

San José State University
Department of Physics and Astronomy
ASTR 101: Modern Astronomy Section 01, Spring 2017

Course and Contact Information

Instructor:	Dr. Elisabeth Mills
Office Location:	SCI 322
Telephone:	(area code) (telephone number)
Email:	elisabeth.mills@sjsu.edu
Office Hours:	Tuesday, Thursday 3:00-4:00 PM or by appointment
Class Days/Time:	Tuesday, Thursday 10:30 - 11:45 AM
Classroom:	SCI 253
Prerequisites:	Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better, and completion of Core General Education
GE/SJSU Studies Category:	R

Faculty Web Page and MYSJSU Messaging

Course materials such as the syllabus, in-class handouts, lecture notes, and homework assignments can be found on Canvas. You are responsible for regularly checking with the Canvas messaging system through MySJSU at <http://my.sjsu.edu> to learn of any updates.

Course Description

A principally non-mathematical discussion of current scientific observational and theoretical understanding of the origin and evolution of stars, galaxies and the cosmos. GE Area: R Prerequisite: Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better (C- not accepted), completion of Core General Education and upper division standing are prerequisites to all SJSU studies courses. Completion of, or co-registration in, 100W is strongly recommended.

This course will present a survey of the current state of astronomy: how we understand the universe, and how we have come to this understanding. This is not a mathematics-intensive course, however we will focus on building skills of logical analysis and discussion.

This semester, the course will focus on two main topics: first, how astronomers came to understand the universe we can see with our eyes (the solar system, sun, and stars) and second, the origin of the structure in our universe as probed by observations at many different wavelengths, and the role played by unseen ingredients like dark matter and dark energy. Throughout the semester, we will emphasize active research topics where astronomers are confronting and modifying existing theories, and making exciting discoveries.

Course Goals

The goals of this course are (1) to understand the tools and methods astronomers have used and continue to use to learn about the universe around us, (2) to be familiar with the history of the universe and the origin of its structure (3) to gain physical intuition into how processes in astronomy work, and (4) to build a set of skills in logical and scientific reasoning that can be applied beyond astronomy in everyday life.

GE Learning Outcomes (GELO)

Upon successful completion of this course, students will be able to:

1. demonstrate an understanding of the methods and limits of scientific investigation, satisfied by homework assignments and weekly discussions of the work being done by current astronomers
2. distinguish scientific from pseudo-scientific arguments, satisfied by weekly discussions where we ‘bust’ various science-related myths and hoaxes.
3. apply a scientific approach to answer questions about the universe we live in, satisfied by critical thinking exercises during each class

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. Describe how our understanding of the structure of our universe and our place inside it has changed, and how astronomers have determined this without traveling outside of our solar system
2. List key steps in the formation of structures from the size of of the entire universe down to individual planets, and identify areas where astronomers are actively using the scientific method to determine how our universe works
3. Explain how tangible physical concepts like gravity, heat, or angular momentum can be used to explain the properties of our observed universe: from round planets, to the difference between the inner and outer planets in our solar system, all the way out to the properties and evolution of galaxies.
4. Use reasoning, evidence, and critical thinking to analyze scientific findings reported in the media to decide whether the student does or does not agree with the claims.

Required Texts/Readings

Textbook

We have two, free online textbooks that we will use for this class.

Most reading will be assigned from “Astronomy” published by OpenStax, which is a **free**, online introduction to astronomy that you can view online or download as a PDF from <https://openstax.org/details/books/astronomy>

A smaller number of reading assignments will come from “Astropedia Textbook: Universe Revealed” by Chris Impey, available at <http://www.teachastronomy.com/textbook>

Please contact me immediately if you encounter any difficulties in accessing these texts.

Other Readings

Additional readings may be assigned from other online sources

Other technology requirements

For homework, this course will use the online assignment and quiz system in Canvas.

For in class discussions, this course will use the REEF polling system. You can find the information for setting this up on your computer or mobile device at <http://www.sjsu.edu/at/ec/reef/> under Student Resources. I will also go over this on our first day of class.

Course Requirements and Assignments

This course will have weekly assigned ‘quiz’ homework to complete in Canvas, 5 short written and peer-graded assignments, and a written semester project (to be described and assigned after the midterm, and due before Thanksgiving), all of which will contribute to the final grade and will allow multiple opportunities for feedback on student progress, and assessment of course learning goals.

There will also be time devoted in class to a midterm exam study session and a final exam study session.

Final Examination or Evaluation

A written final examination will take place in the scheduled time for this section, on Friday December 16 beginning at 12:15 PM, lasting until 2:30 PM.

Grading Information

- Grades in this course will be a weighted average of scores from different components of the class:
 - 10% — in class summaries of reading assignments and lecture (graded on participation)
 - 20% — weekly ‘online quiz’ homework due Mondays through Canvas (graded on a 10 point scale)
 - 10% — 6 writing assignments, turned in through Canvas (peer-graded on a 10 point scale)
 - 20% — One midterm exam (graded on a 100 point scale)
 - 20% — One final exam (graded on a 100 point scale)
 - 20% — One semester project, with a writing emphasis (graded on a 100 point scale).
- In addition, there will be multiple opportunities for extra credit (worth in total up to 15% of the final grade). These opportunities will come from participation, additional assignments and exam problems.
- Late homework will be accepted, but may be subject to a penalty of 10% for each day after the deadline
- Final grades will be assigned according to the chart below

A+ : 97-100%

A : 93-96%

A- : 90-92%

B+ : 87-89%

B : 83-86%

B- : 80-82%

C+ : 77-79%

C : 73-76%

C- : 70-72%

D+ : 67-69%

D : 63-66%

D- : 60-62%

F : Below 60 %

Note that passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better (C- not accepted), and completion of Core General Education are prerequisite to all SJSU Studies courses. Completion of, or co-registration in, 100W is strongly recommended. A minimum aggregate GPA of 2.0 in GE Areas R, S, & V shall be required of all students.

Classroom Protocol

I invite students to use the space in the classroom as you need to: sit, stand, walk and move around, or put your feet up. As this is a 75-minute class, there will be a scheduled break, but please also feel free to take any breaks you need. I trust that you recognize that you are ultimately responsible for your learning outcome from this class, and that you are doing what you need to in order to focus best. I ask that students participate as you are able in class discussions, and bring your phones and/or computers in order to use the clicker software.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>"

ASTR 101 Spring 2017 Course Schedule

This schedule is subject to change with fair notice (one week in advance of any changes). Detailed reading assignments can be found in a Google document linked from Canvas. Readings marked with 'OS' are from the OpenStax 'Astronomy' text. Readings marked with 'TA' are from the Teach Astronomy 'Astropedia' text.

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/26	The sky. The scientific method. <i>Reading assignment from: TA ch. 1, OS ch. 1.2, 1.3, 1.4, 2.1</i>
2	1/31	Indigenous astronomy. Astronomy before tools and technology. <i>Reading assignment from: TA ch. 2</i> HW #1 due
2	2/2	The modern view of our solar system <i>Reading assignment from: OS ch. 2.2, 2.4</i> Writing #1 due
3	2/7	The sun: the center of our solar system <i>Reading assignment from: OS ch. 15</i> HW #2 due
3	2/9	The sun and moon system: eclipses, seasons and tides <i>Reading assignment from: OS ch. 4</i> Extra credit #1 due

Week	Date	Topics, Readings, Assignments, Deadlines
4	2/14	The role of gravity in the solar system. <i>Reading assignment from: OS ch. 3, TA ch. 8</i> HW #3 due
4	2/16	The inner solar system, violent impacts <i>Reading assignment from: OS ch. 9,10</i> Writing #2 due
5	2/21	The planets of the outer solar system. <i>Reading assignment from: OS ch. 11, 12</i> HW #4 due
5	2/23	Comets, asteroids, and other debris. <i>Reading assignment from: OS ch. 13, 14</i> Extra credit #2 due
6	2/28	Exoplanets <i>Reading assignment from: OS ch. 21.4, 21.5, TA ch. 9</i> HW #5 due
6	3/2	Life in the universe <i>Reading assignment from: OS ch. 30</i> Writing #3 due
7	3/7	Beyond visible light: X-rays, gamma rays, and Cosmic rays. Telescopes. <i>Reading assignment from: OS ch. 5, 6</i> HW #6 due
7	3/9	The interstellar medium <i>Reading assignment from: OS ch. 20</i> Extra credit #3 due
8	3/14	Midterm exam review HW #7 due
8	3/16	Midterm exam
9	3/21	Star and planet formation. <i>Reading assignment from: OS ch. 21.1, 21.3, 21.6</i> HW #8 due
9	3/23	The stars: Their ages, lifetimes, and physical properties <i>Reading assignment from: OS ch. 18</i> Writing #4 due

Week	Date	Topics, Readings, Assignments, Deadlines
		SPRING BREAK. No class.
10	4/4	The death of the sun. <i>Reading assignment from: OS ch. 22.1, 23.1</i> HW #9 due. Semester project assigned
10	4/6	The death of massive stars <i>Reading assignment from: OS ch. 23</i> Extra credit #4 due
11	4/11	Black holes, gravitational waves <i>Reading assignment from: OS ch. 24</i> HW #10 due
11	4/13	The speed of light and relativity <i>Reading assignment from: OS ch. 1.5</i> Writing #5 due
12	4/18	Distance scales, our Milky Way Galaxy <i>Reading assignment from: OS Ch.1.7, 19, 25, 26.4</i> HW #11 due
12	4/20	Classifying galaxies <i>Reading assignment from: OS ch. 26</i> Extra credit #5 due
13	4/25	Galaxy formation and evolution. <i>Reading assignment from: OS ch. 27, 28</i> HW #12 due
13	4/27	Dark matter <i>Reading assignment from: TA ch. 16</i> Writing #6 due (semester project check-in)
14	5/2	The Big Bang and how we know it happened <i>Reading assignment from: OS ch. 26.4, 26.5</i> HW #13 due
14	5/4	Energy and matter in the early universe. <i>Reading assignment from: OS ch. 29</i> Semester project due

Week	Date	Topics, Readings, Assignments, Deadlines
15	5/9	Fundamental forces and particles <i>Reading assignment from: OS ch. 1.8, 29.6, TA ch. 17</i> HW #14 due
15	5/11	Dark energy and the future of the universe <i>Reading assignment from: OS ch. 29.1, TA ch. 16, 17</i>
16	5/16	Final exam review HW #15 due
Final Exam	5/22	9:45 AM – 12:00 PM SCI 253