

**San José State University**  
**Department of Physics and Astronomy**  
**ASTR 101: Modern Astronomy Section 02, Fall 2016**

**Course and Contact Information**

<b>Instructor:</b>	Dr. Elisabeth Mills
<b>Office Location:</b>	SCI 322
<b>Telephone:</b>	(area code) (telephone number)
<b>Email:</b>	<a href="mailto:elisabeth.mills@sjsu.edu">elisabeth.mills@sjsu.edu</a>
<b>Office Hours:</b>	Wednesdays, 1:00 - 3:00 PM or by appointment
<b>Class Days/Time:</b>	Tuesday, Thursday 1:30 - 2:45 PM
<b>Classroom:</b>	SCI 258
<b>Prerequisites:</b>	Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better, and completion of Core General Education
<b>GE/SJSU Studies Category:</b>	R

**Faculty Web Page and MYSJSU Messaging**

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my faculty web page at <http://www.sjsu.edu/people/elisabeth.mills> under 'courses'. You are responsible for regularly checking with the 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

The textbook for this class is “Astropedia Textbook: Universe Revealed” by Chris Impey, available at <http://www.teachastronomy.com/textbook>

Reading assignments will be assigned from this textbook, which is a **free**, online introduction to basic astronomy. Please contact me immediately if you encounter any difficulties in accessing this text.

### Other Readings

Additional readings will be assigned from the ‘Astrobites’ website: <https://astrobites.org/>

A recommended text for this course is ‘*How to Build a Universe: From the Big Bang to the End of the Universe*’ by Ben Gilliland. This book can be found online at Amazon (\$13 used, \$22 new). I will have several copies in my office available for short-term loan. I will also request a copy to be on reserve at the Martin Luther King campus library. This text will be most applicable for the second part of the semester.

## 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 iClicker system. I will explain how to set this up on your personal phone or computer during the first week of class.

## Course Requirements and Assignments

This course will have weekly assigned 'quiz' homework to complete in Canvas, 10 short written 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 three additional (optional) help sessions held outside of normal office hours: a midterm exam study session, a final exam study session, and a help session for the semester project.

## Final Examination or Evaluation

A comprehensive 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 discussion using the iClicker system (graded on participation)
  - 10% — weekly 'online quiz' homework through Canvas (graded on a 5 point scale)
  - 20% — 10 writing assignments, turned in through Canvas (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).
- **We will discuss on the first day of class how to keep track of your current grade, and weekly opportunities available for feedback and self-assessment.**
- Opportunities for extra credit (worth in total up to 10% of the final grade) will be announced in class.
- Late homework will be accepted, with 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 at <http://www.sjsu.edu/gup/syllabusinfo/>

## **ASTR 101 Fall 2016 Course Schedule**

*This schedule is subject to change with fair notice (one week in advance of any changes). Any changes will be announced in class and through the MySJSU messaging system.*

### **Course Schedule**

<b>Week</b>	<b>Date</b>	<b>Topics, Readings, Assignments, Deadlines</b>
1	8/30	The cultural importance of astronomy. The scientific method. <i>Reading assignment from: Chapter 1</i>
1	9/1	Indigenous astronomy. Astronomy before tools and technology. <i>Reading assignment from: Chapter 2</i>
2	9/6	Modern tools of astronomy. <i>Reading assignment from: Chapter 1, Chapter 3</i>
2	9/8	The sun: our closest star. <i>Reading assignment from: Chapter 11</i>
3	9/13	The sun and moon system (1): motion and eclipses. <i>Reading assignment from: Chapter 2</i>
3	9/15	The sun and moon system (2): seasons and tides. <i>Reading assignment from: Chapter 2, Chapter 5</i>

<b>Week</b>	<b>Date</b>	<b>Topics, Readings, Assignments, Deadlines</b>
4	9/20	The role of gravity in the solar system. <i>Reading assignment from: Chapter 3, Chapter 5</i>
4	9/22	The inner solar system. <i>Reading assignment from: Chapter 6</i>
5	9/27	The planets of the outer solar system. <i>Reading assignment from: Chapter 7</i>
5	9/29	Comets, asteroids, and other debris. <i>Reading assignment from: Chapter 8</i>
6	10/4	The stars (1): Their ages and lifetimes <i>Reading assignment from: Chapter 12</i>
6	10/6	The stars (2): Their physical properties. <i>Reading assignment from: Chapter 12</i>
7	10/11	How astronomers measure distances <i>Reading assignment from: Chapter 12, Chapter 16</i>
7	10/12	Beyond visible light: X-rays, gamma rays, and Cosmic rays. <i>Reading assignment from: Chapter 10</i>
8	10/18	<b>Midterm exam</b>
8	10/20	The Big Bang and how we know it happened <i>Reading assignment from: Chapter 16, Chapter 17</i>
9	10/25	Energy and matter. <b>Semester project assigned</b> <i>Reading assignment from: Chapter 4</i>
9	10/27	Fundamental forces and gravitational waves <i>Reading assignment from: Chapter 17</i>
10	11/1	Dark matter <i>Reading assignment from: Chapter 15, Chapter 17</i>
10	11/3	Dark energy <i>Reading assignment from: Chapter 16, Chapter 17</i>
11	11/8	The life and death of the sun <i>Reading assignment from: Chapter 11, Chapter 13</i>
11	11/10	The life and death of massive stars <i>Reading assignment from: Chapter 12, Chapter 13</i>

Week	Date	Topics, Readings, Assignments, Deadlines
12	11/15	Forming galaxies. Our Milky Way. <i>Reading assignment from: Chapter 15</i>
12	11/17	Black holes <i>Reading assignment from: Chapter 13, Chapter 16</i>
13	11/22	Classifying galaxies, galaxy evolution. <b>Semester project due</b> <i>Reading assignment from: Chapter 10</i>
13	11/24	Thanksgiving break — <b>NO CLASS</b> —
14	11/29	The interstellar medium <i>Reading assignment from: Chapter 13, Chapter 14</i>
14	12/1	Star and planet formation. <i>Reading assignment from: Chapter 9, Chapter 13</i>
15	12/8	Exoplanets <i>Reading assignment from: Astrobites</i>
15	12/8	Life in the universe <i>Reading assignment from: Chapter 18, Chapter 19</i>
Final Exam	12/16	12:15 PM - 2:30 PM SCI 258