Course Approval Form

For instructions: *http://registrar.gmu.edu/facultystaff/catalog-revisions/course/*

Action Requested: (definitions available at website above)
- [x] Create NEW
- [ ] Inactivate
- [ ] Modify (check all that apply below)
  - [ ] Title (must be 75% similar to original)
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Schedule Type
  - [ ] Prereq/coreq
  - [ ] Restrictions
  - [ ] Grade Mode
  - [ ] Other:

Course Level:
- [x] Undergraduate
- [ ] Graduate

College/School: COS
Department: Physics and Astronomy
Submitted by: Joseph Weingartner
Ext: 4596
Email: jweinga1

Subject Code: ASTR
Number: 480
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:
- [ ] Fall
- [x] Spring
- [ ] Summer

Year: 2018

Title:
- Current:
- Banner (30 characters max w/ spaces): The Interstellar Medium
- New: The Interstellar Medium

Fulfills Mason Core Req? (undergrad only)
- [ ] Currently fulfills requirement
- [ ] Submission in progress

Credits: (check one)
- [x] Fixed: 3
- [ ] Variable: to
- [ ] Lec + Lab/Rct: 0 or

Repeat Status: (check one)
- [x] Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Max credits allowed: (required for RT/RD status only)

Grade Mode: (check one)
- [x] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one)
LEC can include LAB or RCT if linked sections will be offered
- [x] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s) (NOTE: hard-coding requires separate Prereq Checking form; see above website): ASTR 210, PHYS 305

Corequisite(s):

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code(s).

Equivalencies (check only as applicable):
- [ ] YES, course is 100% equivalent to
- [ ] YES, course renumbered to or replaces

Catalog Copy (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
Physical processes in the interstellar medium. Topics include the production and transfer of radiation, ionization and recombination, atomic and molecular excitation, dust physics, gas heating and cooling, and star formation.	

Indicate number of contact hours:	Hours of Lecture or Seminar per week: 3	Hours of Lab or Studio:
When Offered: (check all that apply)	[ ] Fall [ ] Summer [x] Spring	

Approval Signatures

Department Approval — Date — College/School Approval — Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

Undergraduate or Graduate Council Approval

UGC or GC Council Member — Provost's Office — UGC or GC Approval Date

Form revised 9/2/2016

Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL COURSES (required)
Course Number and Title: ASTR 480, The Interstellar Medium

Date of Departmental Approval:

FOR NEW COURSES (required if creating a new course)

- Reason for the New Course: This new undergraduate course will be cross-level listed with ASTR 680. Nearly every time that ASTR 680 has been offered, undergraduates have enrolled, and their number has been increasing, reachiung 10 last year. Most astronomy majors have used ASTR 680 to satisfy one of the elective courses for the major. The undergrads typically struggle with the more advanced elements in the course. By introducing ASTR 480, these elements can be restricted to the graduate students, making the remaining topics more suitable for most undergrads. Also, the new course will enable a modification to ASTR 328 "Stars and the Interstellar Medium" to cover only stars, eliminating the overlap that most undergrads (i.e. those who take both 328 and 680) currently experience.

- Relationship to Existing Programs: ASTR 480 will be an elective course for both the BS and minor in astronomy, and for the Physics B.S. astrophysics concentration.

- Relationship to Existing Courses: ASTR 480 will be cross-level listed with ASTR 680. No additional resources are needed to offer this course.

- Semester of Initial Offering: Spring 2018

- Proposed Instructors: Weingartner

- Insert Tentative Syllabus Below

Please see attached.

ASTR 480: The Interstellar Medium

Classes

Place: Exploratory Hall, room 1004
Time: T 4:30–7:10 pm
Web site: www.physics.gmu.edu/~joe/ASTR480.html

Instructor

Joe Weingartner
Planetary Hall, room 231
jweinga1@gmu.edu
Office hours: TW 3:00–4:00 pm or by appointment

Course Objectives

1. Develop the skills and knowledge needed to participate in research projects in astrophysics
2. Reinforce basic physics concepts and skills in a novel setting

Textbook

Physics of the Interstellar and Intergalactic Medium, Bruce T. Draine (Princeton University Press)

Evaluation

Problems, to be worked both in class and at home (90%)

1. You are encouraged to discuss the problems with one another, but the detailed solutions that you submit must be your own, independent work.
2. Do not hesitate to seek help from me, in person, over the phone, or by email.
3. The point value of each problem is indicated in brackets.
4. Due dates are on the course web site and are firm.
5. The clarity of your solutions will factor significantly into your grade. It is not sufficient to write a few equations. You must define your variables, draw well-labeled figures where appropriate, and explain what you're doing. Use the distributed solutions as a guide for the level of detail required. Also, you must write legibly. I will not struggle to decipher handwriting; instead, I will simply assign zero points.
6. Each week, I will choose a fraction (possibly 100%) of the submitted problems to grade. Of course, I will not reveal in advance which problems will be graded. Your total earned points for each submission will be AB/C, where C is the total number of points in the graded problems, A is the number of points you earned on those problems, and B is the total number of points in the problems on which you made a serious effort.
7. Unless explicitly stated, you may not use computer programs like Mathematica.
8. When a problem asks you to "show" something, this should be interpreted as "derive" rather than "verify".

Presentations on journal articles related to the ISM (10%)

We'll do the presentations during the last class of the semester and during the time allocated for the final exam (May 10, 4:30–6:30).

Letter grades for the course will be determined from total numerical grades as follows:
A range: 87-100%
B range: 74-87%
C range: 64-74%
D: 55-64%
F: < 55%

Course Outline

1. Background Physics
2. Introduction to the ISM
3. Atomic Structure and Radiation
4. H I Regions
5. Dust
6. H II Regions
7. Molecular Clouds and Star Formation
8. Structure and Dynamics of the ISM

Useful ISM-related Resources

Not needed for this course!

1. J. Binney & M. Merrifield 1998, *Galactic Astronomy* (Princeton U. Press) Contains some very readable material on the ISM.

2. M.A. Dopita & R.S. Sutherland 2003, *Astrophysics of the Diffuse Universe* (Springer)

3. J.E. Dyson & D.A. Williams 1997, *The Physics of the Interstellar Medium*, 2nd ed (Institute of Physics)

4. Sun Kwok 2007, *Physics and Chemistry of the Interstellar Medium*, (University Science Books)

5. K.R. Lang 1980, *Astrophysical Formulae: A Compendium for the Physicist and Astrophysicist*, 2nd ed (Springer)

6. J. Lequeux 2005, *The Interstellar Medium* (Springer)

7. D.E. Osterbrock & G.J. Ferland 2005, *Astrophysics of Gaseous Nebulae and Active Galactic Nuclei*, 2nd ed (University Science Books) Known as "AGNAGN" or "AGN^2".

8. G.B. Rybicki & A.P. Lightman 1979, *Radiative Processes in Astrophysics* (Wiley)

9. L. Spitzer 1978, *Physical Processes in the Interstellar Medium* (Wiley) The classic text, but now out-of-date in many respects. Still an excellent resource for the basic physics.

10. A.G.G.M. Tielens 2005, *The Physics and Chemistry of the Interstellar Medium* (Cambridge U. Press) Runner-up for course textbook.

11. G.L. Verschuur 1989, *Interstellar Matters* (Springer) An enjoyable popular-level account of the discovery of the ISM.

12. D.C.B. Whittet 2002, *Dust in the Galactic Environment*, 2nd ed (Institute of Physics)

13. G. Wynn-Williams 1992, *The Fullness of Space: Nebulae, Stardust, and the Interstellar Medium* (Cambridge U. Press) An excellent popular-level introduction to the ISM.

Academic integrity

George Mason University is an Honor Code university. Cheating, copying homework, giving or receiving assistance on exams, or other improper conduct will be considered a violation of the Honor Code. The full description of the code and the honor committee process can be found at http://oai.gmu.edu/the-mason-honor-code/.

Office of Disability Services

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. Visit http://ods.gmu.edu.