

ASTR 1001-10: Stars, Planets and Life in the Universe (Fall 2016)

Instructor: Prof. Oleg Kargaltsev (kargaltsev@gwu.edu)

Class Hours: Lecture: Mon / Wed, 9:35am – 10:50am, 108 Fonger Hall
Lab: see the lab schedule below

Office Hours: Mondays and Wednesdays, 11 am – noon
Staughton Hall 202, 707 22nd St

Required Materials:

The textbook: Bennett, Donahue, Schneider & Voit. “*The Cosmic Perspective*”, 7th (only!) Edition, San Francisco: Addison-Wesley, 2013 (ISBN: 978-0321839558) + Mastering Astronomy access code.

Lab Manual: ASTR 1001 Laboratory Manual from GWU bookstore

TurningPoint Response Card: must be registered via GW Blackboard

Course Website: <http://blackboard.gwu.edu>

Homework: MasteringAstronomy.com; Course ID: ASTR1001FALL2016KARGALTSEV

TA (labs): Taylor Jacovich (tjacovich@gwmail.gwu.edu) - office hours by appointment

OVERVIEW & COURSE OBJECTIVES

ASTR 1001 encompasses an exploration of our solar system with a focus on improved scientific and mathematical literacy. This course is intended for non-science majors. There is no university level course prerequisites: high school science & math (basic algebra and trigonometry) are sufficient. There are two major goals to this course (with specific examples listed below):

1. Learning objectives for astronomical concepts, structures, and processes.

a. Concepts:

- i. Laws of nature, e.g. be able to apply Kepler's laws, momentum, energy, conservation laws, gravity laws, explain the electromagnetic spectrum
- ii. Be able to explain: planetary formation and motion around sun, geology and atmospheres of the inner planets, formation of the Jovian planets and the structure of the sun and how it is powered.

b. Structures:

- i. Rocky Planets and Moons
- ii. Gaseous Planets

- iii. Our Sun
 - iv. Other objects: asteroids, comets, etc.
 - c. Scientific Process:
 - i. For example: be able to determine the mass, structure and chemical composition of various objects in our solar system, explain what powers the sun.
- 2. **Practicing basic problem solving (mathematical and conceptual) in an astrophysical context.**
 - a. Mathematical:
 - i. Basic algebra (e.g. $y = mx + b$, the equation of a line, or ‘distance = rate \times time’, using given equations to solve for unknown values)
 - ii. Basic geometry (e.g., surface area and volume)
 - b. Conceptual:
 - i. Apply scales and conversion factors (e.g. sizes in scaled models, light-years to meters conversion)
 - ii. Reasoning/thought problems (applying a law or theory to explain some observed celestial or physical phenomenon)

GRADING

Your final numerical course grade will be calculated as a weighted average of:

- 10% In Class Quiz Questions [*using TurningPoint clickers*]
- 15% Lab exercises and activities
- 5% Research paper
- 15% Homework [*on MasteringAstronomy.com*]
- 30% 2 Mid-Term Exams
- 20% Cumulative Final Exam
- 5% Class Participation (Instructor’s Discretion – ask and answer questions in class!)

Numerical course grades translate into letter grades using the following scale:

| | | | |
|---------------|-----------|---------------|-----------|
| ≥ 94.00 | A | 70.00 – 73.99 | C |
| 90.00 – 93.99 | A- | 66.00 – 69.99 | C- |
| 86.00 – 89.99 | B+ | 61.00 – 65.99 | D+ |
| 82.00 – 85.99 | B | 55.00 – 60.99 | D |
| 78.00 – 81.99 | B- | 50.00 – 54.99 | D- |
| 74.00-77.99 | C+ | ≤ 49.99 | F |

EXAMS

The 2 midterm exams will be held during the regular class time. *No make-up exams will be given.* The 2 midterms combined are worth 30% of overall grade.

The final exam will be in December. The room and date are to be determined. This exam is worth 20% of the student’s overall grade and is **mandatory and comprehensive**. *No make-up exams will be given* (except in the event of a Final Exam “hardship” – e.g. a student with more

than 3 Finals scheduled on a given day – if you are declaring a hardship you must contact the instructor by mid-April to make alternative arrangements). Do not make end of semester travel plans before the Final exam date is announced. The date is set by GW, not by the instructor.

Minimum amount of independent, out-of-class, learning expected per week: **10 hrs**

CLASS PARTICIPATION

Students are expected to participate in discussions in class; answer questions posed by the instructor and ask questions about topics being discussed. Specific activities to be considered in awarding class participation points include, asking questions during the lecture about the content being explain, group presentations describing the theory and details of the lab experiments to be undertaken during the term at the start of lab. The instructor may identify other pertinent activities for possible class participation credit. Class participation credit is awarded solely at the instructor's discretion and is limited to 5% of overall grade.

HOMEWORK ASSIGNMENTS

Homework is assigned both as a way to help you learn the material being covered and as a way for you to explore new material independently. Expect to spend between 1 and 2 hours on homework most weeks, in addition to chapter reading. You will fall behind very quickly if you do not complete work as it is assigned. To that end **NO LATE ASSIGNMENTS WILL BE ACCEPTED**. All the homework assignments will be available for you from the very start of the semester. *Therefore, getting sick or having an emergency the day the HW is due is not a valid excuse for not completing the HW.* **Don't wait until the last minute!** Homework will be assigned and completed on Mastering Astronomy's website (www.masteringastronomy.com). Registration requires a Student Access Code (which will come bundled with your textbook or can be purchased separately online). Students are encouraged to discuss course material outside of class, and may help each other with homework assignments. However, copying or cheating of any kind will not be tolerated and will result in Integrity Code violation charges for all involved students and zero credit on the entire homework portion of this course (15% of overall grade).

The MasteringAstronomy Course ID for this class is: ASTR1001FALL2016KARGALTSEV. All homeworks are due at **midnight on Sundays**. Consult the MasteringAstronomy.com website for a full calendar of HW due dates.

IN-CLASS QUIZ QUESTIONS with TURNING_POINT RESPONSE CARDS (RCUs)

Students will be challenged with in-class quiz questions to be answered using *TurningPoint Clickers* available from the GWU bookstore. There are no make-ups for in-class quiz questions. If you are absent or tardy on a day when such questions are administered, you will *not* receive any credit for that day. You will also not receive any points for such questions if you fail to bring your *TurningPoint Clicker* to class. In-class quiz questions are worth 10% of overall grade.

LAB EXPERIMENTS

Students are expected to complete lab experiments during the term on a schedule specified in the Schedule of Lectures and Labs attached to this syllabus. Lab experiments are conducted in Monroe B33 at various times (depends on the Lab section you registered for; see GW course schedule) during the term. In the event of a conflict with a scheduled lab time, the student is to

identify the conflict promptly to the instructor and the TA to determine if the student can do the experiment in an alternate lab section that day. Lab attendance is mandatory and students missing two or more labs without a proper excuse **will receive a grade of F for the entire course**. Lab experiments and exercises are worth 15% of overall grade. The TAs grade them. If you have question about your grade contact your course instructor promptly.

ATTENDANCE

Students are required to attend all classes and labs. Attendance will be recorded with Turning Point Response Cards. Missing a class requires a legitimate documented reason. Students who are absent for more than 4 days without medical or other documented legitimate reason will be unable to earn higher than a B- in this course. Students must notify the instructor during the first week of the semester of their intention to be absent from class on their day(s) of religious observance **Missing 7 or more days of class (lab or lecture) will automatically result in a failing grade (F) for the semester.**

REQUIRED MATERIALS

1. The textbook: Bennett, Donahue, Schneider & Voit. “*The Cosmic Perspective*”, 7th Ed. San Francisco: Addison-Wesley, 2013 (ISBN: 978-0321839558).
2. Students must also obtain a “Student Access Code” to access *MasteringAstronomy* on the web (<http://www.masteringastronomy.com/>). This generally comes bundled with the textbook, but may also be purchased separately online.
2. The ASTR 1001 Laboratory Manual, available only through the GWU Bookstore.
3. You must bring a *stand-alone scientific* calculator to class. No cell phone or computer-based calculators are permitted.
4. A **TurningPoint Response Card** (see image below), this is informally called a “clicker,” which will be used to answer in-class RCU questions (as well as other questions during class). These clickers are available through the GWU Bookstore (be sure to buy a *TurningPoint* clicker and not some other brand). The clickers are also the primary mechanism for tracking attendance – you must bring your clicker to class each day and it must be associated with you via BlackBoard registration



COMPUTER/CELL PHONE POLICY

Laptop and tablet use is not allowed during the lecture unless specifically explicitly by the instructor. Cell phones must be turned off and stored during class and texting are not allowed. Do not rely on your cell phone for calculations since *any use of a cell phone during quizzes or exams is forbidden and will result in the student receiving a failing grade for that exercise or exam.*

ONLINE RESOURCES

The course webpage is on Blackboard (Bbd) (<http://blackboard.gwu.edu/>). Course announcements will be posted on this site. Any PowerPoint slides shown in class will be made available online *after* each class. Exam and Lab grades will be posted in the Bbd Gradebook on a regular basis.

ACADEMIC INTEGRITY

Under GW's Code of Academic Integrity, academic dishonesty is defined as "cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and fabrication of information." Note that plagiarism covers both *words and ideas*—be sure to use proper citations for both! Find more information about the GW Academic Integrity Code at <http://www.gwu.edu/~ntegrity/code.html>. Violations of the code will be referred to the Academic Integrity Council for action.

Opt Out Form for Anonymous Testing

The Department of Physics, which houses Astronomy, at George Washington University is dedicated to ensuring that students have the best academic experience and get the most out of their education. In order to accomplish this, it is essential that we adapt teaching and learning styles to the ever-changing world.

In the Department of Physics, this is done by analyzing and researching different ways of teaching; what works best, what elicits enthusiasm in students, and how these techniques translate into academic achievement. The Department conducts ongoing analyses of instructional methods by examining enrollments in physics courses, and by reviewing the grade trends and the valuable survey responses from faculty, staff and students. This research is limited to the review of records, both present and past. The Department will not request additional information to be submitted by any member or student of the Department of Physics.

No analysis is done with any particular single individual in mind. All analyses are done in an aggregate manner and no identifying information will be published, presented, or kept. All surveys are *completely anonymous*.

If you do not wish to be included in such anonymous research, please contact the Physics Department (physics@gwu.edu) to express your desire to decline participation in such research.

Thank you for your continuing support in our educational growth and development.

Lecture and HW Schedule & Important Dates:

| HW* | Chapter | Monday | | In-Class Quizzes and Chapter #s | Wednesday | |
|-------|---------|--|--------|---|-----------|--|
| | 1 | A modern view of the Universe | Aug 29 | | Aug 31 | A modern view of the Universe |
| | 2 | Labor day | Sep 5 | CH 1 & 2 RCU @ | Sep 7 | Discovering the Universe |
| #1 | 2 | Discovering the Universe | Sep 12 | CH 2 RCU | Sep 14 | Discovering the Universe |
| #2 | 3 | Science of Astronomy | Sep 19 | CH 3 RCU | Sep 21 | Science of Astronomy |
| #3 | 4 | Making Sense of the Universe | Sep 26 | CH 4 RCU | Sep 28 | Making Sense of the Universe |
| #4 | 5 | Light & Matter | Oct 3 | CH 5 RCU | Oct 5 | Light & Matter |
| #5 | 6 | Telescopes. | Oct 10 | CH 6 RCU | Oct 12 | EXAM #1 (Ch 1, 2, 3, 4, 5, 6) |
| #6 | 14, 7 | Our Star | Oct 17 | CH 14 RCU | Oct 19 | Our Planetary System |
| #7 | 7 | Fall break | Oct 24 | CH 7 RCU | Oct 26 | Our Planetary System |
| #8 | 8, 9 | Formation of Solar system | Oct 31 | CH 8 RCU | Nov 2 | Planetary Geology |
| #9,10 | 9,10 | Planetary Geology | Nov 7 | CH 9 RCU | Nov 9 | Planetary Atmospheres |
| #11 | 11 | Jovian planet systems | Nov 14 | CH 11 RCU | Nov 16 | Jovian planet systems / EXAM #2 review |
| ... | ... | EXAM #2 (Ch 14, 7, 8, 9, 10, 11) | Nov 21 | | Nov 23 | Thanksgiving Break |
| #12 | 12 | Asteroids, comets, small planets | Nov 28 | CH 12 RCU, research papers due on Nov 30 | Nov 30 | Extra solar Planets, Aliens |
| ... | | Guided tour of the Universe/ Guest Speaker | Dec 5 | Make up Lab week | Dec 7 | Review for Final Exam |
| ... | | Make up / Snow Day | Dec 12 | | | Final Exam Date To be Determined! |

* All homeworks are due at 23:59 on **Sundays for the week in the corresponding Table row.**

@ Chapter and Lab RCUs are administered using the *TurningPoint* clickers. There are no make-ups for missed RCUs.

Lab times:

| STATUS | CRN | SUBJECT | SECT | COURSE | CREDIT | INSTR. | BLDG/RM | DAY/TIME | FROM / TO | |
|---|-------|-----------|------|--|--------|---------------|----------|-------------------------|---------------------|----------------------------|
| OPEN | 11488 | ASTR 1001 | 10 | Stars, Planets, and Life in the Universe | 4.00 | Kargaltsev, O | FNGR 108 | MW 09:35AM - 10:50AM | 08/29/16 - 12/12/16 | Linked |
| Comments: Also register for one laboratory section: ASTR 1001.30-.33. OLD Course Number: ASTR 001 Course Attributes | | | | | | | | | | Find Books |
| LINKED COURSES: | | | | | | | | | | |
| OPEN | 12919 | ASTR 1001 | 30 | Laboratory | 0.00 | Kargaltsev, O | MON B33 | W 05:10PM - 07:00PM | 08/29/16 - 12/12/16 | Find Books |
| Comments: Once this course has closed, an electronic waitlist will be available. Please see: http://go.gwu.edu/waitlist for more information. OLD Course Number: ASTR 001 | | | | | | | | | | Phys Lab Fee \$90.00 |
| WAITLIST | 11130 | ASTR 1001 | 31 | Laboratory | 0.00 | Kargaltsev, O | MON B33 | T 05:10PM - 07:00PM | 08/29/16 - 12/12/16 | Find Books |
| Comments: Once this course has closed, an electronic waitlist will be available. Please see: http://go.gwu.edu/waitlist for more information. OLD Course Number: ASTR 001 | | | | | | | | | | Phys Lab Fee \$90.00 |
| WAITLIST | 11131 | ASTR 1001 | 32 | Laboratory | 0.00 | Kargaltsev, O | MON B33 | T 07:10PM - 09:00PM | 08/29/16 - 12/12/16 | Find Books |
| Comments: Once this course has closed, an electronic waitlist will be available. Please see: http://go.gwu.edu/waitlist for more information. OLD Course Number: ASTR 001 | | | | | | | | | | Phys Lab Fee \$90.00 |
| OPEN | 12721 | ASTR 1001 | 33 | Laboratory | 0.00 | Kargaltsev, O | MON B33 | W 03:10PM - 05:00PM | 08/29/16 - 12/12/16 | Find Books |
| Comments: Once this course has closed, an electronic waitlist will be available. Please see: http://go.gwu.edu/waitlist for more information. OLD Course Number: ASTR 001 | | | | | | | | | | Phys Lab Fee \$90.00 |

Astr-1001 Sections 10 and 11 - Lab Schedule Fall 2016

(must read the **Lab Manual** before coming to lab):

| Week | Section 11 (scale-up) | Section 10 (your section) |
|-----------------|--|--|
| Week 1, Aug 29 | <i>No Labs (Lecture Classes begin)</i> | <i>No Labs (Lecture Classes begin)</i> |
| Week 2, Sept 5 | <i>No Labs (Labor day)</i> | <i>No Labs (Labor day)</i> |
| Week 3, Sept 12 | Lab 1: Parallax & Appendix A: Measurements | Lab Orientation (must attend): Equipment, software, Lab rules, research paper writing |
| Week 4, Sept 19 | Lab 2: Kepler's Laws | Lab 1: Parallax & Appendix A: Measurements |
| Week 5, Sept 26 | Lab 4: Acceleration of Gravity Near Earth - Free Fall Motion | Lab 2: Kepler's Laws |
| Week 6, Oct 3 | Lab 5: Light Radiation and Planck Distribution | Lab 4: Acceleration Due to Gravity—Free Fall Motion |
| Week 7, Oct 10 | Lab 6: Optics and Ray Tracing | Lab 5: Light Radiation and Planck Distribution |
| Week 8, Oct 17 | Lab 10: Sunspots and Solar Cycle | Lab 6: Optics and Ray Tracing |
| Week 9, Oct 24 | Fall break (No LAB) | Fall break (No LAB) |
| Week 10, Oct 31 | Lab 7: Scale of the Solar System | Lab 10: Sunspots and Solar Cycle |
| Week 11, Nov 7 | No lab: Guest speaker. | Lab 7: Scale of the Solar System |
| Week 12, Nov 14 | Lab 9: Mass of Jupiter | Lab 8: Diameter of Jupiter |
| Week 13, Nov 21 | Thanksgiving (No LAB) | Thanksgiving (No LAB) |
| Week 14, Nov 28 | Lab: Impact Craters and the Power Law | Research paper presentations |
| Week 15, Dec 05 | Make Up Lab Week – All Labs Set up in B33 for students to make up; only students who missed a lab should attend | Make Up Lab Week – All Labs Set up in B33 for students to make up; only students who missed a lab should attend |

HOMework SCHEDULE:

| # | TITLE | CATEGORY | DUE DATE/TIME |
|----|---|----------|---------------------|
| 1 | <input type="button" value="▼"/> HW01 Intro to MasteringAstronomy & Mathematical Methods, and Chapters 1 & 2 (Place In Universe & Discovering For Yourself) | Homework | 09/18/16 at 11:59pm |
| 2 | <input type="button" value="▼"/> HW02 Chapter 3 (The Science of Astronomy) | Homework | 09/25/16 at 11:59pm |
| 3 | <input type="button" value="▼"/> HW03 Chapter 4 (Making Sense of the Universe: Motion/Energy/Gravity) | Homework | 10/02/16 at 11:59pm |
| 4 | <input type="button" value="▼"/> HW04 Chapter 5 (Light & Matter) | Homework | 10/09/16 at 11:59pm |
| 5 | <input type="button" value="▼"/> HW05 Chapter 6 (Telescopes) | Homework | 10/16/16 at 11:59pm |
| 6 | <input type="button" value="▼"/> HW06 Chapter 14 (The Sun) | Homework | 10/23/16 at 11:59pm |
| 7 | <input type="button" value="▼"/> HW07 Chapter 7 (Our Planetary System) | Homework | 10/30/16 at 11:59pm |
| 8 | <input type="button" value="▼"/> HW08 Chapter 8 (Formation of the Solar System) | Homework | 11/06/16 at 11:59pm |
| 9 | <input type="button" value="▼"/> HW09 Chapter 9 (Planetary Geology) | Homework | 11/13/16 at 11:59pm |
| 10 | <input type="button" value="▼"/> HW10 Chapter 10 (Terrestrial Planetary Atmospheres) | Homework | 11/13/16 at 11:59pm |
| 11 | <input type="button" value="▼"/> HW11 Chapter 11 (Jovian Planets) | Homework | 11/27/16 at 11:59pm |
| 12 | <input type="button" value="▼"/> HW12 Chapter 12 (Asteroids and Comets) | Homework | 12/04/16 at 11:59pm |

ABOUT YOUR INSTRUCTOR:



Prof. Oleg Kargaltsev is a full-time research and teaching faculty at GWU. He does research in high-energy astrophysics studying neutron stars, black holes, and extreme explosions. Prof. Kargaltsev uses Hubble Space Telescope (NASA), Chandra X-ray Observatory (NASA), the X-ray Multi-Mirror Mission (ESA), and Nustar Hard X-ray Observatory (NASA) to study the physics, evolution, and properties of the compact, high-energy objects. He authored and co-authored more than 100 research publications and serves as a Principle Investigator of multiple observing programs on the above mentioned international space missions. Prof. Kargaltsev's other interests include science philosophy and science policy, logical and mathematical puzzles, independent movies, cooking, and science fiction.