ASTRONOMY (ASTR)

ASTR 100 - EXPLORING THE COSMOS
Short Title: EXPLORING THE COSMOS
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Seminar
Credit Hour: 1
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Description: Introduction to concepts, methods and discoveries of astronomy and astrophysics, with a theme to be chosen from the frontier topics of modern astrophysics. Will emphasize student presentations. Designed for first year students interested in science or engineering, but other majors are welcome.

ASTR 201 - STARS, GALAXIES, AND THE UNIVERSE
Short Title: STARS, GALAXIES & THE UNIVERSE
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Distribution Group: Distribution Group III
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Description: An introductory course for students in academic programs. The formation, evolution, and death of stars; the composition and evolution of galaxies; the structure and evolution of the universe.

ASTR 202 - EXPLORATION OF THE SOLAR SYSTEM
Short Title: EXPLORATN OF THE SOLAR SYSTEM
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Distribution Group: Distribution Group III
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Description: The physical processes governing the nature and behavior of the various Solar System bodies are discussed with a focus on the origins, evolution and fate of the Solar System and its parts. This broader context leads to a deeper understanding of the Earth as a life-supporting planet.

ASTR 221 - OBSERVING THE NIGHT SKY
Short Title: OBSERVING THE NIGHT SKY
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture/Laboratory
Credit Hours: 2
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Description: An introduction to the celestial sphere and movements of the sun, moon, and planets. Students will gain hands-on experience using computerized telescopes, binoculars, digital imagers, and planetarium software to study astronomical objects. Intended for students in all types of academic programs.

ASTR 230 - ASTRONOMY LAB
Short Title: ASTRONOMY LAB
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Laboratory
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Description: A hands-on introduction to modern techniques of observational astronomy. Students use telescopes, CCDs, and computers to obtain and analyze their own images and spectra of solar system, galactic, and extragalactic objects. The course employs the campus observatory, dark sky observing sites, and state of the art data analysis software. Instructor Permission Required.

ASTR 243 - LIVING WITH A STAR: THE PHYSICS OF THE SUN-EARTH CONNECTION
Short Title: LIVING WITH A STAR
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Lower-Level
Prerequisite(s): MATH 102 and PHYS 102 or PHYS 126
Description: Introduction to astrophysical processes, particularly the effect of the Sun on the Earth. Possible effects of solar variability will be considered, especially global warming. The observational and theoretical basis of our current understanding will be presented.

ASTR 350 - INTRODUCTION TO ASTROPHYSICS-STARS
Short Title: INTRO ASTROPHYSICS-STARS
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Upper-Level
Prerequisite(s): MATH 211 and PHYS 202
Description: An introductory course to modern techniques of observational astronomy. Students use telescopes, CCDs, and computers to obtain and analyze their own images and spectra of solar system, galactic, and extragalactic objects. The course employs the campus observatory, dark sky observing sites, and state of the art data analysis software. Instructor Permission Required.

ASTR 360 - INTRODUCTION TO ASTROPHYSICS-GALAXIES
Short Title: INTRO ASTROPHYSICS-GALAXIES
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Credit Hours: 3
Restrictions: Graduate level students may not enroll.
Course Level: Undergraduate Upper-Level
Prerequisite(s): MATH 211 and PHYS 202
Description: An introductory course to modern techniques of observational astronomy. Students use telescopes, CCDs, and computers to obtain and analyze their own images and spectra of solar system, galactic, and extragalactic objects. The course employs the campus observatory, dark sky observing sites, and state of the art data analysis software. Instructor Permission Required.
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<th>Course Code</th>
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<td>Physics and Astronomy</td>
<td>Standard Letter</td>
<td>Lecture</td>
<td>3</td>
<td>Graduate level students may not enroll.</td>
<td>MATH 211 and PHYS 202 (may be taken concurrently)</td>
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<td>ASTR 451</td>
<td>ASTROPHYSICS I: SUN AND STARS</td>
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<td>Physics and Astronomy</td>
<td>Satisfactory/Unsatisfactory</td>
<td>Seminar</td>
<td>1</td>
<td>Graduate level students may not enroll.</td>
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<td>ASTR 452</td>
<td>ASTROPHYSICS II: GALAXIES AND COSMOLOGY</td>
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<td>Standard Letter</td>
<td>Lecture</td>
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<td>Physics and Astronomy</td>
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<td>Lecture</td>
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<td>ASTR 502</td>
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<td>Physics and Astronomy</td>
<td>Satisfactory/Unsatisfactory</td>
<td>Lecture</td>
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<td>ASTR 503</td>
<td>ASTRONOMY FOR TEACHERS</td>
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<td>Physics and Astronomy</td>
<td>Standard Letter</td>
<td>Lecture</td>
<td>3</td>
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Description:
- ASTR 360: Study of redshift phenomena. Radiation, large-scale structure, galaxy formation and evolution, and high redshift phenomena.
- ASTR 451: Overview of the Sun, stars, galaxies, and the Universe at a non-calculus level. Methods to help students master content, including lab activities suitable for K-12. Observing sessions at Rice campus observatory and George Observatory TBD. Designed for inservice and preservice science teachers (grades 4-12), but open to undergraduates considering a teaching career.
- ASTR 452: Study of physical cosmology models. Description of the evolution of the universe, including nucleosynthesis, cosmic background radiation, large-scale structure, galaxy formation and evolution, and high redshift phenomena.
ASTR 505 - PROCESSES IN COSMIC PLASMAS
Short Title: PROCESSES IN COSMIC PLASMAS
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Credit Hours: 3
Restrictions: Enrollment is limited to Graduate level students.
Course Level: Graduate
Prerequisite(s): ASTR 470 and PHYS 480
Description: Study of plasma phenomena that occur widely in nature. May include quasi-static equilibrium, magnetic equilibrium, magnetic reconnection, particle acceleration, plasma winds and jets, and interchange instabilities.

ASTR 530 - TEACHING ASTRONOMY LABORATORY
Short Title: TEACHING ASTRONOMY LABORATORY
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Laboratory
Credit Hours: 3
Restrictions: Enrollment is limited to Graduate level students.
Course Level: Graduate
Prerequisite(s): ASTR 230 or ASTR 350 or ASTR 360 or ASTR 402 or ASTR 403 or ASTR 502 or ASTR 503
Description: Methods of observational astronomy for public education: telescopes, astronomical binoculars, portable planetariums, digital cameras, and photography (still, 3D, and time lapse). Students will train beginners in the use of telescopes and carry out a modest observational program. The course requires one public presentation. Topics vary with each offering. Mutually Exclusive: Credit cannot be earned for ASTR 530 and ASTR 430.

ASTR 555 - PROTOSTARS AND PLANETS
Short Title: PROTOSTARS AND PLANETS
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Lecture
Credit Hours: 3
Restrictions: Enrollment is limited to Graduate level students.
Course Level: Graduate
Prerequisite(s): ASTR 451
Description: Physics of star and planet formation, including molecular cloud dynamics and chemistry, circumstellar accretion disks, dust, debris disks, atmospheres rotation, and magnetic fields of young stars, binaries, brown dwarfs, comets, Kuiper belt objects, giant planet formation and discoveries of extra solar planets.

ASTR 600 - ADVANCED TOPICS IN ASTROPHYSICS
Short Title: ADV TOPICS IN ASTROPHYSICS
Department: Physics and Astronomy
Grade Mode: Standard Letter
Course Type: Seminar
Credit Hours: 3
Restrictions: Enrollment is limited to Graduate level students.
Course Level: Graduate
Description: Lecture/seminars which treat topics of departmental interest. Not offered every year. Repeatable for Credit.