large commercial nuclear power plants provide more than 10% of the nation’s nuclear generated electricity. One of the world’s largest commercial nuclear fuel fabrication facilities is located just a few miles south of Columbia. In the western part of the state just ninety miles from Columbia is the large US government nuclear complex at the Savannah River Site. Adjacent to the Savannah River Site is the low level nuclear waste site at Barnwell. In the southern part of the state, at Charleston, is the Navy Nuclear Power School. Because of this industry, there is considerable demand for nuclear engineers in South Carolina. With projected growth in the future, the demand for qualified nuclear engineers will be unprecedented.

The field of nuclear engineering, and in particular, nuclear electric power generation, is experiencing a rebirth. Reliable and affordable electricity is the backbone of the nation’s economy and national security. The US Government has issued a National Energy Policy in which it is currently projecting an increase of nuclear generating capacity of 60,000 megawatts by the year 2020 in order to maintain diversity in the national energy portfolio. This translates to approximately five new large nuclear plants a year being brought on line starting in the year 2010. To maintain this schedule, ordering of new plants must commence during the year 2003. Additionally, the US Department of Energy is endorsing nuclear power as the preferred energy source for hydrogen production, which is the clean combustible fuel of the future particularly for the automotive industry. To support this growth, the US Congress has under consideration a call for the revitalization of the nuclear power infrastructure in this country. Not only is Congress concerned about the increased energy production, but so is the electric power industry at large.

PURPOSE AND OBJECTIVES

The purpose of the graduate program in Nuclear Engineering is to educate engineers who will develop and manage the resurgent nuclear industry in research, design, and operation.

The program objectives are to develop graduate-level engineers who have the ability to lead and sustain the future growth of the nuclear industry, to develop new concepts of reactor design, fuel management and waste management, and to develop non-traditional applications of nuclear energy.

DEMAND FOR NUCLEAR ENGINEERING GRADUATES

Studies carried out by the Nuclear Engineering Department Heads Organization (NEDHO) have shown a major imbalance between the number of nuclear engineering students and the positions available. For the BS/MS level the projected supply of graduating students for 2003 is 174 versus 642. To counter this shortage, the federal government is undertaking extensive programs to support graduate students in the nuclear field.

From power generation, to agriculture, to medicine, to space exploration, the opportunities for nuclear engineers are broad and the need is great.

EARNING POTENTIAL

Nuclear engineers have a very high earning potential compared to engineers in other fields. Statistics from the United States Bureau of Labor indicate that in 1999 the median annual salary for nuclear engineers was $74,600. The top 25 percent earned a median
annual salary of $87,090, and the highest 10 percent earned an average of more than $105,000 per year. As a whole, nuclear engineers tend to earn more than engineers in any other field except petroleum engineering across all degree levels.

LEADING THE WAY

There is no other graduate program in Nuclear Engineering within the state of South Carolina. We believe that the projected demand for qualified nuclear engineers justifies the development of a nuclear engineering graduate program to serve personnel needs and to place South Carolina in a leadership position. This belief is strongly endorsed by the USNRC. To assure that the nuclear engineering graduate program is at the forefront of cutting edge technology, the Mechanical Engineering department has established a Nuclear Advisory Board whose members reflect the strong partnership that exists between the Nuclear Industry, the US Government and the University of South Carolina.

The field of nuclear engineering offers unique choices and challenging opportunities that one would not find in any other field.

ENROLLMENT

Applicants to the graduate program in Nuclear Engineering are expected to have a baccalaureate degree in engineering, computer science, or physics with at least a 3.00 GPA.

Applicants to all degree programs should visit the Graduate School’s website for information on admission requirements.

All graduate nuclear engineering courses will be made available through the University of South Carolina Distance Learning Program called APOGEE (A Program Of Graduate Engineering Education). Students who have full time employment and/or live some distance from the University campus, will be able to access all video streamed course material at any time, and at any place through the internet; for those who prefer, video tapes will also be available.

Students who wish to take selected courses, either as a part of a professional development program, or for graduate credit at a later date, may enroll in Nuclear Engineering courses as non-degree students.

CURRICULUM

For both the Master of Science and Master of Engineering degrees, the following list of courses will constitute a required core.

- EMCH 552 - Introduction to Nuclear Engineering*
- EMCH 555 - Instrumentation for Nuclear Engineering
- EMCH 555L - Nuclear Instrumentation Laboratory
- MATH 521 - Boundary Value Problems and Partial Differential Equations
- EMCH 757 - Radiation Shielding

Elective courses sufficient to give a total of 24 hours for the Master of Science degree and 30 hours for the Master of Engineering degree are to be chosen from the following list. Students working toward the MS degree will also take six hours of thesis preparation leading to a master’s thesis.

- EMCH 553 - Nuclear Fuel Cycles
- EMCH 571 - Advanced Heat Transfer
- EMCH 755 - Advanced Nuclear Engineering
- EMCH 756 - Safety Analysis for Energy Systems
- EMCH 758 - Nuclear Reactor Systems
- EMCH 759 - Waste Management in the Nuclear Industry*
- EMCH 791 - Selected Topics in Thermal Systems (Thermal Hydraulic Design of Nuclear Reactors)*
- EMCH 792 - Nuclear Materials
- ECHE 705 - Chemical Processes in Nuclear Engineering
- ECHE 720 - Advanced Fluid Flow Analysis
- ECHE 722 - Advanced Mass Transfer

* Courses offered Fall 2003.

Students working toward the PhD degree will take a minimum of 18 hours of graduate courses beyond the master’s degree and 12 hours of dissertation preparation leading to a dissertation based on independent research.

SCHOLARSHIPS AND FELLOWSHIPS

Successful full-time students can be supported on scholarships or fellowships from NANT, NEI, DOE or NSF. Additionally, there are numerous opportunities for internships in the nuclear industry.

USEFUL LINKS

- International Energy Agency (http://www.iea.org)
- US Department of Energy (http://www.energy.gov)
- International Atomic Energy Agency (http://www.iaea.org)
- Nuclear Regulatory Commission (http://www.nrc.gov)
- American Nuclear Society (http://www.ans.org)
- Nuclear Energy Institute (http://www.nei.org)

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