George Mason University
Graduate Course Approval / Inventory Form

Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete the Coordinator Form on page 2, if changes in this course will affect other units.

Please Indicate

X NEW

MODIFY

DELETE

Local Unit

Physics and Astronomy

Graduate Council Approval Date

Course Abbreviation

PHYS / ASTR

Course Number

760 / 760

Full Course Title

Space Plasma Physics

Abbreviated Course Title

Space Plasma Physics

Credit Hours

3

Program Record

PhAE

Repeatable for Credit

D = Yes, not within same term

T = Yes, within the same term

N = Cannot be repeated for credit.

Up to _______ hours

Up to _______ hours

Activity Code

X Lecture (LEC)

Lab (LAB)

Seminar (SEM)

Studio (STU)

Internship (INT)

Independent Study (IND)

Catalog Format

3 : 0 : 0

Course Level

QF (500 - 600)

GA (700+)

Maximum Enrollment

20

For New courses, first term offered

2005-06

Prerequisites or Corequisites

PHYS 622 or PHYS 513, or permission of instructor

Catalog Description (35 words or less). Please use catalog format and attach a copy of the syllabus for new courses.

see attached

For MODIFIED or DELETED courses as appropriate:

Previous course abbreviation

Previous number

Description of Modification

APPROVAL SIGNATURES

Submitted by

Roeke Mahoney

email

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Department / Program

College Committee

Graduate Council Representative

date

10.10.05

date
GRADUATE COURSE PROPOSAL

I. Course Designation: Space Plasma Physics

II. Catalog Description:

A. Course Designation: PHYS 760/ASTR 760 – Space Plasma Physics

B. Credit Hours: 3

C. Prerequisites: PHYS 622 and/or PHYS 513, or permission of instructor.

D. Description:
This course will cover the basic physical processes, in particular, plasma processes that are involved in today's space physics research. This course intends to be the requirement course for the PhD students in Space Physics area. It will provide students the necessary background to be able to produce groundbreaking research. Since Space Physics covers different regimes of plasma, this course will introduce the basic concepts in kinetic, fluid and MHD plasmas and the existent waves in these media. It will also cover the basics of shocks, discontinuities, transport and acceleration of particles (e.g., cosmic rays), reconnection and MHD instabilities.

III. Justification of the Proposal:

A. Course Objectives: To prepare students to master the basic physical processes in space physics to allow them to produce state-of-the-art research.

B. Necessity or Desirability of Adding this Course: To prepare graduating space physics students, to master the basic physics of the diverse plasma processes occurring in space. Since Space Physics is such a broad area – it is necessary to introduce basic physical concepts in the context of what is relevant to Space Physics. It prepares students for course work and research in the area of space weather sciences including solar and heliospheric physics, magnetospheric physics, and ionospheric physics, and astronomy as well. Very few courses like that exist in the country (an example is one offered at the Univ of Michigan). In order to prepare future front-of-the line researchers in space physics, there is a need for them to master the basic physical and in particular plasma processes. This can position GMU as the center for academic studies of space physics. Besides the GMU students, potentially, it could attract students from other DC metropolitan universities such as University of Maryland, for example, where such a course is not offered.

C. Relationship of this Course to any Similar Course: No similar graduate course exists in the Physics Department.

IV. Department Recommendation:

A. Department: Physics
V. Semester and Year for Planned Initial Offering: Fall Semester 2003

VI. Sample Student Syllabus:

A. Course Designation: PHYS 760/ASTR760 – Space Plasma Course

B. Course Goals:

C. Proposed Course Content:
   - Kinetic Theory
   - Basic Plasma Phenomena
   - Fluid and MHD Theory
   - Kinetic and MHD Waves
   - Shocks and Discontinuities
   - Instabilities
   - Transport of Energetic Particles
   - Reconnection

D. Readings and Reference Materials:
   - Plasma Instabilities in Spaces and Laboratory Plasmas, Don Melrose (1989)
   - Space Physics, May-Britt Kallenrode (Springer 2001)
   - Solar Magnetohydrodynamic, E. R. Priest (Reidel 1984)
   - Principles of Plasma Physics, Kallai and Trivelpiece (San Francisco Press 1986)

E. Student Evaluation Process: A student's final grade will be determined according to a formula which may include exclusively or in part papers, examinations, attendance, and research reports; the means determining the final grade will be determined by the instructor and communicated to the students at the beginning of the course.