As103—Observational and Solar-System Astronomy

2025–2026–Fall

Description: The course begins with some background material, and an overview of what you might call naked-eye astronomy—the motions of the sky, seasons, lunar phases, and so on. Then we move on to the basic ideas behind modern observational astronomy, including gravity, the properties of light, the absorption and emission of light by atoms, and the different types of telescopes. We use these ideas to study the orbits and composition of objects in our solar system—the terrestrial planets (including the Earth), the gas giants (such as Jupiter), and finally the sun. These topics are covered in chapters 1–16 of the textbook.

This course is part of the Quantitative Reasoning and Analysis division of the General Education Program. Thus, it emphasizes critical thinking (assessing the quality of information, integrating information with existing knowledge, and drawing conclusions) and the use of data to draw conclusions (via calculations for data analysis, and interpretation of the results). All parts of the course involve critical thinking of some kind; the laboratory component is especially pertinent to the method of quantitative analysis. The course also satisfies the university laboratory science requirement. However it does not count for credit toward the physics major or minor.

Objectives: You will learn many facts in this course, but the real point of it is to learn the *process* of observation, inference, and testing that is the heart of the scientific method. In so doing, you will also learn what is meant by a natural "law," and how a relatively small number of basic principles (laws) govern the behavior of many seemingly different physical phenomena. Your knowledge of these things, and where to find amazing pictures from space, may well make you the hit of the cocktail party circuit, besides. But seriously, you should end up with

- an understanding of the night sky as seen from earth,
- basic knowledge of underlying concepts like light and gravity,
- basic knowledge of the formation and structure of the solar system,
- the ability to apply simple calculations and geometrical reasoning, and interpret the results, and
- the ability to integrate appropriate scientific evidence and evaluate the results.

Prerequisites: High-school algebra or Ma100 are recommended. Any additional mathematics will be taught as needed. Basic geometry is also very useful.

Course material: The textbook for the course is "Universe (Eleventh Edition)," by Geller, Freedman, and Kaufmann. It's important to read (and review) the book frequently. This stuff takes time to sink in. The lectures are meant to give additional explanation of particular topics, and maybe introduce outside material—not merely to outline the text. Although it's not required, the OpenStax Astronomy (2e) book could be useful too. It also covers all the things we talk about, from a second point of vew. A PDF copy is available for free at `https://openstax.org/subjects/science/`. Additional material (including the OpenStax book) may be made available at `http://physics.nmu.edu/~mjacobs/As103/`. The course does not use EduCat; I will show you how to keep track of your grades on your own.

Instructor: The instructor for this course is me, Dr. Mark Jacobs, of the physics department. My office is in room 2509 of the science building. You can see me there during office hours (in person or by Zoom; times TBA). You can also reach me by phone (906-227-2557) or email (mjacobs@nmu.edu). My professional background is in general relativity (that is, gravitation) and cosmology, and I operate the observatory on the roof of the science building—so the material in this course is really my thing. I hope you will come to appreciate it as much as I do.

More...

Requirements: Grades are based on the following. Letter grades (A, B, ...) are not given until the end of the course, but the usual correspondences (A=90%, B=80%, etc) are the "target" scale. The cutoff values may be adjusted downward, but they won't move up.

Quizzes / HW	15%	
Exam 1	15%	
Exam 2	15%	(with review of E1 material)
Exam 3	15%	(with review of E1, E2 material)
Final	20%	(comprehensive, Tue Dec 9, 10a–noon)
Lab	20%	(must pass—see Laboratory below)

Quizzes and exams: This course moves quickly, so we will have a weekly quiz (or some other short graded assignment) as an incentive to keep up. Getting behind is bad, because much material depends on what came before. The exams are to be given when we have completed a major section of the course, such as the topic groups mentioned above. If you must miss a quiz or exam, arrangements have to be made ahead of time, unless the reason was unforeseeable. There are no make-ups otherwise. Please note that "social events," vacation trips, and things like that are not acceptable reasons for missing or rescheduling.

Laboratory: You will get more information in the lab meetings themselves, but generally speaking the purpose of the labs is to illustrate the "how" of some of the things we talk about in lecture. Some of the exercises use traditional lab apparatus, while others are simulations of procedures that would require equipment beyond the means of this course. You may need to install software on your portable computer for some of the lab work; we'll handle that in the lab sessions. Note that you must pass the lab component to pass the course; otherwise it would make no sense for the course to satisfy natural-science lab requirements.

Attendance: No records are kept, but attendance is expected, and no accommodation will be made for problems resulting from (avoidably) poor attendance. This is especially important in the labs, since the logistics of room scheduling prohibit running the lab exercises outside the allotted meeting times. If you are unable to attend and fear detrimental consequences, see me ahead of time to make arrangements.

Classroom behavior: Astronomy (and all of nature) has an intrinsic level of complexity. It won't simplify itself to accommodate distraction or a short attention span, so you need to stay focused. Please try to do so, and not cause distractions for other students. Except as needed for disability services, computers and other electronic devices may not be used in class unless specifically permitted by the instructor. Calculators may be used for quizzes and exams, but only for numerical work. Cellphones, pagers, blackberries, and starship communicators must be turned off. If you need to make an urgent call or beam up, please leave the room quietly before doing so.

Academic integrity: University standards for academic integrity will be observed. Cheating is bad—obviously—but rules regarding conduct also apply. It's mostly just courtesy and common sense, but you can see the NMU Student Handbook (`http://nmu.edu/dso/studenthandbook`) for details. I take this course, and education in general, seriously, and will not hesitate to deal with violations.

Students with disabilities: If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (906-227-1737 or disability@nmu.edu). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and university guidelines.