Instructor:  Professor Supriya Chakrabarti  
Office CAS 506; Tel: 353-5990; supc@bu.edu  
Office Hours: Tuesdays 2:00 PM – 3:00PM and  
       Wednesdays 12:00 Noon – 1:00PM (or by appointment)  

Teaching Fellows:  Ms. Carol Carveth  
Tel : (617) 353 6554; ccarveth@bu.edu  
Office Hours: M 2:30 – 4:00; Th 2:00– 3:30 in Room 524  
Mr. Neil Lender  
Tel : (617) 680-5486; nlender@bu.edu  
Office Hours: W 3:30 –5:00; and Th 3:30 –5:00 in Room 524  

Class Hours:  Tuesdays and Thursdays 12:30 PM – 2:00 PM, CAS Room 522  

Discussion Sections (in CAS B04): You can go to only one of these sections.  

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Tuesdays</td>
<td>9:30 A – 11:00 A</td>
</tr>
<tr>
<td>A3</td>
<td>Tuesdays</td>
<td>11:00 A – 12:30 P</td>
</tr>
<tr>
<td>A4</td>
<td>Wednesdays</td>
<td>2:00 P – 3:30 P</td>
</tr>
<tr>
<td>A5</td>
<td>Thursdays</td>
<td>11:00 A – 12:30 P</td>
</tr>
<tr>
<td>A6</td>
<td>Thursdays</td>
<td>3:30 P – 5:00 P</td>
</tr>
<tr>
<td>A7</td>
<td>Fridays</td>
<td>11:00 A – 12:30 P</td>
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</tbody>
</table>

Either book will work (Note 5th Edition)  

Required Texts:  

**The Cosmic Perspective: Solar System media update, 5th edition, by Bennett, Donahue, Schneider & Voit.** Alternatively, it is possible to use (a costlier option): The Cosmic Perspective, 5th edition, by Bennett, Donahue, Schneider, & Voit. This includes extra chapters on the Solar System that we will not cover in this class. If you are interested in this material try AS101.  

You will be responsible for **ALL** material in Chapters 1 – 6, S1 – S3 and 18 – 23 (even though everything may not be covered in class).  

**NOTE:** You may not be able to use the 4th edition of either version of The Cosmic Perspective. **You also cannot use The Essential Cosmic Perspective.**  

Other Material:  

A Scientific Calculator will be needed for some of the exercises and tests.  

Class Web site:  Additional information on this class (including class notes) will be provided through our courseinfo web site: http://courseinfo.bu.edu/courses/08sprgcasas109_a1/
Course Overview:

The Cosmology course will provide you with an overview of the origin, structure and evolution of the Universe. A key objective of this course is to provide a perspective of our place in the physical Universe. In this class we will investigate such profound and simply-formulated questions as “How did the Universe begin?” “Will the Universe as we know it exist forever?” We will also answer other practical questions like “Why do I need to know Newton’s Laws and Relativity to understand the nature of the Universe?”

We will discuss what we know about the “big picture” of the Universe and how we arrived at this knowledge. Important components of this discussion are a survey of the basic scientific principles that guide our studies, historical account of some observations and related interpretations. We are truly fortunate to live in an era where new discoveries are abound. Each new information either supports our understanding or contradicts them – this is how science marches on. I will try to highlight some of these works as appropriate. The lectures will be supplemented by discussions that will reinforce the concepts.

During this course we will use some of the tools used by astronomers, including: the quantitative mathematical methods for describing, for example, gravitation, the physical manifestations of light and matter; and astronomical instruments for probing the properties of astronomical objects. To understand these concepts we will apply the laws of physics in areas such as atomic and nuclear physics, Special and general theories of Relativity. In many cases, due to its efficiency, a concept can be best understood when viewed in mathematical terms. The level of physics and mathematics used in this course will be at the high school level. The “biggest surprise” for many of students that to do well in this class you have to do well in the math problems. For mathematics problem (in homework as well as the examinations), we will not look for numerically correct answers, rather, an understanding of the fundamental concepts and scientific reasoning.

AS 109 is a demanding course. Besides moving quickly, each new topic will build upon concepts covered previously. It is imperative that you keep up, otherwise it will be extremely difficult to catch up. However, the hard work will be amply rewarded by an understanding of the mysteries of the heavens that has inspired humans from the beginning of time. For more ideas on how to excel in the class read the section entitled How to succeed in your astronomy course in your book.

Grades:

Letter grade will be assigned only at the end of the course. No letter grade will be given to any of the individual components such as midterm, quizzes or homework. Your final letter grade will depend upon the following graded course components, their indicated weights and your overall ranking:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>The higher of two Midterm Exams</td>
<td>25%</td>
</tr>
<tr>
<td>Homework (Best 5 of 6 assignments)</td>
<td>20%</td>
</tr>
<tr>
<td>Project and Discussion Section</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
</tr>
<tr>
<td>Quizzes and Tutorials</td>
<td>5%</td>
</tr>
</tbody>
</table>

Since only the higher of the two hourly exams and five of six homework assignments will count toward your final grade, no make-up exams will be given or late assignments accepted.
Examinations:

All examinations will be closed book. You will be required to leave your books, notes, bags etc. in front of the room during the examination. You will, however, be allowed to use your calculator. Since the higher of the two midterm grades will be used towards your final grade, no make up examination will be given. The date and time of the Final examination are set by the University and cannot be changed. It is expected that the examination will consist of a combination of multiple choice, short answers and mathematical problems.

Homework:

Homework sets will be handed out in class (see the attached schedule). In order to be graded for full credit, they must be handed in at the beginning of the class on the due-dates as noted in the schedule. If, for some reason, you cannot attend the class, please turn in the homework in the class mailbox in the astronomy main office (Room CAS 514) before they are due. When you turn in your homework, please make sure you have stapled multiple pages together and have your name printed.

NOTE: You must bring the laboratory manual and necessary report forms to the labs – with your own pencil and eraser – as these are not available in the observatory! A flashlight will also help.

Semester long Project (Done in Discussion Sections):

The Discussion Sections will be led by the Teaching Fellows in CAS B04. These are meant to reinforce the concepts being discussed in class. This will be your opportunity to interact with the TFs and your fellow students in small groups.

To encourage such interactions, you will choose a topic related to the class and research it. Towards the end of the semester your group will be required to present your research and write a paper.

The presentation should give the audience a good idea of the concepts covered in the paper. Possible topics for projects and other details will be discussed during the discussion sections.

Quizzes:

There will be several unannounced quizzes during the lectures as well as in the discussion sections. The date will not be announced ahead of time. The primary purpose of these is to encourage you to keep up with the material, participate in the class and attend classes regularly.

On-line tutorials:

Your textbook comes with a subscription to Mastering Astronomy (http://www.masteringastronomy.com). Follow the instructions in your “Student Access Kit” to set up your account. You will need an internet browser and a network connection. If your textbook did not come with a Student Access Kit (usually this is the case with used books), you will have to purchase a subscription on-line. I have found the tutorial to be very useful in
reinforcing some of the ideas to be discussed and would highly recommend that you take advantage of this on-line resource.

After you go to the website, you need to select the correct textbook (The Cosmic Perspective: Stars, Galaxies and Cosmology, 5th Edition). Then click on “Register” to create a personal login name and password. After registration, you will be able to use Mastering Astronomy from any computer with an internet access.

During registration, you will also be asked to “Join a class” using our class ID (AS109sp2008). Make sure that it confirms that you have been added to the Astronomy 109 Cosmology course of Prof. Chakrabarti. From then on, any work that you do on Mastering Astronomy will be recorded and automatically sent to my grade book. Do not forget to join this class online, otherwise you will not receive credit for the work you are doing! Mastering Astronomy contains a wealth of supporting material that will help you with the class.

You will be assigned to do five tutorials on Mastering Astronomy which will comprise 5% of your class grade. You will be responsible for the material covered in the tutorials in a timely fashion. Your grade will be based on the fraction of the tutorials completed, NOT on the accuracy of your answers. This is the easiest part of the grade – you can get 100% just for your participation.

Classroom Conduct:

For the benefit of all, we expect you to be respectful to others and practice some common courtesy such as:

♦ Show up for class on time. If you are late, please enter through the rear door (the one near the elevator). If you must be late, please notify the teacher or the TF in advance.

♦ Turn off all mobile phones and other electronic devices before the class begins. If you must use a laptop, please do not surf the web during the class or answer your e-mail messages.

♦ Do not leave class early, and do not rustle papers in preparation to leave before the class is dismissed.

♦ Be attentive in class, stay awake and do not read newspapers etc. or talk among your selves during the class.

Academic Conduct:

It is your responsibility to know and understand the provisions of the CAS Academic Conduct Code. Copies are available in room CAS 105. Academic misconduct will be taken very seriously and all suspected cases will be referred to the CAS Dean's Office.
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## AS 109 Section A1: Spring Semester 2008 Schedule (Tentative)

<table>
<thead>
<tr>
<th>Date</th>
<th>Lec No</th>
<th>Lecture Topic</th>
<th>Reading</th>
<th>Homework Handed out</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 17, 08</td>
<td>1</td>
<td>The big picture</td>
<td>Chapter 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>Overview of the universe</td>
<td>Appendix C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>3</td>
<td>Everything Moves</td>
<td>Chapter 1</td>
<td>Homework 1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>4</td>
<td>Time keeping–day, month, year and Celestial Navigation</td>
<td>Chapter S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>5</td>
<td>Historical development: Ancient times to Copernicus</td>
<td>Chapter 2</td>
<td>Homework 1</td>
<td></td>
</tr>
<tr>
<td>Feb 5</td>
<td>6</td>
<td>Renaissance in Astronomy – Brahe, Kepler and Galileo</td>
<td>Chapter 3</td>
<td>Tutorial 1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Newton’s Law of Universal Gravitation</td>
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<tr>
<td>7</td>
<td>7</td>
<td>Newton’s Laws of Motion</td>
<td>Chapter 4</td>
<td>Homework 2</td>
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<tr>
<td>12</td>
<td>8</td>
<td>Light</td>
<td>Chapter 5</td>
<td></td>
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<tr>
<td>14</td>
<td>9</td>
<td>Analyzing light (spectroscopy)</td>
<td>Homework 3</td>
<td>Homework 2</td>
<td></td>
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<tr>
<td>19</td>
<td></td>
<td>ACADEMIC MONDAY</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>21</td>
<td>10</td>
<td>Measuring Light (Telescopes, spectrograph,</td>
<td>Chapter 6</td>
<td>Homework 3</td>
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<tr>
<td>Feb 26</td>
<td></td>
<td>Mid Term Exam 1 (Chapter 1 – 5, and S1)</td>
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<tr>
<td>28</td>
<td>11</td>
<td>Telescopes</td>
<td>Homework 4</td>
<td>Tutorial 2</td>
<td></td>
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<tr>
<td>March 4</td>
<td>12</td>
<td>Special Relativity</td>
<td>Ch S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>Special Relativity</td>
<td>Ch S2</td>
<td>Homework 4</td>
<td></td>
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<tr>
<td>March 8 – 16</td>
<td></td>
<td>SPRING BREAK</td>
<td></td>
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<tr>
<td>18</td>
<td>14</td>
<td>Spacetime and gravity – General Relativity</td>
<td>Chapter S3</td>
<td>Homework 5</td>
<td></td>
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<tr>
<td>20</td>
<td>15</td>
<td>Finish General Relativity</td>
<td>Chapter S3</td>
<td></td>
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<tr>
<td>25</td>
<td>16</td>
<td>Stars and Black Holes – a whirlwind tour</td>
<td>Chapter 18</td>
<td>Homework 5</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>17</td>
<td>Our Galaxy</td>
<td>Chapter 19</td>
<td>Tutorial 3</td>
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<tr>
<td>April 1</td>
<td>18</td>
<td>Our Galaxy continued</td>
<td>Chapter 19</td>
<td></td>
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<tr>
<td>April 3</td>
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<td>Mid Term Exam 2 (Chapter 6, S2,S3, 18, 19)</td>
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<tr>
<td>8</td>
<td>19</td>
<td>Other galaxies</td>
<td>Chapter 20</td>
<td>Tutorial 4</td>
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<tr>
<td>10</td>
<td>20</td>
<td>Other galaxies</td>
<td>Chapter 20</td>
<td></td>
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<tr>
<td>15</td>
<td>21</td>
<td>Galaxy evolution</td>
<td>Chapter 21</td>
<td>Homework 6</td>
<td></td>
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<tr>
<td>17</td>
<td>22</td>
<td>Galaxy evolution</td>
<td>Chapter 21</td>
<td></td>
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</tr>
<tr>
<td>22</td>
<td>23</td>
<td>Dark matter</td>
<td>Chapter 22</td>
<td>Homework 6</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td>Dark matter</td>
<td>Chapter 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>25</td>
<td>The beginning of time</td>
<td>Chapter 23</td>
<td>Tutorial 5</td>
<td></td>
</tr>
<tr>
<td>May 1</td>
<td>26</td>
<td>The beginning of time</td>
<td>Chapter 23</td>
<td></td>
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<tr>
<td>May 7, 2008</td>
<td></td>
<td>Final Exam (Chapters 1 - 6, S1 – S3, 18 - 23)</td>
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<td>9:00 A – 11:00A</td>
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