Master of Nuclear Engineering Traineeship Program

Paul J. Turinsky, Kuruvilla Verghese
North Carolina State University

INTRODUCTION

One of the recommendations that appears often from recent national discussions on reshaping graduate education in science and technology[1,2] is to provide joint industry-university projects as part of the students' preparation. Many institutions are starting to do this particularly as a part of masters degree programs.

Since 1981, the NCSU Department of Nuclear Engineering has offered a masters degree that requires a combination of graduate course work and an engineering project of current interest to industry. The degree awarded is a Master of Nuclear Engineering (MNE). This differs from the Master of Science thesis work which is research oriented. Around 1983, an industry-funded MNE Traineeship Program was initiated to both provide financial support for the MNE graduate students and to enhance the relevance and quality of the engineering projects. The MNE Traineeship Program has been quite successful and is being continued at the rate of about three students per year.

This paper reports on the structure of the MNE Traineeship Program and an assessment of the benefits to the trainees, the sponsoring institution and the NCSU Department of Nuclear Engineering.

MNE DEGREE AND THE TRAINEESHIP PROGRAM STRUCTURE

Normally an MNE graduate student will take a total of twenty four credit hours of course work, with nine of these credit hours required to be in courses constituting a minor. Additional six credit hours are associated with completion of an engineering project, summing to a total of thirty credit hours for the MNE degree. The course program for the MNE degree is somewhat more structured than for the MS degree. Also, admission to the MNE program requires an engineering baccalaureate degree while MS students often come from physical science disciplines. The engineering project required for the MNE can be either experimental or analysis based, in either case involving solution of a practical problem of current industrial interest. This is in contrast to the MS thesis which is based on original research. Upon completion of the engineering project, a written technical report is presented to the student's graduate committee and it is defended in an oral examination. A total of 53 MNE degrees have been awarded so far.

Since its creation in 1983, the MNE Traineeship Program has been continuously supported by the nuclear power industry. More recently and to a lesser extent, the Department of Energy national laboratories

have also chosen to support it. MNE trainees typically complete the degree requirements over a fifteen to eighteen month period. The traineeship starts with a two-month assignment during the first summer at the sponsor's site from June 15-August 15. The site, in most cases, has been the engineering staff offices, but some sites have been manufacturing facilities. There the trainee begins to work on his/her engineering project. Advising is completed jointly by a sponsor's engineer and a nuclear engineering faculty member from NCSU. A brief summary report is required at the completion of this summer assignment, which serves as the basis for awarding two credit hours and assigning a grade. During the fall and spring semesters following the first summer assignment, the MNE Trainee attends graduate courses on campus. To obtain the total of twenty four course credit hours required, this implies a course load of twelve credit hours per semester. Graduate students on normal half-time graduate assistantships take nine credits per semester. Since the MNE student has no work obligations while on campus, the 12 credits per semester course load is demanding but manageable. After completion of the spring semester, the MNE Trainee returns to the sponsor's site for four additional months (May 15-September 15) to again work on the engineering project. Ideally this work is a continuation of the first summer's project work, which occurs in most cases. At the conclusion of the four month assignment, the MNE trainee completes his/her project report and orally defends it on campus to the trainee's Graduate Committee. This committee is chaired by the trainee's faculty advisor, with the sponsor's advisor serving as a committee member along with a minimum of two other faculty members, one of them chosen from the minor field. An additional four credit hours is awarded for the second summer assignment based upon the successful completion of the engineering project. Twenty five MNE trainees have been awarded degrees since its inception.

BENEFICIAL ASPECTS OF THE MNE TRAINEESHIP PROGRAM

The Traineeship Program has been beneficial for all parties concerned: the student, the NCSU Department of Nuclear Engineering and the sponsoring organization. Of the 25 MNE trainees, 22 were sponsored by the nuclear industry and three by a national DOE laboratory. 17 of the graduates accepted employment with nuclear utilities or reactor vendors, four were employed by the Department of Energy, one works with a software development company and the remaining three continued their education. Among the latter, two received their Ph.D. Of these, one is on the faculty at a university and one is employed by an R&D company. The benefits to the MNE trainee are self-evident in terms of better employment prospects and to the sponsoring agency, in terms of employing a tested individual. However, there are many additional benefits derived form the program, as summarized below:

1. The key academic advantage to the student is that he/she gets to work on an engineering project that is relevant to engineering practice.
2. The resources of the sponsor, which include personnel, test facilities and computer software, provide a basis where much can be accomplished in a very short period of time.
3. From the sponsor's perspective, in return for their financial contribution they receive six months of support by the trainee. Given current BS/Master starting salaries and associated fringe benefit costs, the sponsor's cost of about $25,000 is equitable.
4. Additionally, in many cases the sponsor obtains the expertise of the MNE Trainee's faculty advisor at no additional cost.
5. To the University's benefit, the faculty advisor has the opportunity to interact with practitioners which can lead to future interactions via consulting and sponsored research.

6. These interactions can be of mutual benefit in that in more recent years MNE trainees have been utilized to transfer technology, that has originated on campus as a result of sponsored research, to the MNE Trainee's host organization.

Even though no employment commitment is made by either the MNE Trainee nor sponsor, the two summer assignments provide each party with an opportunity to evaluate each other. In a number of cases the sponsor has elected to offer the MNE Trainee a permanent position at the conclusion of the program. If this does not occur or the MNE Trainee declines such an offer, the summer assignments make the trainee very attractive to other potential employers.

As noted above, the current cost of sponsoring an MNE Trainee is about $25,000. These funds are used to pay the student's stipend and tuition, in addition to a modest relocation allowance for the stays at the sponsor's site. Stipend payment is uniform throughout the assignment whether at the sponsor's site or on campus. The implication is that the trainee is never a temporary employee of the sponsor, which can raise some interesting issues related to liability while on the sponsor's site. Formally, an MNE Traineeship is handled as a contract between the sponsor and NC State University.

The MNE Traineeship Program is seen as highly worthwhile by the sponsors, the Department faculty, and the students. It continues and likely will continue in the foreseeable future in spite of the lull in nuclear power plant orders.

REFERENCES

1. Reshaping the Graduate Education of Scientists and Engineers, p.78, National Academy Press, Washington D. C., 1995.
2. "Careers 95: The Future of the Ph.D.", p. 129, Science, v. 270,6 October, 1995.

BIOGRAPHICAL INFORMATION

PAUL J. TURINSKY is Professor of Nuclear Engineering at NCSU. He also is Faculty Coordinator of the Interdisciplinary Graduate Program in Computational Engineering and Sciences and Technical Director of the Nuclear Program Area of the NCSU Electrical Power Research Center. He received his Ph.D. from the University of Michigan.

KURUVILLA VERGHESE is Professor of Nuclear Engineering at NCSU. He also is Graduate Administrator of the Department of Nuclear Engineering. He received his Ph.D. from Iowa State University.

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