“MNE-ACCEND” – An Integrated Nuclear and Mechanical Engineering Educational Program for the New Millennium

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1. Introduction

“MNE-ACCEND” is an acronym for the newly initiated University of Cincinnati Mechanical and Nuclear Engineering ACCelerated ENgineering Degrees Program. MNE-ACCEND is an integrated 5-year academic program leading to a BS degree in mechanical engineering and an MS degree in nuclear engineering. The combination of two degrees in a compact time frame, coupled with the experience gained through cooperative education has been a strong selling point for the MNE-ACCEND program.

The MNE-ACCEND Program has the following goals:

- To create a means by which a select group of highly motivated, well-qualified students can earn a BS-ME degree and an MS-NE in five calendar years.
- To increase the versatility, visibility and attractiveness of UC’s ME program at local, regional, and national levels, while also increasing the number of students entering the ME Program by ~15 additional new students yearly.
- To develop a pipeline of talented and motivated students feeding into the UC Nuclear and Radiological Engineering (UCNRE) Graduate Program.
- To position the UCNRE Graduate Program into a leadership position in addressing the forthcoming growing demand for ~90,000+ skilled new workers in the nuclear industry projected in the next decade.

2. General Features

MNE-ACCEND students have five, one quarter Co-op sections – one less than in the standard UC engineering curriculum. Limiting the number of Co-op quarters to five, allows one additional on-campus academic quarter before MNE-ACCEND students receive their BSME degree. While co-oping, MNE-ACCEND students take one UC class each quarter using distance-learning techniques with support before and after the co-op quarter from UCNRE Program Faculty.

Except for one class, MNE-ACCEND students take all of their “name-specified” ME courses in the sequence specified in the standard undergraduate ME curriculum and receive their BSME degrees with ME classmates in June of their senior year. At that time they will also have completed almost all of the class work required for the MSNE.

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MNE-ACCEND students are able to complete all of the MSNE degree requirements at the end of their post-BSME summer quarter – five calendar years after entering UC -- by doing the following:

- Enrolling into one additional academic quarter while an undergraduate.
- Taking five distance-learning courses while on co-op sections.
- Registering for the summer quarter following their BSME degree

The specific details of how the foregoing is accomplished are described in the following sections.

In consonance with College policy, MNE-ACCEND students will be required to participate in a mandatory co-operative educational program. Co-op professional practice assignments will be at National Laboratories, Nuclear Power Plants, or various nuclear industry vendors and will have a mechanical-nuclear engineering orientation. The normal length of the MNE-ACCEND co-op program [for “on schedule” students] is five quarters.

Students for the MNE-ACCEND program are recruited from well-qualified and well-motivated high school graduates and first year ME program students who have previously expressed an interest in the program.

Admission to the MNE-ACCEND program is competitive and most students will be eligible for Cincinnati Scholarships. Many students are also expected to be eligible for scholarship awards from the National Academy for Nuclear Training [NANT] and the American Nuclear Society [ANS].

3. Program Specifics

1. Specific features of the program are:

- MNE-ACCEND students will be designated as “MNE-ACCEND” students and register for the NE ACCEND seminar series during the Winter and Spring Quarters of their freshman year. The seminar sessions will be designed to provide awareness of current issues in nuclear engineering.
- BSME degree awarded at the “usual” time: 4-3/4 calendar years after entering UC.
- Standard “alternating term” co-op program of five quarters duration.
- MNE-ACCEND students spend a total of two more quarters on the UC campus than standard curriculum ME students [one as an undergraduate, Year 4, Winter or Spring Quarter, and one after receiving their BSME degree, Year 5, Summer Quarter].
- MNE-ACCEND students take no courses for graduate credit until Years 4 and 5.

2. MNE-ACCEND students take all of the “name-specified” courses in the undergraduate MECH curriculum in the normal sequence -- with the sole exception of an Introduction to Metallurgy class which is delayed from the Autumn Quarter of the Sophomore Year to the Autumn Quarter of the Senior Year.

3. Co-op assignments are nuclear-oriented, ME-qualified assignments. Nuclear Power Plant and National Laboratory engineering aide positions will be the norm. Other types of assignments will be considered on a case-by-case basis.

4. MNE-ACCEND students take five 3-credit NE courses for undergraduate credit during their first “three plus” years in the program. [The fifth course is either in the Summer Quarter of Year 3 or the Autumn Quarter of Year 4, depending on co-op section]

- The courses fulfill the BSME 12 credit technical elective requirement and three credits of the BSME guided elective requirement.
- The first required NE class, Introduction to Nuclear Engineering, is taken on-campus during the first quarter of the second academic year.
- The other four undergraduate NE classes will be delivered using a mixed-mode distance learning technology, permitting MNE-ACCEND students to take these courses while they are on co-op sections.
- Credit for a total of five NE courses taken for undergraduate credit will qualify the ME students for a nuclear engineering minor certificate and an appropriate entry on their transcript.

5. The combination of one more on-campus undergraduate quarter and the distance learning classes taken during co-op quarters creates “open slots” in the standard ME curriculum. The “open slots” in the on-campus schedule are used to

- Move forward senior-year ME elective class requirements
- Move forward “Breadth of Knowledge” [BoK] elective classes to the junior year
- Permit MNE-ACCEND students to take 4 graduate NE classes during their fourth year
- Permit MNE-ACCEND students to take 6 graduate NE classes during their senior year

6. With the approval of student’s academic advisor, taking graduate ME, IE, or Math classes may satisfy two of the graduate course requirements.

7. During the fifth co-op quarter, at the end of their fourth year, MNE-ACCEND students begin their MS project and register for three graduate credits of MS Thesis Project Research. The research will probably be on a topic of technical interest to the student’s co-op employer. An advising team that includes at least one UCNRE faculty will closely supervise the research.

8. MNE-ACCEND students graduate with their ME classmates in June of their senior year with a BSME degree.

9. Limiting the number of Co-op quarters to five allows one additional on-campus academic quarter before MNE-ACCEND students receive their BSME degree. The combination of

- One additional academic quarter while an undergraduate
- Five courses taken while on co-op section
- Registering for the summer quarter after receiving their BSME degree

make it possible for MNE-ACCEND students to complete all of their MSNE degree requirements at the end of their post-BSME summer quarter -- with an elapsed time of five calendar years since their enrollment at UC.

10. During the summer after receiving their BSME, MNE-ACCEND students enroll for one quarter as full-time graduate students. The primary objective during this quarter is for the students to complete their MSNE thesis project.

5. Co-Op and Academic Schedules

MNE-ACCEND Quarterly Sequences for Co-op Sections 1 and 2 are shown in Figures 1 and 2. Except for the deletion of one co-op quarter, the sequences follow the UC College of Engineering standard sequence – with the sole exception of the junior year when winter/spring co-op quarter is replaced by an academic quarter. A positive aspect of the Sequences is that, except for the fourth year Summer Quarter, the Section 1 and Section 2 Co-op Quarters alternate, thus permitting two students to provide a co-op employer with continuous coverage.

MNE-ACCEND students take one distance learning class during each of their five co-op quarters [~15 Academic credits]. Four of the “DL” classes will follow the conventional format. The fifth class, during the last co-op quarter, is three credits of MS Thesis Project Research which will be closely supervised by an advising team that includes at least one UCNRE faculty.

The Internship in summer of the first year is optional. The program faculty expects that most students who seek this option can be placed [with faculty assistance] at nuclear industry locations. Other options are for MNE ACCEND students to take the summer off – as they do in most other UC undergraduate engineering programs – or to attend summer school enhance their academic standing.

The MNE-ACCEND academic program has the features described in the foregoing sections and is described in detail on the MNE-ACCEND Web site. The URL for the Web site is:

<http://www.eng.uc.edu/prospectivestudents/accend/mne/>

THE MNE-ACCEND QUARTERLY SEQUENCE

Co-op Section 1 Schedule

	Autumn	Winter	Spring	Summer	
First Year	SCHOOL Freshman	SCHOOL Freshman	SCHOOL Freshman	INTERN + Sophomore	
Second Year	SCHOOL Sophomore	CO-OP + Sophomore	SCHOOL Sophomore	CO-OP + Pre-Junior	
Third Year	SCHOOL Pre-Junior	CO-OP + Pre-Junior	SCHOOL Pre-Junior	CO-OP + Junior	
Fourth Year	SCHOOL Junior	SCHOOL Junior	SCHOOL Junior	 CO-OP + Senior	
Fifth Year	SCHOOL Senior	SCHOOL Senior	SCHOOL Senior	 SCHOOL Graduate	
Total Quarters			SCHOOL 14	CO-OP + 5	INTERN + 1

Figure 1. Quarterly Sequence for Co-op Section 1

THE MNE-ACCEND QUARTERLY SEQUENCE

Co-op Section 2 Schedule

	Autumn	Winter	Spring	Summer	
First Year	SCHOOL Freshman	SCHOOL Freshman	SCHOOL Freshman	INTERN + Sophomore	
Second Year	SCHOOL Sophomore	SCHOOL Sophomore	CO-OP + Sophomore	SCHOOL Pre-Junior	
Third Year	CO-OP + Pre-Junior	SCHOOL Pre-Junior	CO-OP + Pre-Junior	SCHOOL Junior	
Fourth Year	CO-OP + Junior	SCHOOL Junior	SCHOOL Junior	 CO-OP + Senior	
Fifth Year	SCHOOL Senior	SCHOOL Senior	SCHOOL Senior	 SCHOOL Graduate	
Total Quarters			SCHOOL 14	CO-OP + 5	INTERN + 1

Figure 2. Quarterly Sequence for Co-op Section 2

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6. Program Enrollment

Beginning in Autumn 2003, MNE-ACCEND applicants were recruited from high school seniors and first year ME students. Applicants were admitted to the program on a competitive basis. More than 25 incoming ME students expressed an interest in the program. As of January, 2004, ten students have been admitted to the program – two more than the first year target enrollment.

After an initial shake-down/break-in period, the target steady state enrollment goal is to admit fifteen MNE-ACCEND students every year. Assuming normal attrition rates, after eight years the enrollment reaches an average steady state value of about 60 students.

Biographical Information

JOHN CHRISTENSON is the director of University of Cincinnati Nuclear & Radiological Engineering Program. He has also been a staff member at Argonne National Laboratory, a Ford Foundation Industrial Resident at the Prairie Island Nuclear Power Plant and a visiting Scholar at the Halden Nuclear Reactor Project.

G. IVAN MALDONADO is an Associate Professor in the University of Cincinnati Nuclear & Radiological Engineering Program. Most recently a Technical Program Manager with GE Nuclear Energy / Global Nuclear Fuel, and formerly an Assistant Professor at Iowa State University, Dr. Maldonado has worked as a core designer for the GE Knolls Atomic Power Laboratory and as a Visiting Research Scientist with Electricité de France in Paris.

EUGENE RUTZ is director of Distance Learning And Professional Development in the College of Engineering at the University of Cincinnati. Mr. Rutz has worked in industry as a mechanical design engineer and nuclear engineer. His academic experience includes program development, engineering and educational research, and teaching.

HENRY SPITZ is the Health Physics Program Director and the Graduate Studies Director for Mechanical, Industrial and Nuclear Engineering Department. At UC, Dr. Spitz has established the Laboratory for Radiological Assessment and Measurement which emphasizes development of applied techniques for measurement and calibration of radiation detection equipment, *in vivo* measurements, and measuring the effects of the natural radiation environment.