New Courses
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name):
   Physics and Astronomy

2. Course prefix, number and complete title of course:
   ASTR 601 Extragalactic Astronomy

3. Catalog course description (not to exceed 50 words):
   Overview of observations of galaxies and large-scale structures in the Universe to understand their formation and evolution from theoretical and observational perspectives. Galaxy luminosity functions; evolution of stellar populations and chemical enrichment; clusters and AGN.

4. Prerequisite(s):
   PHYS 601; or ASTR 314 and PHYS 302; or permission of Instructor
   Cross-listed with: PHYS 641
   Stacked with: __________

5. Is this a variable credit course? □ Yes ☑ No
   If yes, from ________ to ________

6. Is this a repeatable course? □ Yes ☑ No
   Will this course be repeated within the same semester? □ Yes □ No
   If yes, this course may be taken ________ times.

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
   MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix | Course# | Title (excluding punctuation)
   --- | --- | ---
   ASTR | 601 | EXTRAGALACTIC ASTRONOMY

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<th>Lect.</th>
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Approval recommended by:

George R. Welch
Department Head or Program Chair (Type Name & Sign) Date: 11-28-2012

Chair, College Review Committee Date: 12-10-12

Dean of College Date: 1-9-13

Chair, GC & UCC Date: 2-7-13

Submitted to Coordinating Board by:

Associate Director, Curricular Services Date:

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 5/10
Course Number: ASTR601
Course Title: Extragalactic Astronomy
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course provides an overview of observations of galaxies in the Universe. The goal of this course is to provide an advanced understanding of the formation and evolution of galaxies and large-scale structures in the Universe both from a theoretical and observational perspective. Topics will include the formation of structure in the early Universe, the distribution of galaxy properties, galaxy number counts and luminosity functions. The course will discuss the evolution of stellar populations and chemical enrichment in galaxies. Other topics include galaxy groups, galaxy clusters, and the effects of these dense environments on galaxy evolution. The course will also include an overview of active galaxies (radio galaxies, quasars, other AGN) and their relationship to galaxies.
Prerequisites: PHYS 601 or ASTR 314 & PHYS302 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will be familiar with state-of-the-art observations of galaxies in the Universe and will understand the basic formulations of theories that explain the formation and evolution of galaxies and large-scale structure in the Universe. Students will be able to discuss current research papers on integrated stellar populations, galaxy groups and clusters, active galactic nuclei and galaxy evolution.

Instructor information
Name: Casey Papovich
Telephone: (979) 862-2704
Email address: papovich@physics.tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M325

Textbook and Resource Materials
- Course handouts and notes will also be available.
Grading policies
The course grade will be assigned on the basis of exam performance (20%), assigned homework (60%), and attendance and class participation (20%). The grading scale will be as follows: A, ≥ 90%; B ≥ 80%; C ≥ 70%; D ≥ 60%; F < 60%

Exams
There will be one final exam over material presented in the course lectures. Each will contain short-answer and essay questions that will require calculation and quantitative estimates.

Homework
There will be three homework assignments due about every four weeks. Late homework will be penalized at the rate of 10% per day.

Course Outline
Week 1: Preliminaries, Radiation, Magnitudes, Stars, Stellar Populations
Weeks 3-4: Galaxies. Hubble Sequence, light distributions, dynamics, mass-to-light ratios.
Week 5: Luminosity functions, Bimodal color distributions.
Week 7: Cosmology and Galaxy distributions. Newtonian cosmology, cosmological parameters, cosmic time and distances.
Week 11: Large Scale Surveys. Redshift surveys.
Week 14: Lyman-alpha forest. First stars and galaxies, Reionization

ADA Policy
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attempt to present work that the student has not actually prepared as their own work, or to pass an examination by improper means, is regarded as a serious offense. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

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Texas A&M University  
Departmental Request for a New Course  
Undergraduate • Graduate • Professional  
• Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: ASTR 602 Astronomical Observing Techniques and Instrumentation

3. Catalog course description (not to exceed 50 words):
   Theory and practice of obtaining and analyzing astrometric, photometric, spectroscopic, and interferometric measurements of astronomical sources across the electromagnetic spectrum. Principles of design, fabrication, assembly, test, deployment, and use of astronomical instruments.

4. Prerequisite(s):
   PHYS 615 or equivalent; or permission of instructor

5. Cross-listed with: PHYS 642

6. Is this a variable credit course?  
   [ ] Yes  
   [x] No  
   If yes, from _____ to _____

7. Is this a repeatable course?  
   [ ] Yes  
   [x] No  
   If yes, this course may be taken _____ times.

   Will this course be repeated within the same semester?  
   [ ] Yes  
   [ ] No

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   MS or PhD in physics

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

   Approval recommended by:

   George R. Welch  
   Department Head or Program Chair  
   Type Name & Sign: Date  
   Chair, College Review Committee  
   Date

   George R. Welch  
   Department Head or Program Chair (Type Name & Sign)  
   Date

   (if cross-listed course)

   Submitted to Coordinating Board by:

   Associate Director, Curricular Services  
   Date  
   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandy.williams@tamu.edu.
Curricular Services – 3/10
Course Number: ASTR602
Course Title: Astronomical Observing Techniques and Instrumentation
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course covers the theory and practice of obtaining astronomical data. Specific topics include the astrometric, photometric, spectroscopic, and interferometric measurement of astronomical sources across the electromagnetic spectrum. There is an introduction to statistical analysis of astronomical data that includes signal detection, signal-to-noise estimates, model fitting, good-of-fit estimation, and non-parametric techniques. There is discussion of the techniques and practices of the design, fabrication, assembly, test, deployment, and use of modern astronomical instruments.
Prerequisites: PHYS 615 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will be familiar with the basic techniques of how to obtain meaningful astronomical data and the principles of astronomical instrumentation. They will know how to use basic analysis tools (IRAF, IDL, AIPS, etc.) and statistical techniques (correlation, regression, $\chi^2$, non-parametric) that are commonly applied to astronomical research. Course participants will also learn to use a telescope and modern astronomical detector systems in a night-time research setting.

Instructor information
Name: Darren DePoy
Telephone: (979) 862-2082
Email address: depoy@physics.tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Munnerlyn Astronomical Instrumentation Building 204

Textbook and Resource Materials
- Course handouts and notes will also be available.
Grading policies
The course grade will be assigned on the basis of exam performance (33%), assigned homework (33%), and an oral presentation describing some astronomical instrumentation system (33%). The grading scale will be as follows: A, ≥ 90%; B, ≥ 80%; C, ≥ 70%; D, ≥ 60%; F, < 60%

Exams
There will be two in-class exams (mid-term and final) over material presented in the course lectures. Each will contain short-answer and essay questions that will require calculation and quantitative estimates.

Homework
There will be four homework assignments throughout the semester. Each problem will require the student to investigate an aspect of instrument design (throughput, resolution, bandpass, etc.). Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a written report and give an oral presentation on an existing or planned astronomical instrument (telescope, satellite, etc.).

Course Outline
Weeks 1-2: Introduction and Positional Astronomy (coordinate systems, spherical geometry, precession, time, right ascension and declination). Detection of a signal (signal-to-noise ratio). Statistics (sample and parent population, mean and variance, Poisson and Gaussian distributions, regression, correlation, $\chi^2$, etc.)

Weeks 3-4: Non-parametric statistics: non-Gaussian distribution functions (exponential, Cauchy, beta, Student's t, Pareto) and appropriate applications, mean and variance, non-parametric tests (Pearson's $\chi^2$, Kolmogorov-Smirnov, von Mises, Anderson-Darling, Mann-Whitney U, Spearman's Rank, Kendall's $\tau$, etc.) and appropriate application. Multivariate analysis (principal component, discriminant, clustering, etc.). Time series analysis. Bayes' theorem and examples. Fisher matrices and joint probability.

Weeks 5-6: Photon detectors (semiconductors, photodiodes, CCDs, infrared arrays, bolometers, heterodyne mixing, antenna theory). Instrumental signatures and noise sources (dark current, Johnson noise, electronic noise sources, pixel-to-pixel variations in quantum efficiency, etc.). Image analysis and data processing (IRAF, IDL, etc.). Signal-to-noise estimates and predictions.

Weeks 7-8: Optics (geometric optics, telescope design, aberrations, physical optics, elementary optical design). Atmospheric effects (refraction, seeing, observatory sites and selection criteria, extinction and emission, adaptive optics). Practical considerations in instrumentation design (finite element and flexure analysis, cryogenic systems and cooling design, scattered and stray light analysis and control, calibration unit design, etc.)

Weeks 9-11: Photometry (photometric and radiometric concepts, magnitudes, photometric systems, absolute calibration, signal-to-noise calculation, etc.). Definition and design of filters. Photometry from a photographic plate. Design of a photometer (photomultiplier tubes, field lens, stops, readout electronics). Design of an imaging system (CCDs, optics, structural analysis, cryogenics, etc.).
Weeks 12-14: Spectroscopy: design of a slit spectrometer, dispersers (prisms, gratings, grisms, volume-phase holographic gratings), and other practical considerations. Analysis of spectroscopic data and removal of instrumental effects. Spectroscopy in the infrared. Other assorted spectroscopic techniques (Fourier transform spectroscopy, heterodyne techniques, Fabry-Perot interference, etc.). Design considerations for multi-object spectrographs (fibers, slit masks, etc.). Signal-to-noise calculations.

Week 15: Special topics: Radio, sub-mm, and x-ray astronomy; space astronomy and satellite design, etc. Neutrino and Gravitational Wave astronomy.

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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy
   Course prefix, number and complete title of course: ASTR 603 Stellar Astrophysics

3. Catalog course description (not to exceed 50 words):
Theoretical and observational aspects of stellar astrophysics. Thermodynamic properties of stellar interiors; energy sources; nuclear processes and burning stages; convective and radiative energy transport; evolutionary models; atmospheres; stability and pulsations; chemical enrichment processes; population synthesis.

4. Prerequisite(s):
   PHYS 606 and PHYS 607 or equivalents; or permission of instructor
   Cross-listed with: PHYS 643
   Stacked with: 
   Cross-listed courses require the signature of both department heads.

5. Is this a variable credit course? □ Yes ☑ No
   If yes, from _____ to _____

6. Is this a repeatable course? □ Yes ☑ No
   If yes, this course may be taken _____ times.
   Will this course be repeated within the same semester? □ Yes ☑ No

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix | Course? | Title (excluding punctuation)
   ASTR | 603 | STELLAR ASTROPHYSICS

   Lab | Sch | CP and Fund Code | Admin Unit | Acad Year | HCC Code
   0 | 3 | 0 0 0 3 4 0 0 2 0 2 0 1 0 | 2 3 0 4 1 3 | 1 4 | 0 0 3 6 3 2

   Approval recommended by:
   George R. Welch
   Department Head or Program Chair (Type Name & Sign) Date 11-28-2012

   Chair, College Review Committee Date 12-10-12
   Dean of College Date 1-9-12
   Chair, GC or UCC Date 2-7-13

   Submitted to Coordinating Board by:
   Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Course Number: ASTR603
Course Title: Stellar Astrophysics
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course covers the theoretical and observational aspects of stellar astrophysics. Specific topics include: thermodynamic properties of stellar interiors, energy sources, nuclear processes and burning stages, convective and radiative energy transport, evolutionary models, atmospheres, stability and pulsations, chemical enrichment processes and population synthesis.
Prerequisites: PHYS 606 & 607 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will be able to carry out simple radiative transfer calculations and determinations of photospheric properties (abundances, electron densities, pressure). They will understand the different energy generation mechanisms at work in the cores of stars and the sources of opacity that regulate energy transfer. They will be familiar with the various stages of stellar evolution for low- and high-mass stars, and the differences between the evolution of single and binary stars.

Instructor information
Name: Lucas Macri
Telephone: (979) 314-1592
Email address: Lmacri@tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M423

Textbook and Resource Materials
• An Introduction to Stellar Astrophysics by Francis LeBlanc (2010: Wiley) ISBN 470699560
• Course handouts and notes will also be available.

Grading policies
The course grade will be assigned on the basis of assigned homework (40%), presentation and discussion of papers in class (20%), a term paper on a topic not covered in class (20%) and an associated oral presentation (20%). The grading scale will be as follows: A, ≥ 90%; B ≥ 80%; C ≥ 70%; D ≥ 60%; F < 60%
Homework
There will be four homework assignments throughout the semester, due every three weeks. Each assignment will cover a specific section of the course: (observational introduction; stellar atmospheres; stellar interiors; stellar evolution). Some problems will require basic programming skills. Late homework will be penalized at the rate of 10% per day.

Presentation and discussion of papers in class
Each student will lead the discussion of a paper during one lecture (10% of the grade). Students must also read and actively participate in the discussion of all other papers during the semester (10% of the grade).

Term paper
Each student will write a 5-10 page paper on a topic not covered in class, chosen in consultation with the instructor. The paper will be due during finals week and will count for 20% of the grade. It must be typeset using LaTeX. Each student will give a 20-minute presentation on her/his term paper during the final two weeks of the semester. The presentation will count for 20% of the grade.

Course Outline

Stellar atmospheres [6 lectures]: Radiative Transfer - Diffusion Equation - Opacity sources - Grey atmosphere - Line profiles - Curves of growth

Stellar interiors [8 lectures]: Equations of stellar structure - Energy transport: conduction, convection and mixing-length theory - Polytropic equations of state – The radiative envelope and its structure - Completely convective stars - Thermonuclear energy sources: the p-p chain, the CNO cycle, He-burning reactions, more massive nuclei - Neutrino emission mechanisms - The solar neutrino "problem"

Stellar evolution [7 lectures]: Pre-main sequence evolution and Young Stellar Objects – The Zero-Age Main Sequence – Evolutionary lifetimes – Post-main sequence evolution – Red giants and supergiants – The helium flash – Later phases – Core collapse and nucleosynthesis – Rotational mixing – Binaries – Stellar pulsation mechanisms

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Texas A&M University
Departmental Request for a New Course
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Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: ASTR 604 Cosmology

3. Catalog course description (not to exceed 50 words):
   Basic principles of modern cosmology and particle physics. General relativity; cosmic inflation; Big Bang nucleosynthesis; expansion of the universe; cosmic microwave background; large-scale structure of the Universe; properties of particles; dark matter; dark energy.

4. Prerequisite(s):
   PHYS 615 or equivalent; or permission of instructor

5. Is this a variable credit course? Yes □ No □ If yes, from _______ to _______

6. Is this a repeatable course? Yes □ No □ If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester? Yes □ No □

7. This course will be:
   a. for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
   MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course# Title (excluding punctuation)
   A S T R 6 0 4 C O S M O L O G Y

   Lect Lab SCH CP and Fund Code Admin Unit Acad Year HCC Code
   0 3 0 0 0 3 4 0 0 2 0 2 0 1 0 0 2 3 0 4 1 3 - 1 4 0 0 3 6 3 2

   Approval recommended by:
   George R. Welch 11.28.2012
   Department Head or Program Chair (Type Name & Sign) Date

   Chair, College Review Committee 12-10-12
   Dean of College Date

   George R. Welch 11.28.2012
   Department Head or Program Chair (Type Name & Sign) Date
   (if cross-listed course)

   Submitted to Coordinating Board by:
   Associate Director, Curricular Services

   Date

   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: ASTR604
Course Title: Particle Physics & Cosmology
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course will provide the basic principles of modern cosmology and particle physics, as well as their connections. This course will cover: General Relativity; expansion of the Universe; the cosmic microwave background; the large-scale structure of the Universe; properties of particles; dark matter; Big-Bang nucleosynthesis; and cosmic inflation.
Prerequisites: PHYS 615 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will understand the processes that regulated the evolution of the Universe from the era of inflation until the generation of the cosmic microwave background. They will be able to solve simple problems in General Relativity and use the Friedman-Robertson-Lemaître-Walker metric to derive basic cosmological equations.

Instructor information
Name: Bhaskar Dutta
Telephone: (979) 845-5359
Email address: dutta@physics.tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M424

Textbook and Resource Materials
• No textbook is required -- course handouts and lecture notes will be provided.

Grading policies
The course grade will be assigned on the basis of assigned homework (100%). The grading scale will be as follows: A, ≥ 80%; B, ≥ 70%; C, ≥ 60%; D, ≥ 50%; F, < 50%

Homework
There will be four homework assignments, which will consist of written assignments and reports (see course schedule for topics). Late homework will be penalized at the rate of 10% per day.
Course Outline

Week 1: Expansion of the Universe: General Relativity and the FRLW metric
Week 2: Review of particle physics models
Week 3: Cosmic Microwave Background
Week 4: Dark matter
Week 5: Primordial perturbations and Gravitational waves
Week 6: Neutrinos
Week 7: Large Scale Structure
Week 8: Big bang nucleosynthesis
Week 9: Acoustic oscillations and non-gaussianities
Week 10: Inflation
Week 11: Dark energy
Week 12: Overview of current research in cosmology and particle physics

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Texas A&M University  
Departmental Request for a New Course 
Undergraduate • Graduate • Professional  
* Submit original form and attach a course syllabus. *

1. Request submitted by (Department or Program Name): Physics and Astronomy
2. Course prefix, number and complete title of course: ASTR 605 Galactic Astronomy
3. Catalog course description (not to exceed 50 words): Basic nature and structure of constituents of Milky Way galaxy. Distribution and motions of stars and gas; origin, evolution and distribution of large-scale chemical abundances and kinematic patterns across populations; models of galaxy formation and implications of modern observations.

4. Prerequisite(s):
PHYS 601 and PHYS 607 or equivalents; or permission of instructor

5. Is this a variable credit course? ☐ Yes ☑ No  If yes, from _____ to _____
6. Is this a repeatable course? ☐ Yes ☑ No  If yes, this course may be taken _____ times.
7. Will this course be repeated within the same semester? ☐ Yes ☑ No
8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
   MS or PhD in physics

9. Approval recommended by:
   George R. Welch 
   Department Head or Program Chair (Type Name & Sign)  Date
   [Signature]
   Chair, College Review Committee  Date
   Dean of College (if cross-listed course)  Date
   Chair, GC or UCC  Date

   Submitted to Coordinating Board by:
   [Signature]
   Date

   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 3/10
Course Number: ASTR605
Course Title: Galactic Astronomy
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
An overview of the content and structure of our Milky Way Galaxy. The course will discuss the physical properties of stars and gas constituents of the Galaxy, the space distribution of stars and chemical elements, large-scale structure and kinematics, and formation scenarios. Comparison of formation models to modern observational results will also be included.
Prerequisites: PHYS 601 & 607 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will understand the basic nature and structure of the constituents of our Milky Way galaxy, including the distribution and motions of stars and gas in the Milky Way, the origin, evolution and large scale distribution of chemical abundances and the patterns seen in different kinematic populations. Students will be familiar with different models of galaxy formation and how they compare with modern observations.

Instructor information
Name: Nicholas Suntzeff
Telephone: (979) 458-1786
Email address: nsuntzeff@tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M513

Textbook and Resource Materials
• Course handouts and notes will also be available.

Grading policies
The course grade will be assigned on the basis of exam performance (25%), assigned homework (50%), and an oral presentation on a topic covered by the course (25%). The grading scale will be as follows: A, ≥ 90%; B ≥ 80%; C ≥ 70%; D ≥ 60%; F < 60%

Exams
There will be one final exam over material presented in the course lectures. The exam will contain short-answer and essay questions that will require calculation and quantitative estimates.
Homework
There will be homework problems assigned throughout the semester. Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a 30-minute presentation on a topic related to current research on Galactic astronomy.

Course Outline

Weeks 1-2: Overview of the Milky Way. The historical growth of our conception of our Galaxy.

Weeks 3-4: Measurements of stars that help us understand the nature of the Milky Way: positions and coordinate systems, proper motions, parallax, radial velocities, stellar spectra, magnitudes and colors, absolute energy distributions, and a survey of astronomical catalogues and atlases.

Weeks 5-6: The physical properties of stars and the gaseous constituents of the Milky Way: stellar distances, masses and radii, analysis of stellar spectra, the systematic differences between stellar populations (spiral arms and disk populations versus halo populations), and interstellar absorption.

Weeks 7-9: The space distribution of stars and chemical elements in the Milky Way: the apparent distribution of stars, star-count analysis, the distribution of stars and the chemical elements, and the difference between stellar populations.

Weeks 10-12: Stellar kinematics: the motion of the Sun in the Milky Way, motions of disk stars, motions of halo stars, rotation kinematics of the Milky Way and other galaxies, dark matter halos.

Weeks 13-14: The large-scale distribution of gas in the Milky Way and other galaxies: neutral hydrogen, molecular clouds, the Galactic Center, mass in-fall due to collisions.

Week 15: Models of the formation of the Milky Way and other galaxies: classic monolithic collapse, hierarchical formation and accretion, observational evidence for either scenario.

ADA Policy
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit http://disability.tamu.edu.

Honor Code
Texas A&M University assumes that all students enroll in its programs with a serious learning purpose and expects them to be responsible individuals who demand of themselves high standards of honesty and personal conduct. All students are expected to behave at all times with respect and courtesy toward
their fellow students and instructors and are to have the highest standards of honesty and integrity in their academic performance. Any behavior which disrupts the classroom learning environment or any attempt to present work that the student has not actually prepared as their own work, or to pass an examination by improper means, is regarded as a serious offense. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

I consider it a privilege to work with students of such character as that of Aggies. The Honor Code sets Texas A&M apart from other universities, and you should be proud of the standard this sets. I expect that you will abide by the Aggie Code of Honor:

The Aggie Honor Code: An Aggie does not lie, cheat or steal, or tolerate those who do

Further information regarding the Honor Council Rules and Procedures may be found on the web at http://www.tamu.edu/aggiehonor
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: ASTR 606 Radiative Transfer

3. Catalog course description (not to exceed 50 words):
Fundamental radiative processes in stellar and planetary atmospheres. Radiation fields; Stokes parameters; Mueller matrix formalism; radiation from moving charges; Compton scattering; plasma effects; atomic structure and radiative transitions; molecular structure and spectra; multiple scattering.

4. Prerequisite(s):
   PHYS 302, PHYS 304, PHYS 408, and PHYS 412 or equivalents; or permission of instructor

5. Is this a variable credit course? ☑ No
   If yes, from _______ to _______

6. Is this a repeatable course? ☑ No
   If yes, this course may be taken ______ times.
   Will this course be repeated within the same semester? ☑ Yes ☑ No

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course NO Title (excluding punctuation)

   ASTR 606 Radiative Processes

   Lect. Lab SCH CIP and Fund Code Admin. Unit Acad. Year HICE Code
   0 3 0 0 0 3 4 0 0 2 0 2 0 1 0 0 2 3 0 4 1 3 - 1 4 0 0 3 6 3 2

   Approval recommended by:

   George R. Welch
   Department Head or Program Chair (Type Name & Sign) Date 11-28-2012
   Chair, College Review Committee Date 12-10-12

   George R. Welch
   Department Head or Program Chair (Type Name & Sign) Date 11-28-2012
   Dean of College Date 1-9-13

   Submitted to Coordinating Board by:

   Associate Director, Curricular Services Date

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: ASTR606  
Course Title: Radiative Processes in Stellar and Planetary Atmospheres  
Term: Fall 2013  
Meeting times and location: MPH 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites  
This course will emphasize the physics involved in the fundamental radiative processes that occur in both stellar and planetary atmospheres.  
Prerequisites: PHYS 302, 304, 408 & 412 or equivalent; or permission of instructor.

Course Objectives  
By the end of the course, students will be familiar with radiation fields, Stokes parameters and the Mueller matrix formalism. They will be able to carry out basic calculations pertaining to radiation from moving charges, scattering processes and radiative transitions. Students will be able to develop a basic radiative transfer algorithm and compute the internal structure of simple (idealized) stars and planets.

Instructor Information  
Name: George Kattawar  
Telephone: (979) 845-1180  
Email address: kattawar@physics.tamu.edu  
Office hours: Tuesdays and Thursdays 11am-12:30pm  
Office location: Mitchell Physics Building, 555

Textbook and Resource Materials  
- Course handouts and notes will also be available.

Grading Policies  
The course grade will be assigned on the basis of exam performance (60%), assigned homework (20%), and special assignments (20%). The grading scale will be as follows: A, ≥ 90%; B, ≥ 80%; C, ≥ 70%; D, ≥ 60%; F, < 60%

Exams  
There will be one midterm and one final exam over material presented in the course lectures. Each exam will count for 30% of the total grade.
Homework
There will be homework problems assigned throughout the semester. Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a special written assignment on a topic related to the course.

Course Outline

Weeks 1-2: Fundamentals of Radiative Transfer

Weeks 3-4: Radiation fields – Stokes parameters – Mueller matrix formalism

Weeks 5-6: Radiation from moving charges – Bremsstrahlung and synchrotron radiation

Weeks 7-8: Compton scattering – Plasma effects

Weeks 9-10: Atomic structure and radiative transitions

Weeks 11-12: Molecular structure and spectra

Week 13: Elementary multiple scattering

Week 14: Advanced multiple scattering

ADA Policy
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Texas A&M University
Departmental Request for a New Course
Undergraduate ▶ Graduate ▶ Professional
Submit original form and attach a course syllabus.

Form Instructions

1. Request submitted by (Department or Program Name): Department of Economics

2. Course prefix, number and complete title of course: ECMT 674 : Economic Forecasting

3. Catalog course description (not to exceed 50 words):
Empirical application of econometric techniques to prediction in economics; model building and specification; examination of various modern forecasting techniques

4. Prerequisite(s): Graduate level; must be enrolled in the M.S. program in the department of economics; or approval of instructor.

5. Is this a variable credit course? Yes □ No □ If yes, from _______ to _______.

6. Is this a repeatable course? Yes □ No □ If yes, this course may be taken _______ times. Will this course be repeated within the same semester? Yes □ No □

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in History)
      M.S. in Economics
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S. Ph.D. in Geography)

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course # Title (excluding punctuation)

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<tr>
<th>Lect.</th>
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Approval recommended by:

Timothy Gronberg
Department Head or Program Chair (Type Name & Sign)
Date 1/29/13

Chair, College Review Committee
Date 1-29-13

Dean of College
Date

Chair, GC or UCC
Date 2-7-13

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 3/10
ECMT 674 – Economic Forecasting – Fall 2013

Instructor: Craig T. Schulman
Phone: 845-8899, 599-5299, 324-5988
Email: rschulman@hrg-expert.com

Office Hours: (Tuesday and Thursday) – 2:00pm –3:00pm and by appointment
Class/Location: (Tuesday/Thursday) 8:00 –9:15 am – RICH 101
Class Website: http://econweb.tamu.edu/lcschulman/class/class.htm

Course Description
This course is meant to be taken subsequent to introductory economic statistics and undergraduate econometrics. The course focus is on the empirical application of econometric techniques to prediction in economics. Topics such as basic regression, model building and specification, and hypothesis testing will be reviewed, followed by an in depth examination of various modern forecasting techniques with an emphasis on time series econometric analysis.

Prerequisites ECMT 463; enrolled in the M.S. program in the department of economics; or approval of instructor.

Textbooks (Optional)
Wooldridge, Jeffrey M., Introductory Econometrics, 2nd edition (South-Western), 2003.

Selected additional readings will be made available as needed.

Value and Objectives of the Course
At the end of the course, the student should be able to:

- Use popular spreadsheet and statistical software such as Microsoft Excel and SAS to combine, manipulate and summarize economic data.
- Distinguish between deterministic and stochastic trends in economic time series data.
- Specify, diagnose and estimate econometric models that decompose the trend, seasonal and cyclical components of an economic time series.
- Use the results of both univariate and multivariate econometric models to construct forecasts of economic time series.

Disclaimer: Texas A&M University encourages qualified persons with disabilities to participate in its programs and activities. If you anticipate needing any type of accommodation in this course or have questions about physical access, please tell the instructor as soon as possible.
Class Procedures

The class will be conducted in a lecture/class discussion format. Questions are strongly encouraged.

Attendance Policy

Class attendance is not mandatory. However, you are responsible for material in the assigned readings and lectures. Therefore, attendance is in your best interest. I am also available for questions during the office hours listed above. If you are unable to meet during these hours, see me before or after class to make an appointment. If you must be absent for one of the exams, you should make prior arrangements with me, if at all possible. If you are unable to make prior arrangements, you must contact me within one class period for the absence to be considered excused. If you miss an exam with an excused absence, a make-up quiz will be arranged. Unexcused absences result in a zero on missed exams or assignments. I may require verifiable evidence of a sickness or other calamity that precludes you from attending class. See University regulations website at (http://student-rules.tamu.edu/rule07).

Course Grade

Your grades will be based on the combination of 3 exams, 6 assignments and a project.
60%: Combined for the 3 Exams (20% each)
15%: Combined for the Assignments (roughly one due every two weeks)
25%: Term Project

For most assignments I strongly recommend teamwork. For those assignments where teamwork is allowed, the group may turn in a single copy of the assignment listing all members of the team. For the Term Project, teams will be assigned according to a common interest in a particular company. Maximum team size for assignments is 3. Assignment teams and Term Project teams may be different.

All assignments are due at the BEGINNING of the class on the announced due date.
For the Term Project, the due date is the last day of classes. I will work closely with each project team to help define and focus the forecasting exercise. The final product should be a typed 7-10 page paper discussing the objectives of the forecasting exercise, the econometric analysis undertaken as part of that exercise and how the analyses address the initial objectives of the project. We will use our final exam period for in-class presentations of the Term Project by each team; an 8-10 minute presentation to the class followed by a brief question and answer session.

Grading Scale

90 –100% = A
80 – 89% = B
70 – 79% = C
60 – 69% = D
< 60% = F

Homework - Computer Assignments
Homework will be assigned approximately every-other week throughout the semester. Most all of the assignments will involve the use of specialized econometric software. Several different software packages, such as E-Views, STATA, GRETl or SAS are available in the 4th floor Economics computer lab. I will primarily use the GRETl software package for demonstrations in class but you are not required to use, nor will you be tested on, a particular software package. A student version of E Views is available for purchase. The GRETl software is 'shareware' and is available for free downloading from http://gretl.sourceforge.net. In addition to econometric software, we will make considerable use of the Excel spreadsheet program for data manipulation and graphing.

**Americans with Disabilities Act (ADA)**

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**Academic Integrity**

Academic dishonesty will not be tolerated. Your responsibilities with regard to scholastic dishonesty are described in detail in various Texas A&M University policy statements on scholastic dishonesty. Scholastic dishonesty may result in failure on the examination, project or course. For more information visit website at: [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor). You will be expected to acknowledge and adhere to the Aggie Code of Conduct – “An Aggie does not lie, cheat, or steal, or tolerate those who do.”

Note that evidence of group/joint effort on individual class assignments constitutes academic dishonesty and will result in a failing grade for the course.

**Topical Outline:**

**Week 1.**

a. Introduction: Why Forecast?

b. Review of Statistics and Regression

**Week 2.**

a. Review of Statistics and Regression (cont.)

b. Exploring Time Series Data

c. Forecasting Stationary Time Series Variables

**Week 3.**

Forecasting Stationary Time Series Variables (cont.)

**Week 4.**

Forecasting Stationary Time Series Variables (cont.)

**Exam 1:** Tentatively Scheduled for Thursday, September 19th
Week 5. Modeling Volatility

Week 6. Non-Stationary Time Series Variables - Unit Roots in Time Series Variables

Week 7. Non-Stationary Time Series Variables - Unit Roots in Time Series Variables (cont.)

Week 8. Multi-equation Time Series Models

Week 9. Multi-equation Time Series Models (cont.)

**Exam 2:** Tentatively Scheduled for Tuesday, October 24th

Week 10. Cointegration: Tests and Implications

Week 11. Error Correction Models

Week 12. Error Correction Models

Week 13. Forecast Evaluation and Presentation

Week 14. Structural Breaks and Intercept Correction

**Exam 3:** During Regularly Scheduled Final Exam Period
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

Form Instructions

1. Request submitted by (Department or Program Name): Educational Psychology

2. Course prefix, number and complete title of course: EDTC 641: Educational Game Design

3. Catalog course description (not to exceed 50 words): Formal and dramatic elements of successful non-educational games for principles of effective game design; application principles to the critique of existing educational games; examination commercial games originally designed for entertainment and their use to address educational objectives; games through the lens of multiple theories of learning and motivation, including situated cognition, flow, and systems theory.

4. Prerequisite(s): Graduate Classification; approval of department head

Cross-listed with: 

Stacked with: 

Cross-listed courses require the signature of both department heads.

5. Is this a variable credit course? 

Yes ☐ No ☒ If yes, from _______ to _______

6. Is this a repeatable course? 

Yes ☐ No ☒ If yes, this course may be taken ______ times.

Will this course be repeated within the same semester? 

Yes ☐ No ☒

7. This course will be:

a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

b. an elective for students enrolled in the following degree program(s) (e.g., M.S. Ph.D. in geography)

Master's program in Educational Technology and the Ph.D. program in Educational Psychology

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Ex: EDTC 641 EDUCATIONAL GAME DESIGN

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<th>Lect.</th>
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<th>Acad. Year</th>
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</tbody>
</table>

Approval recommended by:

Victor Williams, Ph.D.
Department Head or Program Chair (Type Name & Sign) Date
George Cunningham, Ph.D.
Chair, College Review Committee Date

Victor Williams, Ph.D.
Department Head or Program Chair (Type Name & Sign) Date
George Cunningham, Ph.D.
Dean of College Date

Mark Zoran, Ph.D.
Chair, GC or UCC Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Date Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu. Curricular Services – 3/10
EDTC 641: Educational Game Design

Spring, 2015

Dr. Susan Pedersen
Office: Harrington, Room 643
Email: spedersen@tamu.edu
512-633-2206
Skype: susan-pedersen
Office Hours: by appointment, in office or electronically in Skype or Collaborate

Course Description

Games have long been used in education, but with the rapid uptake of electronic gaming systems in recent years, educators have begun to explore how the motivational potential of games can best be exploited to support learning. In this course, we will examine the formal and dramatic elements of successful non-educational games for principles of effective game design, and then apply these principles to the critique of existing educational games. We will also examine how commercial games originally designed for entertainment can be used to address educational objectives. We will examine games through the lens of multiple theories of learning and motivation, including situated cognition, flow, and systems theory.

Course Objectives

By the time you complete this course, you should be able to

- Explain how the formal and dramatic elements of popular games engage players
- Critique existing educational games for their potential
to impact learning and engagement

- Connect learners’ experiences in non-educational games to educational objectives
- Develop a pitch for an educational game, using theories of learning and motivation to explain why the game has the potential to impact learning

Meeting Location and Times

This course is held completely online and requires no face-to-face meetings or synchronous online meetings. When working on group projects, some students prefer to set up face-to-face or synchronous meetings; this is fine, but not expected.

Prerequisites
Graduate student standing and Approval of department head. Students are not expected to have instructional design, gaming, or programming experience.

**Texts**


**Assignments**

- Blog. You will maintain your own personal blog within Blackboard in which you apply ideas you garner from the readings and class discussion to critique the games that we review in class. You will review others' blogs and post comments on them.
- Game Implementation Plan. You will work with a group to develop a plan for how to use a commercial game in a classroom setting to address an educational objective, and then develop the support materials necessary to use the game effectively.
- Game Pitch. You will work with a group to develop a pitch for an original educational game.
- Final Project: You will propose a final project designed to advance your understanding of educational games. Projects must be approved by the instructor prior to starting them. Examples of possible projects include
  - Playtest an existing educational game with target users and report on the results. This may involve creating supplemental materials or measures that you test and revise through multiple cycles. Or it could result in a report for the developers with suggestions for revisions to the game.
  - Design and develop a digital prototype for an original educational game using a simple program like GameMaker or Scratch; test the game with a small number of target players

**Grading Policies**

- Late work: All work must be turned in on time. Assignments involving group work cannot be made up if missed except in instances of excused University absence. A grade of incomplete will only be given for certifiable medical reasons or under extraordinary circumstances discussed with the instructor. Please review the University attendance policy here: [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)
- Attendance: This class is conducted asynchronously. If you are working with a group that sets up a time to meet synchronously, you are expected to notify the group if you will be absent at least 12 hours in advance, unless the absence is due to an emergency situation or is a University excused absence.
- Submission of products for multiple classes: Since the course objectives focus on the processes of developing course related materials, as well as the materials themselves, it is expected that all course products will consist of **work done specifically for this course.** Products completed for previous or concurrent course credit cannot be used for
assignments for this course. If you wish to continue a theme or content area used in another course, inform the instructor and supply any requested existing materials at the start of this course. Any intended projects relating to other courses should be approved at the start by all instructors and should reflect unique elements and sufficient development effort for all courses involved.

- Originality: the guiding principle of academic integrity is that a student's submitted work must be his/her own. Submitting materials developed by someone else, or merely recreating those materials, is an act of plagiarism. As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person.

**Grading**

Blog: 50 points  
Game Implementation Plan: 15 points  
Game Pitch: 10 points  
Final Project: 25 points  
Total: 100 points

A = 90 to 100 points  
B = 80 to 89 points  
C = 70 to 79 points  
F = 0 to 69 points

**The Americans with Disabilities Act**

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**Academic Integrity Statement and Policy reminder**

"An Aggie does not lie, cheat or steal, or tolerate those who do."

For all assignments for this class, you must agree with this statement: “On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

Please refer to the [Honor Council Rules and Procedures](http://aggiehonor.tamu.edu) for further information on Academic Integrity.

Please visit [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu) for more information
CEHD Statement on Diversity

We, the faculty of the College of Education and Human Development, value and respect diversity and the uniqueness of each individual. The faculty affirms its dedication to non-discrimination in our teaching, programs, and services on the basis of race, color, religion, gender, age, sexual orientation, domestic partner status, ethnic or national origin, veteran status, or disability. The College of Education and Human Development at Texas A&M University is an open and affirming organization that does not tolerate discrimination, vandalism, violence, or hate crimes, and we insist that appropriate action be taken against those who perpetrate such acts. Further, the College is committed to protecting the welfare, rights, and privileges of anyone who is a target of prejudice or bigotry. Our commitment to tolerance, respect, and action to promote and enforce these values embraces the entire university community.

Schedule of Classes

<table>
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<tr>
<th>Week Number</th>
<th>Start Date</th>
<th>Tentative Topics and Major Assignment Due Dates</th>
<th>Games</th>
<th>Readings</th>
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<td>Do Games Belong in Education?</td>
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<td>Formal Elements of Games and Games as Systems</td>
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<td>Gagne's Nine Events</td>
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<td>Game Implementation Project</td>
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<td>Game Implementation Plan due</td>
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<td>Games for the Very Young and the Not So</td>
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<td>Game Development Game Pitch Project</td>
<td>Gamestar Mechanic</td>
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<td>Proposal for final project due</td>
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<td>Games and Assessment</td>
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<td>Games for Social Impact Final Project</td>
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<td>Final Projects Due</td>
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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name):
   Physics and Astronomy

2. Course prefix, number and complete title of course:
   PHYS 641 Extragalactic Astronomy

3. Catalog course description (not to exceed 50 words):
   Overview of observations of galaxies and large-scale structures in the Universe to understand their formation and evolution from theoretical and observational perspectives. Galaxy luminosity functions; evolution of stellar populations and chemical enrichment; clusters and AGN.

4. Prerequisite(s):
   PHYS 601; or ASTR 314 and PHYS 302; or permission of instructor

5. Is this a variable credit course?
   [ ] Yes  [ ] No
   If yes, from _____ to _____

6. Is this a repeatable course?
   [ ] Yes  [ ] No
   If yes, this course may be taken _____ times.

   Will this course be repeated within the same semester?
   [ ] Yes  [ ] No

7. This course will be:
   a. required for students enrolled in the following degree programs(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix  Course #  Title (excluding punctuation)
    PHYS 641 Extragalactic Astronomy

    Lect. Lab SCH CR and Email Code  Admin Unit  Acct Year  HEC Code
    0 3 0 0 0 3 4 0 0 2 0 2 0 1 0 0 2 3 0 4 1 3 1 4 0 0 3 6 3 2

   Approval recommended by:

   George R. Welch
   Department Head or Program Chair
   11.28.2012

   Chair, College Review Committee
   12-10-12

   George R. Welch
   Department Head or Program Chair
   (Type Name & Sign)
   11.28.2012

   Dean of College
   1-9-13

   (if cross-listed course)

   Submitted to Coordinating Board by:

   Chair, GC or UCC
   2-7-13

   Date
   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: PHYS641
Course Title: Extragalactic Astronomy
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course provides an overview of observations of galaxies in the Universe. The goal of this course is to provide an advanced understanding of the formation and evolution of galaxies and large-scale structures in the Universe both from a theoretical and observational perspective. Topics will include the formation of structure in the early Universe, the distribution of galaxy properties, galaxy number counts and luminosity functions. The course will discuss the evolution of stellar populations and chemical enrichment in galaxies. Other topics include galaxy groups, galaxy clusters, and the effects of these dense environments on galaxy evolution. The course will also include an overview of active galaxies (radio galaxies, quasars, other AGN) and their relationship to galaxies.
Prerequisites: PHYS 601 or ASTR 314 & PHYS302 or equivalent; or permission of instructor

Course Objectives
By the end of the course, students will be familiar with state-of-the-art observations of galaxies in the Universe and will understand the basic formulations of theories that explain the formation and evolution of galaxies and large-scale structure in the Universe. Students will be able to discuss current research papers on integrated stellar populations, galaxy groups and clusters, active galactic nuclei and galaxy evolution.

Instructor Information
Name: Casey Papovich
Telephone: (979) 862-2704
Email address: papovich@physics.tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M325

Textbook and Resource Materials
• Extragalactic Astronomy and Cosmology by Schneider (2010, Berlin: Springer) ISBN 3642069711
• Course handouts and notes will also be available.
Grading policies
The course grade will be assigned on the basis of exam performance (20%), assigned homework (60%), and attendance and class participation (20%). The grading scale will be as follows: A, \( \geq 90\% \); B \( \geq 80\% \); C \( \geq 70\% \); D \( \geq 60\% \); F \( < 60\% \)

Exams
There will be one final exam over material presented in the course lectures. Each will contain short-answer and essay questions that will require calculation and quantitative estimates.

Homework
There will be three homework assignments due about every four weeks. Late homework will be penalized at the rate of 10% per day.

Course Outline
Week 1: Preliminaries, Radiation, Magnitudes, Stars, Stellar Populations
Weeks 3-4: Galaxies. Hubble Sequence, light distributions, dynamics, mass-to-light ratios.
Week 5: Luminosity functions, Bimodal color distributions.
Week 7: Cosmology and Galaxy distributions. Newtonian cosmology, cosmological parameters, cosmic time and distances.
Week 11: Large Scale Surveys. Redshift surveys.
Week 14: Lyman-alpha forest. First stars and galaxies, Reionization

ADA Policy
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attempt to present work that the student has not actually prepared as their own work, or to pass an examination by improper means, is regarded as a serious offense. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

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Texas A&M University  
Departmental Request for a New Course  
Undergraduate • Graduate • Professional  
• Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: PHYS 642 Astronomical Observing Techniques and Instrumentation

3. Catalog course description (not to exceed 50 words):
   Theory and practice of obtaining and analyzing astrometric, photometric, spectroscopic, and interferometric measurements of astronomical sources across the electromagnetic spectrum. Principles of design, fabrication, assembly, test, deployment, and use of astronomical instruments.

4. Prerequisite(s):  
   PHYS 615 or equivalent; or permission of instructor

5. Is this a variable credit course?  
   □ Yes  ☑ No  
   If yes, from _______ to _______

6. Is this a repeatable course?  
   □ Yes  ☑ No  
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester?  
   □ Yes  ☑ No

7. This course will be:  
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Approval recommended by:
   George R. Welch  
   Department Head or Program Chair (Type Name & Sign)  
   Date 11.28.2012

   Chair, College Review Committee  
   Chair, Graduate Council  
   Date 12-10-12

George R. Welch  
Department Head or Program Chair (Type Name & Sign)  
(if cross-listed course)  
Date 11.28.2012

Dean of College  
Date 2-7-13

Submitted to Coordinating Board by:

Associate Director, Curricular Services  
Date  
Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: PHYS642
Course Title: Astronomical Observing Techniques and Instrumentation
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course covers the theory and practice of obtaining astronomical data. Specific topics include the astrometric, photometric, spectroscopic, and interferometric measurement of astronomical sources across the electromagnetic spectrum. There is an introduction to statistical analysis of astronomical data that includes signal detection, signal-to-noise estimates, model fitting, good-of-fit estimation, and non-parametric techniques. There is discussion of the techniques and practices of the design, fabrication, assembly, test, deployment, and use of modern astronomical instruments.
Prerequisites: PHYS 615 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will be familiar with the basic techniques of how to obtain meaningful astronomical data and the principles of astronomical instrumentation. They will know how to use basic analysis tools (IRAF, IDL, AIPS, etc.) and statistical techniques (correlation, regression, $\chi^2$, non-parametric) that are commonly applied to astronomical research. Course participants will also learn to use a telescope and modern astronomical detector systems in a night-time research setting.

Instructor information
Name: Darren DePoy
Telephone: (979) 862-2082
Email address: depoy@physics.tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Munnerlyn Astronomical Instrumentation Building 204

Textbook and Resource Materials
- Course handouts and notes will also be available.
Grading policies
The course grade will be assigned on the basis of exam performance (33%), assigned homework (33%), and an oral presentation describing some astronomical instrumentation system (33%). The grading scale will be as follows: A, ≥ 90%; B ≥ 80%; C ≥ 70%; D ≥ 60%; F < 60%

Exams
There will be two in-class exams (mid-term and final) over material presented in the course lectures. Each will contain short-answer and essay questions that will require calculation and quantitative estimates.

Homework
There will be four homework assignments throughout the semester. Each problem will require the student to investigate an aspect of instrument design (throughput, resolution, bandpass, etc.). Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a written report and give an oral presentation on an existing or planned astronomical instrument (telescope, satellite, etc.).

Course Outline
Weeks 1-2: Introduction and Positional Astronomy (coordinate systems, spherical geometry, precession, time, right ascension and declination). Detection of a signal (signal-to-noise ratio). Statistics (sample and parent population, mean and variance, Poisson and Gaussian distributions, regression, correlation, $\chi^2$, etc.)

Weeks 3-4: Non-parametric statistics: non-Gaussian distribution functions (exponential, Cauchy, beta, Student's $t$, Pareto) and appropriate applications, mean and variance, non-parametric tests (Pearson's $\chi^2$, Kolmogorov-Smirnov, von Mises, Anderson-Darling, Mann-Whitney U, Spearman’s Rank, Kendall’s $\tau$, etc.) and appropriate application. Multivariate analysis (principal component, discriminant, clustering, etc.). Time series analysis. Bayes' theorem and examples. Fisher matrices and joint probability.

Weeks 5-6: Photon detectors (semiconductors, photodiodes, CCDs, infrared arrays, bolometers, heterodyne mixing, antenna theory). Instrumental signatures and noise sources (dark current, Johnson noise, electronic noise sources, pixel-to-pixel variations in quantum efficiency, etc.). Image analysis and data processing (IRAF, IDL, etc.). Signal-to-noise estimates and predictions.

Weeks 7-8: Optics (geometric optics, telescope design, aberrations, physical optics, elementary optical design). Atmospheric effects (refraction, seeing, observatory sites and selection criteria, extinction and emission, adaptive optics). Practical considerations in instrumentation design (finite element and flexure analysis, cryogenic systems and cooling design, scattered and stray light analysis and control, calibration unit design, etc.)

Weeks 9-11: Photometry (photometric and radiometric concepts, magnitudes, photometric systems, absolute calibration, signal-to-noise calculation, etc.). Definition and design of filters. Photometry from a photographic plate. Design of a photometer (photomultiplier tubes, field lens, stops, readout electronics). Design of an imaging system (CCDs, optics, structural analysis, cryogenics, etc.).
Weeks 12-14: Spectroscopy: design of a slit spectrometer, dispersers (prisms, gratings, grisms, volume-phase holographic gratings), and other practical considerations. Analysis of spectroscopic data and removal of instrumental effects. Spectroscopy in the infrared. Other assorted spectroscopic techniques (Fourier transform spectroscopy, heterodyne techniques, Fabry-Perot interference, etc.). Design considerations for multi-object spectrographs (fibers, slit masks, etc.). Signal-to-noise calculations.

Week 15: Special topics: Radio, sub-mm, and x-ray astronomy; space astronomy and satellite design, etc. Neutrino and Gravitational Wave astronomy.

ADA Policy
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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy
2. Course prefix, number and complete title of course: PHYS 643 Stellar Astrophysics
3. Catalog course description (not to exceed 50 words):
Theoretical and observational aspects of stellar astrophysics. Thermodynamic properties of stellar interiors; energy sources; nuclear processes and burning stages; convective and radiative energy transport; evolutionary models; atmospheres; stability and pulsations; chemical enrichment processes; population synthesis.

4. Prerequisite(s):
PHYS 606 and PHYS 607 or equivalents; or permission of instructor

5. Is this a variable credit course? □ Yes □ No
If yes, from ______ to ______

6. Is this a repeatable course? □ Yes □ No
If yes, this course may be taken ______ times.

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Pref. No. Course No. Title (excluding punctuation)
   PHYS 643 STELLAR ASTROPHYSICS
   LeC Lab SCI CH and Fund Code Admin Unit Acad Year HCC Code
   0 3 0 0 3 4 0 2 0 0 2 0 1 0 2 3 0 4 1 3 6 3 3 2

Approval recommended by:
George R. Welch
Department Head or Program Chair (Type Name & Sign) Date 11-29-12

Chair, College Review Committee Date 12-10-12
Dean of College Date 1-9-13
Chair, GC or UCC Date 2-7-13

Submitted to Coordinating Board by:
Associate Director, Curricular Services Date

Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services — 3/10
Course Number: PHYS643  
Course Title: Stellar Astrophysics  
Term: Fall 2013  
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites  
This course covers the theoretical and observational aspects of stellar astrophysics. Specific topics include: thermodynamic properties of stellar interiors, energy sources, nuclear processes and burning stages, convective and radiative energy transport, evolutionary models, atmospheres, stability and pulsations, chemical enrichment processes and population synthesis.  
Prerequisites: PHYS 606 & 607 or equivalent; or permission of instructor

Course objectives  
By the end of the course, students will be able to carry out simple radiative transfer calculations and determinations of photospheric properties (abundances, electron densities, pressure). They will understand the different energy generation mechanisms at work in the cores of stars and the sources of opacity that regulate energy transfer. They will be familiar with the various stages of stellar evolution for low- and high-mass stars, and the differences between the evolution of single and binary stars.

Instructor information  
Name: Lucas Macri  
Telephone: (979) 314-1592  
Email address: lmacri@tamu.edu  
Office hours: Tuesdays and Thursdays 11am-12:30pm  
Office location: Mitchell Institute, M423

Textbook and Resource Materials  
• An Introduction to Stellar Astrophysics by Francis LeBlanc (2010: Wiley) ISBN 470699560  
• Course handouts and notes will also be available.

Grading policies  
The course grade will be assigned on the basis of assigned homework (40%), presentation and discussion of papers in class (20%), a term paper on a topic not covered in class (20%) and an associated oral presentation (20%). The grading scale will be as follows: A, ≥ 90%; B, ≥ 80%; C, ≥ 70%; D, ≥ 60%; F, < 60%
Homework
There will be four homework assignments throughout the semester, due every three weeks. Each assignment will cover a specific section of the course: (observational introduction; stellar atmospheres; stellar interiors; stellar evolution). Some problems will require basic programming skills. Late homework will be penalized at the rate of 10% per day.

Presentation and discussion of papers in class
Each student will lead the discussion of a paper during one lecture (10% of the grade). Students must also read and actively participate in the discussion of all other papers during the semester (10% of the grade).

Term paper
Each student will write a 5-10 page paper on a topic not covered in class, chosen in consultation with the instructor. The paper will be due during finals week and will count for 20% of the grade. It must be typeset using LaTeX. Each student will give a 20-minute presentation on her/his term paper during the final two weeks of the semester. The presentation will count for 20% of the grade.

Course Outline

Stellar atmospheres [6 lectures]: Radiative Transfer - Diffusion Equation - Opacity sources - Grey atmosphere - Line profiles - Curves of growth

Stellar interiors [8 lectures]: Equations of stellar structure - Energy transport: conduction, convection and mixing-length theory - Polytropic equations of state - The radiative envelope and its structure - Completely convective stars - Thermonuclear energy sources: the p-p chain, the CNO cycle, He-burning reactions, more massive nuclei - Neutrino emission mechanisms - The solar neutrino "problem"

Stellar evolution [7 lectures]: Pre-main sequence evolution and Young Stellar Objects – The Zero-Age Main Sequence – Evolutionary lifetimes – Post-main sequence evolution – Red giants and supergiants – The helium flash – Later phases – Core collapse and nucleosynthesis – Rotational mixing – Binaries – Stellar pulsation mechanisms

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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: PHYS 644 Cosmology

3. Catalog course description (not to exceed 50 words):
Basic principles of modern cosmology and particle physics. General relativity; cosmic inflation; Big Bang nucleosynthesis; expansion of the universe; cosmic microwave background; large-scale structure of the Universe; properties of particles; dark matter; dark energy.

4. Prerequisite(s):
PHYS 615 or equivalent; or permission of instructor

5. Is this a variable credit course? Yes ☑ No 
If yes, from _______ to _______

6. Is this a repeatable course? Yes ☑ No 
If yes, this course may be taken _______ times.
Will this course be repeated within the same semester? Yes ☑ No

7. This course will be:
a. required for students enrolled in the following degree programs(s) (e.g., B.A. in History)

b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in Geography)

MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course # Title (excluding punctuation)

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Approval recommended by:

George R. Welch 11-28-2012
Department Head or Program Chair (Type Name & Sign) Date
Chair, College Review Committee 12-10-12

George R. Welch 11-28-2012
Department Head or Program Chair (Type Name & Sign) Date
Dean of College 1-9-12

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: PHYS644  
Course Title: Particle Physics & Cosmology  
Term: Fall 2013  
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
This course will provide the basic principles of modern cosmology and particle physics, as well as their connections. This course will cover: General Relativity; expansion of the Universe; the cosmic microwave background; the large-scale structure of the Universe; properties of particles; dark matter; Big-Bang nucleosynthesis; and cosmic inflation.
Prerequisites: PHYS 615 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will understand the processes that regulated the evolution of the Universe from the era of inflation until the generation of the cosmic microwave background. They will be able to solve simple problems in General Relativity and use the Friedman-Robertson-Lemaître-Walker metric to derive basic cosmological equations.

Instructor information
Name: Bhaskar Dutta  
Telephone: (979) 845-5359  
Email address: dutta@physics.tamu.edu  
Office hours: Tuesdays and Thursdays 11am-12:30pm  
Office location: Mitchell Institute, M424

Textbook and Resource Materials
- No textbook is required -- course handouts and lecture notes will be provided.

Grading policies
The course grade will be assigned on the basis of assigned homework (100%). The grading scale will be as follows: A, ≥ 80%; B, ≥ 70%; C, ≥ 60%; D, ≥ 50%; F, < 50%

Homework
There will be four homework assignments, which will consist of written assignments and reports (see course schedule for topics). Late homework will be penalized at the rate of 10% per day.
Course Outline
Week 1: Expansion of the Universe: General Relativity and the FRLW metric
Week 2: Review of particle physics models
Week 3: Cosmic Microwave Background
Week 4: Dark matter
Week 5: Primordial perturbations and Gravitational waves
Week 6: Neutrinos
Week 7: Large Scale Structure
Week 8: Big bang nucleosynthesis
Week 9: Acoustic oscillations and non-gaussianities
Week 10: Inflation
Week 11: Dark energy
Week 12: Overview of current research in cosmology and particle physics

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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. Request submitted by (Department or Program Name):
   Physics and Astronomy
   GRADUATE STUDIES

2. Course prefix, number and complete title of course:
   PHYS 645 Galactic Astronomy

3. Catalog course description (not to exceed 50 words):
   Basic nature and structure of constituents of Milky Way galaxy. Distribution and motions of stars and gas; origin, evolution and distribution of large-scale chemical abundances and kinematic patterns across populations; models of galaxy formation and implications of modern observations.

4. Prerequisite(s):
   PHYS 601 and PHYS 607 or equivalents; or permission of instructor

5. Is this a variable credit course?
   □ Yes       ☑ No
   If yes, from _______ to _______

6. Is this a repeatable course?
   □ Yes       ☑ No
   If yes, this course may be taken _______ times.
   Will this course be repeated within the same semester?
   □ Yes       ☑ No

7. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)
      MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course # Title (excluding punctuation)

   PHYS   6  4  5 GALACTIC ASTRONOMY

   Lect. Lab SCH. CR and Fund Code Admin. Unit Acad. Year HG Code
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   Approval recommended by:
   George R. Welch 11-26-2012
   Department Head or Program Chair (Type Name & Sign) Date

   George R. Welch 11-26-2012
   Department Head or Program Chair (Type Name & Sign) Date
   (if cross-listed course)

   Submitted to Coordinating Board by:
   Associate Director, Curricular Services

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
   Curricular Services – 3/10
Course Number: PHYS645
Course Title: Galactic Astronomy
Term: Fall 2013
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites
An overview of the content and structure of our Milky Way Galaxy. The course will discuss the physical properties of stars and gas constituents of the Galaxy, the space distribution of stars and chemical elements, large-scale structure and kinematics, and formation scenarios. Comparison of formation models to modern observational results will also be included.
Prerequisites: PHYS 601 & 607 or equivalent; or permission of instructor

Course objectives
By the end of the course, students will understand the basic nature and structure of the constituents of our Milky Way galaxy, including the distribution and motions of stars and gas in the Milky Way, the origin, evolution and large scale distribution of chemical abundances and the patterns seen in different kinematic populations. Students will be familiar with different models of galaxy formation and how they compare with modern observations.

Instructor information
Name: Nicholas Suntzeff
Telephone: (979) 458-1786
Email address: nsuntzeff@tamu.edu
Office hours: Tuesdays and Thursdays 11am-12:30pm
Office location: Mitchell Institute, M513

Textbook and Resource Materials
• Course handouts and notes will also be available.

Grading policies
The course grade will be assigned on the basis of exam performance (25%), assigned homework (50%), and an oral presentation on a topic covered by the course (25%). The grading scale will be as follows: A, ≥ 90%; B, ≥ 80%; C, ≥ 70%; D, ≥ 60%; F, < 60%

Exams
There will be one final exam over material presented in the course lectures. The exam will contain short-answer and essay questions that will require calculation and quantitative estimates.
Homework
There will be homework problems assigned throughout the semester. Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a 30-minute presentation on a topic related to current research on Galactic astronomy.

Course Outline

Weeks 1-2: Overview of the Milky Way. The historical growth of our conception of our Galaxy.

Weeks 3-4: Measurements of stars that help us understand the nature of the Milky Way: positions and coordinate systems, proper motions, parallax, radial velocities, stellar spectra, magnitudes and colors, absolute energy distributions, and a survey of astronomical catalogues and atlases.

Weeks 5-6: The physical properties of stars and the gaseous constituents of the Milky Way: stellar distances, masses and radii, analysis of stellar spectra, the systematic differences between stellar populations (spiral arms and disk populations versus halo populations), and interstellar absorption.

Weeks 7-9: The space distribution of stars and chemical elements in the Milky Way: the apparent distribution of stars, star-count analysis, the distribution of stars and the chemical elements, and the difference between stellar populations.

Weeks 10-12: Stellar kinematics: the motion of the Sun in the Milky Way, motions of disk stars, motions of halo stars, rotation kinematics of the Milky Way and other galaxies, dark matter halos.

Weeks 13-14: The large-scale distribution of gas in the Milky Way and other galaxies: neutral hydrogen, molecular clouds, the Galactic Center, mass in-fall due to collisions.

Week 15: Models of the formation of the Milky Way and other galaxies: classic monolithic collapse, hierarchical formation and accretion, observational evidence for either scenario.

ADA Policy
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit http://disability.tamu.edu.

Honor Code
Texas A&M University assumes that all students enroll in its programs with a serious learning purpose and expects them to be responsible individuals who demand of themselves high standards of honesty and personal conduct. All students are expected to behave at all times with respect and courtesy toward
their fellow students and instructors and are to have the highest standards of honesty and integrity in their academic performance. Any behavior which disrupts the classroom learning environment or any attempt to present work that the student has not actually prepared as their own work, or to pass an examination by improper means, is regarded as a serious offense. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

I consider it a privilege to work with students of such character as that of Aggies. The Honor Code sets Texas A&M apart from other universities, and you should be proud of the standard this sets. I expect that you will abide by the Aggie Code of Honor:

The Aggie Honor Code: An Aggie does not lie, cheat or steal, or tolerate those who do

Further information regarding the Honor Council Rules and Procedures may be found on the web at http://www.tamu.edu/aggiehonor
Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
* Submit original form and attach a course syllabus.*

1. Request submitted by (Department or Program Name): Physics and Astronomy

2. Course prefix, number and complete title of course: PHYS 646 Radiative Transfer

3. Catalog course description (not to exceed 50 words):
Fundamental radiative processes in stellar and planetary atmospheres. Radiation fields; Stokes parameters; Mueller matrix formalism; radiation from moving charges; Compton scattering; plasma effects; atomic structure and radiative transitions; molecular structure and spectra; multiple scattering.

4. Prerequisite(s):

Cross-listed with:

Stacked with:

5. Is this a variable credit course? ☐ Yes ☑ No If yes, from ______ to ______

6. Is this a repeatable course? ☐ Yes ☑ No If yes, this course may be taken ______ times.
Will this course be repeated within the same semester? ☐ Yes ☑ No

7. This course will be:

a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

MS or PhD in physics

8. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

9. Prefix Course # Title (excluding punctuation)

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Approval recommended by:

George R. Welch
Department Head or Program Chair (Type Name & Sig) Date 11/28/2012

Chair, College Review Committee Date 1-9-12

Dean of College Date 2-7-13

Substituted to Coordinating Board by:

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 3/10
Course Number: PHYS646  
Course Title: Radiative Processes in Stellar and Planetary Atmospheres  
Term: Fall 2013  
Meeting times and location: MPHY 107, Tuesdays & Thursdays 9:35-10:50

Course Description and Prerequisites  
This course will emphasize the physics involved in the fundamental radiative processes that occur in both stellar and planetary atmospheres.  
Prerequisites: PHYS 302, 304, 408 & 412 or equivalent; or permission of instructor.

Course objectives  
By the end of the course, students will be familiar with radiation fields, Stokes parameters and the Mueller matrix formalism. They will be able to carry out basic calculations pertaining to radiation from moving charges, scattering processes and radiative transitions. Students will be able to develop a basic radiative transfer algorithm and compute the internal structure of simple (idealized) stars and planets.

Instructor information  
Name: George Kattawar  
Telephone: (979) 845-1180  
Email address: kattawar@physics.tamu.edu  
Office hours: Tuesdays and Thursdays 11am-12:30pm  
Office location: Mitchell Physics Building, 555

Textbook and Resource Materials  
• Course handouts and notes will also be available.

Grading policies  
The course grade will be assigned on the basis of exam performance (60%), assigned homework (20%), and special assignments (20%). The grading scale will be as follows: A, ≥ 90%; B ≥ 80%; C ≥ 70%; D ≥ 60%; F < 60%

Exams  
There will be one midterm and one final exam over material presented in the course lectures. Each exam will count for 30% of the total grade.
Homework
There will be homework problems assigned throughout the semester. Late homework will be penalized at the rate of 10% per day.

Presentation
Each student will prepare a special written assignment on a topic related to the course.

Course Outline

Weeks 1-2: Fundamentals of Radiative Transfer

Weeks 3-4: Radiation fields – Stokes parameters – Mueller matrix formalism

Weeks 5-6: Radiation from moving charges – Bremsstrahlung and synchrotron radiation

Weeks 7-8: Compton scattering – Plasma effects

Weeks 9-10: Atomic structure and radiative transitions

Weeks 11-12: Molecular structure and spectra

Week 13: Elementary multiple scattering

Week 14: Advanced multiple scattering

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