



AS 102

The Astronomical Universe

Tue,Thu, 11:00am-12:15pm, CAS B20



Dr. Nicholas R. MacDonald

email: nmacdona@bu.edu  
website: <http://people.bu.edu/nmacdona/Home.html>  
office location: CAS 402  
office hours: Tue,Thu, 10:00am-11:00am or by appointment  
office phone: (617) 358-3245

The syllabus may evolve dynamically depending on class progress.

**Course Description:** This course is designed to offer a broad description of modern astrophysics, at an introductory level, that includes topics such as Gravity and Newton's Laws of Motion, The Properties of Light, and Einstein's Theories of Special and General Relativity. We will also cover the birth and death of stars, red giants, white dwarfs, neutron stars and black holes. Our galaxy, the Milky Way, and other galaxies will be discussed. The Big Bang and other cosmological theories of our expanding Universe will also be introduced. The course will end off with a discussion of the final fate of the Universe. No prior knowledge of astronomy or physics is required.

**Prerequisite(s):** None.

**Text(s):** *The Cosmic Perspective: Stars, Galaxies and Cosmology*, 8<sup>th</sup> Edition with Modified Mastering Astronomy

**Author(s):** Bennett, Donahue, Schneider and Voit; **ISBN:** 9780134612355

### Course Objectives:

At the completion of this course, students will have:

1. An appreciation of our place in space and time: the size, scale, and age of our solar system and its location within the Galaxy.
2. An understanding of the global properties of the Universe: its history and the types of objects within it.
3. A familiarity with the tools Astronomers use to understand what light can tell us about the Universe.

### Grade Distribution:

Labs	25%
Assignments	25%
Participation	10%
Midterm Exam	20%
Final Exam	20%

## Course Policies:

- **General**

- Computers are not to be used unless for note taking.
- The midterm and final exams are closed book, closed notes.
- **No makeup exams will be given.**

- **Grades**

- Grades will be maintained in Blackboard Learn (<https://learn.bu.edu>). Students are responsible for tracking their progress by referring to the Blackboard Grade Center.

- **Labs and Assignments**

- Students are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **will not be tolerated**. All students are expected to follow the BU Academic Conduct Code which can be found at <http://www.bu.edu/academics/policies/academic-conduct-code/>. Discussion amongst students, however, is encouraged, but when in doubt, direct your questions to either the lecturer or the teaching assistant.
- **No late assignments or labs will be accepted under any circumstances.**
- Assignments are done online via MasteringAstronomy, accessible through Blackboard Learn. You will have to setup your MasteringAstronomy account. Follow the registration instructions provided in the AS 102 Blackboard “Content” section using the student key provided in your course text. Once registration is complete you can access your weekly homework assignments in Blackboard by clicking “Content” and then “Mastering Assignments”. MasteringAstronomy provides hints for questions if requested, and gives you multiple opportunities to answer the questions if you answer incorrectly. However, bonus credit is given if you answer the questions without using the hints, and credit is reduced significantly for every time you answer incorrectly. Maximum credit is given if you answer correctly the first time without requesting a hint. The first assignment includes a tutorial on how to properly use MasteringAstronomy. You will have one week to complete each lecture’s corresponding assignment (due by midnight the following Tue/Thu). A schedule of the assignment due dates is available in MasteringAstronomy. Late homework submissions will receive no credit.
- There are a total of **7 day-labs** for this course. We require that for each lab the corresponding manual be printed, read, and brought to the lab. These manuals are available for download at <http://www.bu.edu/astronomy/undergraduate/manuals/>. The labs will occur in CAS B04 on Mon 10:10am-11:25am (A3), Tue 3:30pm-4:45pm (A2), Wed 2:30pm-3:45pm (A5), and Thu 12:30pm-1:45pm (A4).
- There are a total of **2 night-labs** for this course. These are tentatively scheduled to occur on Monday, Tuesday, and Thursday evenings at 8:30pm throughout the term beginning the week of Jan. 24th. The Department of Astronomy maintains a small teaching observatory located on the roof of the CAS building. Note that, since a night-lab depends on clear weather, we can’t schedule the night labs ahead of time. Therefore, a recorded message will be posted indicating whether for a given night the night-lab will be held or not. The phone number to call in and check is (617) 353-2630 and the message is finalized at around 6pm.

- **Attendance and Absences**

- Attendance is **mandatory** and will be taken each class. You are allowed to miss **1** class during the semester without penalty. Any further absences will result in point and/or grade deductions.
- Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee's responsibility to get all missing notes or materials.

- **Exams**

- There will be a midterm exam on Thu Mar 16th and a cumulative final exam to be scheduled by the Registrar. Each exam will have the same format of multiple choice, short answer questions, and possibly an essay question. You may also be asked to perform a calculation of the sort done in lecture or on homework assignments. Equations will be given on a cover page, but not generally for particular problems.

### **Teaching Fellow:**

I am pleased to welcome Emmet Golden-Marx to the course. He will be running the labs and will also be available for homework and conceptual help. He will hold office hours in CAS 524 on Wed 4:00pm-5:00pm, and Fri 10:00am-11:00am. You can contact Emmet (emmetgm@bu.edu) to set up additional appointments.

### **Planetarium Show:**

Mark your calendars for Feb 8th and 9th at 6:30pm. We, as a class, have access to a free Planetarium Show at the Museum of Science. You can attend either show (please let us know which day you plan to attend via the following poll: <http://doodle.com/poll/un7gkk7bqfswed7e>).

### Tentative Course Outline:

The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the reading assignments.

Week	Content
Week 1	<ul style="list-style-type: none"><li>• Tue Jan 17th - No Class</li><li>• Thu Jan 19th - Class Introduction</li></ul>
Week 2	<ul style="list-style-type: none"><li>• Tue Jan 24th - Chapter 1: A Modern View of the Universe</li><li>• Thu Jan 26th - Chapter 2: Discovering the Universe for Yourself</li></ul>
Week 3	<ul style="list-style-type: none"><li>• Tue Jan 31st - Chapter 3: The Science of Astronomy</li><li>• Thu Feb 2nd - Chapter S1: Celestial Timekeeping and Navigation</li></ul>
Week 4	<ul style="list-style-type: none"><li>• Tue Feb 7th - Chapter 4: Understanding Motion, Energy, and Gravity</li><li>• Thu Feb 9th - Chapter 5: Light and Matter</li></ul>
Week 5	<ul style="list-style-type: none"><li>• Tue Feb 14th - Chapter 6: Telescopes</li><li>• Thu Feb 16th - Chapter S2: Space and Time</li></ul>
Week 6	<ul style="list-style-type: none"><li>• Tue Feb 21st - No Class</li><li>• Thu Feb 23rd - Chapter S3: Spacetime and Gravity</li></ul>
Week 7	<ul style="list-style-type: none"><li>• Tue Feb 28th - Chapter S4: Building Blocks of the Universe</li><li>• Thu Mar 2nd - Chapter 14: Our Star</li></ul>
Week 8	<ul style="list-style-type: none"><li>• Tue Mar 7th - Spring Break</li><li>• Thu Mar 9th - Spring Break</li></ul>
Week 9	<ul style="list-style-type: none"><li>• Tue Mar 14th - Chapter 15: Surveying the Stars</li><li>• Thu Mar 16th - <b>Midterm Exam</b></li></ul>
Week 10	<ul style="list-style-type: none"><li>• Tue Mar 21st - Chapter 16: Star Birth</li><li>• Thu Mar 23rd - Chapter 17: Star Stuff</li></ul>
Week 11	<ul style="list-style-type: none"><li>• Tue Mar 28th - Chapter 18: Stellar Graveyards</li><li>• Thu Mar 30th - Chapter 19: Our Galaxy</li></ul>
Week 12	<ul style="list-style-type: none"><li>• Tue Apr 4th - Chapter 20: Galaxies and the Foundation of Modern Cosmology</li><li>• Thu Apr 6th - Chapter 21: Galaxy Evolution</li></ul>
Week 13	<ul style="list-style-type: none"><li>• Tue Apr 11th - Chapter 22: The Birth of the Universe</li><li>• Thu Apr 13th - Chapter 23: Dark Matter and the Fate of the Universe</li></ul>
Week 14	<ul style="list-style-type: none"><li>• Tue Apr 18th - Chapter 24: Life in the Universe</li><li>• Thu Apr 20th - Nature's Death Stars</li></ul>
Week 15	<ul style="list-style-type: none"><li>• Tue Apr 25th - Student Choice Lecture</li><li>• Thu Apr 27th - Class Conclusion</li></ul>
Week 16	<ul style="list-style-type: none"><li>• Tue May 2nd - Exam Review</li><li>• Thu May 4th - No Class</li></ul>

# January

# AS 102 Lab Schedule:

Monday	Tuesday	Wednesday	Thursday	Friday
2	3	4	5	6
9	10	11	12	13
16	17	18	19 First Day of Class	20
23	24 Powers of Ten	25	26	27
30	31 Angles and Distances			

# February

Monday	Tuesday	Wednesday	Thursday	Friday
		1	2	3
6	7	8	9	10
13	14 Parallax	15	16	17
20 Holiday NO LABS	21 MONDAY CLASSES	22	23	24
27	28			

## March

Monday	Tuesday	Wednesday	Thursday	Friday
		1 Gravity	2	3
6 SPRING BREAK	7 SPRING BREAK	8 SPRING BREAK	9 SPRING BREAK	10 SPRING BREAK
13	14	15	16	17
20	21	22 Spectroscopy	23	24
27	28	29	30	31

## April

Monday	Tuesday	Wednesday	Thursday	Friday
3	4	5 Luminosity	6	7
10	11	12	13	14
17 NO LABS	18	19 MONDAY CLASSES	20 Hubble	21
24	25	26	27	28

# May

Monday	Tuesday	Wednesday	Thursday	Friday
1	2	3 Last Day of Class	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26