COURSE #: NERS 471; **CREDITS:** 3/Elective	**COURSE TITLE:** Introduction to Plasmas
TERMS OFFERED: Fall	**For each prerequisite below, "E" denotes Enforced and "A" denotes Advised.**
TEXTBOOKS/REQUIRED MATERIAL: Chen, *Introduction to Plasma Physics and Controlled Fusion*, 2nd E	**PREREQUISITES:** Preceded by Phys 240 or equivalent (A)
INSTRUCTOR(S): John Foster	**COGNIZANT FACULTY:** Foster, Gilgenbach
CoE BULLETIN DESCRIPTION: Single particle orbits electric and magnetic fields, moments of Boltzmann equatio introduction to fluid theory. Wave phenomena in plasmas. Diffusion of plasma in electric and magnetic fields. Analysis laboratory plasmas and magnetic confinement devices. Introduction to plasma kinetic theory.	**COURSE TOPICS:** Introduction to plasmas (4h); Fusion reactions (4h); Cross sections of fusion vs scattering (5h); Reaction rates, power generation vs losses (5h); Single particle orbits in electric and magnetic field (9h); Fluid theory of plasmas (8h); Plasma waves (10h); Diffusion (6h)
COURSE STRUCTURE/SCHEDULE Lecture: 2 per week @ 90 minutes each	
COURSE OBJECTIV For each Course Objective, links to the Program Educational Objectives are shown	1. To teach students the basic properties that define a plasma [1,2] 2. To teach students single particle motions in electric and magnetic fields [1,2] 3. To teach students collective interactions in a plasma [1,2,3] 4. To teach students macroscopic and microscopic properties of a plasma [1,2] 5. To teach students transport processes in a plasma [1,2,3] 6. To teach students the basics of thermonuclear fusion [1,2,3] 7. To apply fundamental concepts to understand major properties of various plasma devices [1,2,3] 8. To teach student the various applications of plasma technology [1,2]
COURSE OUTCOME For each Course Outcome, links to The Program/ABET Student Outcomes are shown [#,a-k]	1. Demonstrate a working knowledge of charged particle motions in plasma devices [1,2|ABET a,k] 2. Demonstrate a fundamental understanding of plasma concepts such as charge neutrality, long range interaction, plasma sheath [1,2|ABET a,k] 3. Analyze various modes of oscillation in a plasma [1,2,3|ABET a.k.e] 4. Demonstrate a working knowledge of electromagnetic waves in a plasma and use the waves as diagnostic [1-4|ABET a,k,e,c] 5. Estimate global properties, such as electrical conductivity and transport coefficients, from microscopic processes in a plasma [1,2,3,4|ABET a,k,e,c] 6. Understand the hierarchy of plasma description: kinetic, two fluid, and single fluid; and the conditions under which they apply [1,2,3,4|ABET ak,e,c] 7. Describe qualitatively the major challenges that are encountered in both magnetic and inertial confinement [1,8|ABET a,h] 8. Describe the various applications of plasma technology in the modern world [1,8,10,11|ABET a,h,i,j]
ASSESSMENT TOOI For each assessment tool, links to the Course Outcomes are identifie	1. A combination of during-term test(s) and/or final examination will be used to measure all outcomes for individual students under a time constraint. 2. Problem sets, ranging from routine to project like, measure all outcomes under less time pressure and with student collaborations.

	3. Course evaluation by each student at the end of the course assesses all outcomes. 4. Faculty self-assessment provides self-assessment data on all outcomes.

Revision History: September, 1998; December 2003; August 2005; October, 2006; October 2010