

# Syllabus: Astronomy 4B – Introduction to Stars and Galaxies

**Instructor:** Dr. Alexander R. Pettitt [He/Him/His]

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Welcome everyone to Introduction to Stars, Galaxies, and Cosmology! I'm Dr Pettitt and I look forward to working with you all this semester.

## Class time and location

Day/time: Monday/Wednesday/Friday, 9:00 – 9:50

TSC1000 (CSUS planetarium), or virtual lectures via Zoom if ever required.

If a faculty member is not available during the semester, students will be contacted and advised how the course will proceed. This may include a change in instructor or modality.



## Catalogue Description

*Description and explanations of astronomical phenomena related to stars, galaxies, and cosmology. Structure and evolution of stellar and galactic systems.*

## Office Hours

**Monday 15:00 – 15:50, Wednesday 10:00 – 10:50, Thursday 9:00 – 9:50.**

Also, by appointment when necessary, or virtually by Zoom if ever required. Office hours are held in SQU414 by default, if I am not present then I will instead be holding my office hours in the physics tutor center just downstairs (SQU238).

Office hours are a great opportunity to come and chat about anything in the course; homework, workload, questions from class, anything really. You don't need to warn me you are coming, simply pop along and we can have a chat, it's supposed to be informal and relaxed (they should be called "student help time" than the possibly intimidating sounding "office hours"!).

## Contacting the Instructor

Email is the easiest route to getting in contact, with but messaging via Canvas also works well.

## Online Resources

Canvas will be used for all online class elements. This includes: announcements, links to external websites, posted grades, homework assignments, quizzes, and exam material. Additional learning materials (e.g. slides) from the lectures will also be uploaded to Canvas.

## Mathematics

This is a non-calculus course but requires a knowledge of high school level algebra and some basic trigonometry. See FAQ at end of syllabus for details.

## Course Commitment

This course involves lectures three times a week, but it is expected that students read and study the text themselves in tandem to the course. The university recommends students spend twice the lecture time as private study (be it on assessments or digestion of course material), which means you should plan to dedicate at least 7 – 8 hours each week on this course (2.5hr on lectures + 5hr on non-lecture activities).

## Course Goals

- To describe the basic principles of modern astronomy: classical mechanics, the electromagnetic spectrum, the formation and evolution of stars, and the structure of galaxies.
- To recount the key advances of human knowledge of the Earth's place in the Universe.
- To describe how the scientific method shapes our changing understanding of the Universe we live in, and how ideas change and adapt to new evidence.
- To explain how astronomers apply knowledge of physics and chemistry to study distant objects via observations and theoretical modelling.
- To identify key properties of stars and galaxies, such as how they are formed, how they change with time, and their statistical properties.

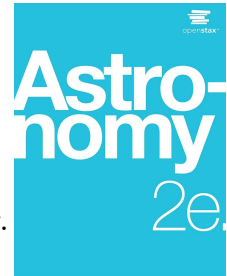
## Textbook

*Astronomy 2e*, from **OpenStax** (Fraknoi, Morrison, and Wolff)

Available 100% for **free(!)** at: <https://openstax.org/details/books/astronomy-2e>

The library does stock some physical copies if you'd prefer that as well.

The second edition is the preferred option, but the first is ok if you find it cheaper.



## Lectures and class environment

This course will offer in-person lectures in CSUS planetarium. Students are *strongly* encouraged to attend lectures, and attendance/participation will take up a small fraction of the course grade ("Class participation" = 6%, enough to easily push a grade across a letter boundary). Some small elements of audience participation will take place during the lecture. If ever required (e.g. the instructor falls ill), virtual lectures will be provided via Zoom at the same scheduled meeting time.

Our time in the planetarium is an open and safe one. At any time in class you are free to ask questions, and I'll have pair/group exercises where it's highly encouraged you work together on a variety of tasks.

## Topics

This is a GE (General Education) area B1 (Physical Science) course. The course is split into three parts, which will cover the following chapters from the OpenStax textbook. As the semester is approximately 15 teaching weeks, this equates to about 26 lectures (accounting for midterms and holidays), which gives us 1 – 2 lectures per chapter.

### Part A: Essential Astronomy

- Ch1: Science and the Universe
- Ch2: Observing the Sky
- Ch3: Orbits and Gravity
- Ch4: Earth, Moon, and Sky
- Ch5: Radiation and Spectra



- Ch19: Celestial Distances
- Ch20: The Interstellar Medium
- Ch21: Star Formation
- Ch22: Stellar Evolution
- Ch23: Stellar Death
- Ch24: Black Holes and Relativity



### Part B: Stars

- Ch15: The Sun
- Ch16: Stellar Physics
- Ch17: Stellar Emission
- Ch18: Stars



### Part C: Galaxies

- Ch25: The Milky Way
- Ch26: Galaxies
- Ch28: Galactic Evolution
- Ch29: The Big Bang



## Important Dates

Some useful dates to keep in mind. Please note examination dates are tentative as of writing but will be confirmed several weeks in advance. **There are no classes held in finals week or**

### Spring break.

Mon. Jan 22 <sup>rd</sup>	– First class	Fri. April 19 <sup>th</sup>	– Exam 2 ( <i>tentative</i> )
Fri. Mar 1 <sup>st</sup>	– Exam 1 ( <i>tentative</i> )	Fri. May 10 <sup>th</sup>	– Last class
March 18 <sup>th</sup> – 22 <sup>th</sup>	– Spring recess	Wed. May 15 <sup>th</sup>	– Final Exam, 12:45-14:45
Mon. April 1 <sup>st</sup>	– No class (C Chavez)		

## Attendance

Coming to class is not mandatory, but **I take attendance every lecture** and it takes up a small fraction of your grade (the “participation” portion). If you don’t turn up, you’ll miss out on the cool planetarium demos and any kind of extra credit I do in class. Grades from past semesters clearly show that students who turn up do better in exams than those who don’t so I strongly advise you to come along at every possible opportunity.

## Calculators and devices in class

There will be a small element of mathematics in the exams (about 8% of the questions on any test) and so you may want to bring a calculator. I allow basic and scientific calculators, but not graphical ones as lots of information can be stored in their memories. I have a couple of loaners, but not many at all so please don’t rely on getting one on exam day. The course textbook is free, so ~\$10 calculator is not much to ask when other professors request you buy their favorite \$300 book.

In class I like to use [Mentimeter](#) to ask questions to the audience. These are a completely anonymous way to interact with class and requires the use of an electronic device. Mentimeter is totally free (unlike many other alternatives) but it does require use of a device: cellphone, computer, or tablet and we have campus Wi-Fi in the planetarium. If most (~90%) the class answers correctly after two attempts **I give everyone in class a bit of extra credit!** I also use this (the “Menti’s”) to take attendance, and if you can’t access it in class come chat with me after class and we’ll work out an alternative.

**The use of electronic devices can be disruptive to those around you.** As a result, the use of such devices should be limited to class-related tasks, such as the Menti questions and taking class notes.

## Homework

Homework will be assigned periodically to give you hands-on experience with some of the important concepts and to help prepare you for exams. The length of the assignments may vary, but they will usually consist of around ten questions and students are given **two attempts** over a whole week. Homework will constitute 22% of your semester grade.

## Quizzes

Every week there will be a quiz on the recent material. These are short review questions and shouldn’t require too much effort. Quizzes will be worth 22% of your grade. Students get one attempt at each quiz (two attempts are allowed for homework). No make-up quizzes will be

given, so please make the most of the opportunity to take some of the pressure off your exams. You get three days to do the quizzes, but they are quite short (only taking 6 minutes).

### Quiz/Homework scoring and delivery

At the end of each semester, **I will drop each student's lowest scoring homework and quiz score.** If you missed one for some reason then that will be the one I will drop. Canvas can't do this automatically, but I do it manually when calculating your grade at the end of the course.

I know life can get in the way sometimes, and if you approach me before the deadline of a homework/quiz then I'll happily work with you to accommodate your concern. However, if you tell me after a deadline there is a lot less I can because I release the answers to homework straight away, so please bare that in mind.

Quizzes and homework will be delivered via Canvas multiple choice assessments. I will post an ungraded practice quiz in the first week so you can see how it works.

### Exams

There will be three exams in this course, see "Important Dates" above. The first exam will occur approximately a third through the course, and will cover material encountered up to that point. The second will cover material from the first exam up to that point. The final exam will be in "finals week" with questions covering the entirety of the course. Make-up exams will be given only in the most extraneous of circumstances with proof provided of their necessity, and only by *prior* arrangement.

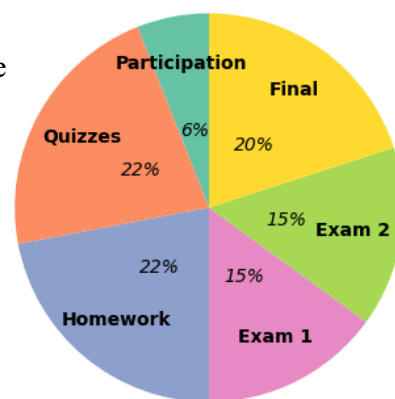
If you have accommodation for extra exam time then please talk to the Testing Center. You will take you exam with them on the same day as the rest of the class:

<https://disabilityservices.csus.edu/custom/misc/home.aspx>

### Course Grade

Your course grade is determined by the points you earn during the semester in each of the following categories:

Class Participation:	6%
Quizzes:	22%
Homework:	22%
Exam 1:	15%
Exam 2:	15%
Final Exam:	20%
<b>Total:</b>	<b>100%</b>



There is also a chance for extra credit which can supplement these percentages. Grades will be assigned based upon a traditional grading scale:

≥ 95 %	A	≥ 77 %	B –	≥ 62%	D +
≥ 90%	A –	≥ 73 %	C +	≥ 58%	D
≥ 87 %	B +	≥ 69 %	C	≥ 55%	D –
≥ 82 %	B	≥ 66 %	C –	below 55 %	F

## Extra Credit Opportunities

Some opportunities for students to gain extra credit will be offered (a maximum of an extra +5% in addition to the 100% allocated above). One such opportunity will be to write a reflection paper on a topical subject in astronomy of your choice. This serves to encourage students to develop a perspective on current topics in physics and astronomy and to see how advances in scientific research can affect society at large. Students are responsible for locating a recent article which highlights a current research problem or application of physics/astronomy research. Another possibility is to have open discussions on Canvas, where student engagement will be assessed. Full details regarding extra credit will be provided via Canvas during the course.

## Schedule

Note that “Reading Material” refers to chapters in the recommended textbooks:

OS = Openstax, CM = Chaisson & McMillan (a higher-level alternative if you’re ambitious!)

<i>Week</i>	<i>Topic</i>	<i>Reading Material</i>	<i>Assignment</i>
<b>1</b>	Intro, numbers in astronomy	<b>OS1</b> ; CM1	Practice quiz, Intro discussion
<b>2</b>	The night’s sky	<b>OS2</b> ; CM2	Quiz1, HW1
<b>3</b>	Orbits	<b>OS3</b> ; CM2	Quiz2, HW2
<b>4</b>	Earth, Moon and sky	<b>OS4</b> ; CM1	Quiz3, HW3
<b>5</b>	Light	<b>OS5</b> ; CM3,4	Quiz4, HW4
<b>6</b>	The Sun <b>(Exam 1 week)</b>	<b>OS15</b> ; CM16	Exam revision
<b>7</b>	Stars	<b>OS16</b> ; CM17	Quiz5, HW5
<b>8</b>	Stars and starlight	<b>OS17</b> ; CM17	Quiz6, HW6
<b>9</b>	Stellar life	<b>OS18,19</b> ; CM20	Quiz7, HW7
<b>10</b>	Interstellar gas	<b>OS20</b> ; CM18	Quiz8, HW8
<b>11</b>	Star formation	<b>OS20,21</b> ; CM19	Quiz9, HW9
<b>12</b>	Stellar old age <b>(Exam 2 week)</b>	<b>OS22,23</b> ; CM21	Exam revision
<b>13</b>	Black holes	<b>OS23,24</b> ; CM22	Quiz10, HW10
<b>14</b>	The Milky Way	<b>OS25</b> ; CM23	Quiz11, HW11
<b>15</b>	Galaxies	<b>OS26,28</b> ; CM24,25	Quiz12, HW12
<b>Finals</b>	<b>Comprehensive Final Exam</b>		Exam revision

## Canvas

Please check announcements via email and Canvas *frequently*. Please set your Canvas announcements to automatically send you a message when an announcement has been posted. I will post details of exams, homework, lecture material etc., please don't ignore it!

## Course Etiquette and Questions

Questions are valid at any time during a lecture, and are also welcome via the discussion board in Canvas. If you are unsure of something the instructor has just said, there is a very good chance that someone else is unsure as well, so help your fellow classmates by asking a question. Questions during class itself can be simply posed by asking out loud ("excuse me Professor") but it's polite to raise your hand first.

Meaningful and constructive dialogue is encouraged in this class and requires a willingness to listen, tolerance for different points of view, and mutual respect from all participants. All course members will be expected to show respect for individual differences and viewpoints at all times. To create and preserve a classroom atmosphere that optimizes teaching and learning, all students share the responsibility of creating a positive learning environment. Students are expected to conduct themselves in a manner that does not disrupt teaching or learning, and they are expected to follow these standards:

- You are expected to be on time. I intend to begin class promptly at the designated time, and you should be in your seat and ready to begin class at this time. Class ends at the designated time. Please refrain from packing up your belongings early. It is disruptive to me and to others around you.
- Classroom participation is a part of your grade in this course. You must attend class prepared to fully participate. Questions and comments must be relevant to the topic at hand.
- Classroom discussion should be civilized and respectful to everyone and relevant to the topic we are discussing. Classroom discussion is meant to allow us to hear a variety of viewpoints. This can only happen if we respect each other and our differences.

## Instructor Professionalism

What you can expect from me: I will be prepared and on time for class; I will not leave early; I will respect you and your opinions.

## COVID: Safety and wellness

You should be aware by now of Sacramento State's Fall 2022 COVID 19 policies. You can find out more at Sacramento State's [COVID-19 page](#). We will be following those policies in this classroom. Vaccines are required for everyone on campus except those who have been granted a religious or medical exemption per the [CSU's COVID-19 vaccination requirement](#). Masks are not required at this point but are recommended indoors. Please respect your fellow students' decision to mask or not mask. You can schedule a vaccine at [My Turn California](#) and find out more about vaccines and booster eligibility on the [CDC website](#). Remember that COVID-19 is still a threat, even for those who are vaccinated and boosted. Please practice self-care, monitor your health for any possible symptoms of COVID-19, and contact a health care provider immediately should you believe you may be infected.

## COVID: Attendance

Do not come to class if you have COVID-19 symptoms or test positive. COVID-19 tests and safety supplies are available at many locations around campus, including the library and student union. The University will continue to offer free testing to students who are symptomatic through [Student Health and Counseling Services](#). To increase safety on campus, you are required to report a positive COVID-19 test. You will find a confidential reporting form on the [Student Affairs COVID-19 web page](#). Everyone who tests positive, regardless of vaccination status, is required to stay home for at least 5 days. You should stay home for up to 10 days if your symptoms are not resolved or you continue to test positive. If you come into contact with someone who has tested positive for COVID-19, please refer to this [flowchart](#). If you need to isolate, please notify me immediately.

- If you are isolating and not ill, I expect you to stay up to date with your academic work remotely as best you can. Checking in with me for assignments will be your responsibility.
- If you are ill, please contact me as soon as you are well so we can work together to catch you up with the rest of the class.
- You will find the latest updates to academic continuity during COVID-19 [here](#).

## COVID: Flexibility

The degree to which COVID-19 will impact the Sacramento State campus this fall is hard to predict. We want to focus on making your time as a Hornet a memorable and fulfilling experience. But patience and flexibility on all our parts will still be necessary as we navigate COVID-19 -related absences. Communicating with me in a clear and timely manner will help you stay on track academically and help all of us stay healthy.

## Code of Conduct

The Department of Physics and Astronomy has unanimously approved the following statement: “The faculty of the Department of Physics and Astronomy will not tolerate academic dishonesty. Falsification of data, copying, unauthorized collaboration, plagiarism, alteration of graded materials, or other actions (as described in, but not necessarily limited to the Sacramento State Policy Manual) *will be promptly reported to the Office of Student Affairs*. The offending student will be penalized on the assignment in question. Serious infractions will result in course failure and a recommendation for administrative sanctions.”

## Netiquette

Given that this class is partially online, it is important that we keep in mind the importance of some basic guidelines for participating in online discussion forums. You can find more info about this in our Canvas course. In short, it is very important to be clear in your messages, avoid potentially offensive comments, and generally reread your messages before posting to make sure they say what you meant to convey. You can also find more information here:

<http://www.albion.com/netiquette/corerules.html>.

## Students with Disabilities (SSWD) / Disability Access Center (DAC)\*

Sacramento State is committed to ensuring an accessible learning environment where course or instructional content are usable by all students and faculty. If you believe that you require disability-related academic adjustments for this class, please immediately contact Services for Students with Disabilities (SSWD) to discuss eligibility. A current accommodation letter from SSWD is required before any modifications, above and beyond what is otherwise available for all other students in this class will be provided.

Please be advised that disability-related academic adjustments are not retroactive. SSWD is located on the first floor of Lassen Hall 1008. Phone is 916-278-6955 and e-mail is [sswd@csus.edu](mailto:sswd@csus.edu). For a complete listing of services and current business hours visit <https://www.csus.edu/student-affairs/centers-programs/disability-access-center/>

*\*Note: as the SSWD is mid-process of being re-imagined as the DAC, some urls and names of services may be out-of-date by the semester's end.*

## Basic Needs Support (CARES)

If you are experiencing challenges with food, housing, financial or other unique circumstances that are impacting your education, help is just a phone call or email away. The CARES office provides case management support for any enrolled student.

Email the CARES office at [cares@csus.edu](mailto:cares@csus.edu) to speak with a case manager about the resources available to you. See the CARES website for more information: <https://www.csus.edu/student-affairs/crisis-assistance-resource-education-support/>.

## Student Health & Counseling Services (SHCS)

Your physical and mental health are important to your success as a college student. Student Health and Counseling Services (SHCS) in The WELL offers medical, counseling, and wellness services to help you get and stay healthy during your time at Sac State. SHCS offers: Primary Care medical services, including sexual and reproductive healthcare, transgender care, and immunizations; urgent care for acute illness, injuries, and urgent counseling needs; pharmacy for prescriptions and over-the-counter products; mental health counseling, including individual sessions, group counseling, support groups, mindfulness training, and peer counseling; athletic training for sports injury rehabilitation; wellness services, including nutrition counseling, peerled health education and wellness workshops, and free safer sex supplies; violence and sexual assault support services. Most services are covered by the Health Services fee and available at no additional cost.

Call (916) 278-6461 and visit their website at <https://www.csus.edu/shcs/>. A number of services are offered using secure remote technology if students are off-campus. If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night: 1-800-273-TALK (8255) to speak with a nurse or call 911.

## Gender Violence Resources

CSUS is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence, and genderbased stalking. If you (or someone you know) has experienced or experiences genderbased violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), know that you are not alone. CSUS has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more. Please visit <https://www.csus.edu/student-affairs/crisis-assistance-resource-education-support/>.

The University requires faculty and staff to report any personal disclosures of sexual misconduct including rape, dating/domestic violence and stalking to the Title IX Coordinator. Students who do not wish to report their experience to me or the Title IX Coordinator may speak to someone confidentially by contacting Student Health and Counseling Services.



## University Standards and Procedures

- This course is subject to the university's usual ADD/DROP policy, detailed here: [Drop and Withdrawal Policy](#).
- This course uses the university's standard grade terminology, detailed here: [Grading Policy](#).

## Links to Other Campus Resources

- [Academic Advising](#)
- [Information Resources and Technology](#)
- [Support Centers and Programs](#)
- [Reading & Writing Center](#)
- [Student Rights and Responsibilities](#)

## Course FAQ

- *I was sick/overworked/absent last week, can I have a "do-over" on the homework?*  
Not in the strict sense, no. As solutions to homework are normally released soon after the submission deadline it is impossible to give extensions on a case-by-case basis. However, life often gets in the way of things, and instructors can usually offer some kind of accommodation, e.g. dropping the HW from that student's grade or offering some other substitute (if the accommodation is well-justified).
- *What is the late HW policy for the course?*  
There is no strict late HW policy (e.g. 1 day late = X% drop). See the answer above.
- *Where can I see my current grade for the course?*  
There is no single place to see a student's current grade. Canvas does keep scores for individual assessments (if the instructor utilizes this feature), **but the weighting for the grade "total" will not be indicative of the actual total grade**. This depends on the instructor who may apply their own unique policies for grading that may be done outside of Canvas, such as dropping lowest scoring HW. It is, however, common to inform students of their grades after midterms as a "sit-rep".
- *I really need this class for graduation, can I have a "grade bump" to a pass?*  
No. Individual requests like this violate academic integrity and amount to asking for special favors. It is not equitable, and bases grades on something other than the student's demonstrated level of performance. Instead, the student should seek help early as the instructor is normally more than happy to oblige and can give advice/extra assistance where needed. Requests like the above often come in far too late to be actionable.
- *What kind of mathematics is required for the course?*  
Any mathematical component takes up only a small total fraction of the course, and students can gain a B grade even if they ignore all mathematical questions. That said, the mathematics is only of high school level and includes such elements as: multiplication, division, powers, square roots, simple trigonometry/angles, and changing units. Students will be given equation sheets in exams that include every equation seen in the course.

*Note: The instructor reserves the right to update the syllabus and schedule during the semester. If a faculty member is not available during the semester, students will be contacted and advised how the course will proceed. This may include a change in instructor or modality.*