

Fall 2019
Syllabus
Physics 171: Planetary & Stellar Astronomy

MWF 9:00-9:50 am in Small Hall room 110

Undergraduate prerequisites: None ... interest in space & the natural world.
(Necessary math skills: algebra, trigonometry.)

Instructors

Prof. Seth Aubin

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CeeCee Bishop

Office: room 258 (graduate student lounge), Small Hall

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Office hours: Aubin: T&Th, noon-1 pm or by appointment.

Bishop: Th 8:30-10:30am or by appointment.

Course Objectives

The primary purpose of this course is to introduce the basic concepts, science, and methods in planetary and stellar astronomy. The course will cover the following topics:

- Basic physics: motion, gravity, light, matter, fusion.
- The night sky: constellations.
- Spectroscopy: identifying molecules from their light.
- Astronomy instruments: telescopes and space probes.
- Solar system: Sun, planets, moons, asteroids, and comets.
- Exo-planets (astrobiology?).
- Main sequence stars, stellar evolution.
- Special stars: dwarfs, Cepheids, neutron stars, black holes.
- Exploding stars: novae, supernovae, mergers.

Course Materials

Text: Most of the course materials and problem sets will be taken from the following required text for the course:

Astronomy by A. Fraknoi, D. Morisson, and S. C. Wolff, OpenStax (Rice U.), 2018.

→ Download for free at <https://openstax.org/details/books/astronomy>

Evaluations

Your final grade for the course will be determined from the following grading weight distribution:

Participation:	10%
Problem sets:	20%
Papers & Presentation:	20%
Midterms (3):	30%
Final Exam:	20%

Participation: The classroom presentation of course material will involve class discussions. All students are expected to participate in these discussions and ask questions, since they will help elucidate the course material. Participation also reflects class attendance and quiz performance. We will use PollEv for in-class participation polls and quizzes (see back page for details).

Problem sets: The problem sets are the main method for learning the course material. Students are expected to do the problems on their own (not as a team effort with other students), though discussion and limited oral consultation with other students is encouraged. The solution manual for the main text is not an acceptable source for solving problem sets before they are due.

There will be weekly problem sets (roughly five problems). A random selection of 1-3 of these problems will be graded. You can also expect these problems to be selected for quizzes and midterm tests.

Papers & Presentation: The course features two interludes (weeks 8 & 14) during which we will investigate a broad topic that reaches out to other academic domains, i.e. Cultures, Societies, and Individuals (CSI) and Arts, Letters, and Values (ALV). Students will write up short papers (4-5 pages) on the interlude topics and will participate in a team presentation (tentative).

Midterms: There will be three midterm tests, each worth 10% of your overall final grade.

Final exam: The final exam will cover all the material in the course.

E-mail policy

Feel free to communicate with S. Aubin or C. Bishop via e-mail. We cannot guarantee that we will read e-mails sent in the evening until the next day.

Important academic deadlines

***Add/drop deadline: Friday, September 6, 2019**

****Withdraw deadline: Monday, October 28, 2019**

Weekly Schedule (tentative)

Week 0: 8/28-30

Intro to Astronomy [Ch. 1, 2]

Overview, units, distance scales, time, past concepts of the stars and planets, constellations.

Week 1: 9/2-6*

Basic Physics I: Motion and Gravity [Ch. 3, 4.6]

Galileo, Newton's laws, gravity, orbits, Kepler's laws, escape velocity.

Week 2: 9/9-13

Basic Physics II: Light and Matter [Ch. 5, 16.1-2]

Electromagnetic radiation, photons, blackbody radiation, spectroscopy, elements, fusion.

Week 3: 9/16-20

Astronomy Instruments [Ch. 6]

Telescopes (optical, infrared, radio, x-ray, gamma), resolution, space probes.

Week 4: 9/23-27

Solar System I: Overview [Ch. 7, 8]

MIDTERM #1. Composition, structure, and origin of our solar system, Earth as a planet.

Week 5: 9/30-10/4

Solar System II: Earth & Earth-like Planets [Ch. 8, 9, 10]

Earth, Moon, Mercury, Venus, Mars.

Week 6: 10/7-11

Solar System III: Gas Giants, etc ... [Ch. 11, 12, 13]

Jupiter, Saturn, Uranus, Neptune, rings, moons, dwarf planets, asteroids, and comets.

----- Fall Break -----

Week 7: 10/16-18

Our Sun [Ch. 15, 16]

Structure of the Sun, thermonuclear fusion energy, space weather.

Week 8: 10/21-25

Interlude I: Humanity in the Solar System

MIDTERM #2. "Colonizing" Earth orbit, Moon, Asteroids, nearby planets. Astro-biology.

Week 9: 10/28-11/1**

Stars I: Stellar Properties [Ch. 17, 18]

Brightness, color, size, rotation, composition, stellar distribution.

Week 10: 11/4-8

Start II: Distances & Interstellar Space [Ch. 19, 20]

Measuring distance, Cepheid stars, H-R diagram, interstellar gas and dust.

Week 11: 11/11-15

Stars III: Star Formation & Exo-Planets [Ch. 21]

Stellar birth, planets outside our solar system, prospects for life outside Solar System.

Week 12: 11/18-22

Stars IV: Stellar Evolution [Ch. 22, 23]

MIDTERM #3. Main sequence stars, stellar death, dwarfs, novae, supernovae.

----- Thanksgiving Break -----

Week 13: 11/25

Stars V: Extreme Stars [Ch. 24]

Neutron stars, black holes, curved space, Einstein's general relativity, gravitational waves.

Week 14: 12/2-6

Interlude II: Space Art

(Extreme stars continued.) Imagining other worlds: space in still art and movies.

Dec 17, 2019, 9am-noon

Final Exam

PolleEv

We will use Poll Everywhere ("PolleEv") throughout this semester. With PolleEv, you use your computer, tablet, or phone to answer questions, take a poll, discuss, and more. Please plan on bringing a smart phone, tablet, or laptop with you to every class. You will need to connect your device to the W&M wireless network. Also, if you use an Apple or Android device, please download the free Poll Everywhere app. The app is not required, but it will make the participation process easier.

Instructions for logging into your PolleEv account can be found on the IT website:
<https://www.wm.edu/offices/it/services/academicsupport/studentresponsesystem/index.php>

There is no fee associated with your student PolleEv account, however you must login with your W&M email and password by selecting "Next" and choosing the "Log in with William & Mary" option at login.

Though we will use PolleEv informally in the first week, we will use PolleEv for graded activities beginning in the second week (i.e. Sept. 2-6) of classes. The *course username* is "sethaubin".

If you need assistance setting up your device to work on the W&M wireless network, please navigate to the IT help page: <http://www.wm.edu/offices/it/gethelp/index.php>

It is your responsibility to bring an operable device to class each session in order to participate in the polls. You can participate in polls using only your account. Additionally, use of Poll Everywhere should adhere to the College of William & Mary honor code expectations

Student Accessibility Services

William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels that's/he/they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see www.wm.edu/sas.

Honor Code (from W&M website)

William & Mary has had an honor code since at least 1779. Academic integrity is at the heart of the university, and we all are responsible for upholding the ideals of honor and integrity. The student-led honor system is responsible for resolving any suspected violations of the Honor Code, and I will report all suspected instances of academic dishonesty to the honor system. The Student Handbook (www.wm.edu/studenthandbook) includes your responsibilities as a student. Your full participation and observance of the Honor Code is expected. To read the Honor Code, see www.wm.edu/honor.

Academic dishonesty includes cheating, plagiarism, unauthorized collaboration, and use of unauthorized materials.