COURSE PROFILE

Degree Program: Nuclear Engineering and Radiological Sciences **Date: May 2017**

Prepared by: Sara Pozzi

COURSE #: NERS 554/ 4 CREDITS/ SELECTIVE	**COURSE TITLE:** Radiation Shielding Design
TERMS OFFERED: Winter	**For each prerequisite below, "E" denotes Enforced and "A" denotes Advised.**
TEXTBOOKS/REQUIRED MATERIAL: **MCNP 5, MCNP X, MCNP-PoliMi**	**PREREQUISITES:** NERS 441 or NERS 484 (A)
INSTRUCTOR(S): Pozzi	**COGNIZANT FACULTY:** Pozzi, Clarke
CoE BULLETIN DESCRIPTION: Neutron and photon transport using Monte Carlo and analytical methods. Student groups participate in a semester-long project to design radiation shields, collimators, sources, and detectors for a variety of applications, including space, medical, and security. Project results include a feasibility study, dosimetric assessments, detector response functions and materials selection; final designs are also subject to realistic constraints and engineering standards.	**COURSE TOPICS:** Design process, characterization of radiation fields, radiation dose to biological systems and electronics, radiation shielding design, regulatory constraints & ALARA, radiation interactions of interest in energy degradation, secondary radiation generation, detector response functions, Monte Carlo, tallies, variance reduction techniques, manufacturability, activation and disposal of materials, facility impacts & constraints, competing needs.
COURSE STRUCTURE/SCHEDULE Lecture: 2 per week @ 80 minutes; Discussion: 1 per week @ 1 hours	

COURSE OBJECTIVES	1	To have students approach open ended problems in radiation shielding and radiological sciences
	2	To have students work in groups of 3-6 members and develop team management skills
	3	To reinforce students' understanding of radiation fields and radiation interactions
	4	To introduce students to the ideas of Monte Carlo radiation transport and to production codes
	5	To have students analyze a system subject to realistic constraints, engineering standards, and competing requirements
	6	To have students design or optimize a radiation shield or other radiological engineered system subject to realistic constraints
	7	To have students question the fundamental purpose of an engineered system, and its long-term impact
	8	To have students practice and improve their written and oral communications skills
COURSE OUTCOMES [] links to the Departmental Student Educational Outcomes	1	Students will be able to use a production Monte Carlo code to model fixed source radiation systems and usefully interpret the results [1,2,3,4,5,6,9,10]
	2	Students will be able to work in groups and delegate work among the group members. [6,7]
	3	Students will be able to explore an open-ended problem in radiation shielding design or analysis [2,3,4,5,9,10,11]
	4	Students will be able to design a radiation shield or other radiological engineered system to meet realistic constraints [3,4,5,9,10,11]
	5	Students will be able to describe the social benefit of their work, and to consider its long term impact on society and the environment [8,9,10,11]
	6	Students will be able to professionally communicate in both written and oral form [6,7,11]
ASSESSMENT TOOLS assess all Course Outcomes	1	Individual and group exercises with written and oral reports
	2	Oral progress reports presented to class
	3	Written final report
	4	Oral final report presented to class and a public forum
	5	Workload evaluation providing self-assessment of shared load in group
	6	Standard course evaluation as well as a specific course-oriented evaluation testing the success of realizing the course objectives and outcomes.

Revision History: September, 1998; May, 2005; June, 2010; May 2017