

As104—Stellar/Galactic Astronomy and Cosmology

2024–2025–Wint

Description: This course deals with the structure and evolution of stars, galaxies, and the universe as a whole (cosmology). But it begins by covering ideas common to all of astronomy: gravitation (the driving force in stars, galaxies, and the universe), the nature of light (from which we get our information about the universe), and telescopes (which we use to gather light). Then we move on to stars, galaxies, and the universe.

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

- basic knowledge of underlying concepts like light and gravity,
- the evidence and modeling process used to describe the evolution of stars and the universe, and also
- 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 is recommended. Any additional mathematics will be taught as needed. Basic geometry is also very useful. Note that As103 is *not* a prerequisite.

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 carefully—probably several times. The lectures are meant to give additional explanation of particular topics, and maybe introduce outside material—they’re not enough if you don’t read the book. The course does not use EduCat; I will show you how to keep track of your grades on your own. Additional material may be made available at <http://physics.nmu.edu/~mjacobs/As104/>.

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. Student hours are Mon 1–3pm, Wed 1–3pm, or by appointment. Virtual meetings (via Zoom) are an option. It’s ok to just try dropping in, too. 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%	(week of Feb 3)
Exam 2	15%	(week of Mar 10, with E1 review)
Exam 3	15%	(week of Apr 7, with E1, E2 review)
Final	20%	(Mon Apr 28, 10a–noon, comprehensive)
Lab	20%	(must pass—see Laboratory below)

Quizzes and exams: This course moves fairly quickly, so we will have a weekly quiz (or some other short graded assignment) as an incentive to keep up. Most material depends on what came before, so (much like crossing the streams), getting behind is bad. The exams are set at roughly equal intervals throughout the semester; the dates may be adjusted so that they coordinate well with major topics in the lecture material. (The final exam date and time are set by the university, and will not be changed.)

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: Please try to attend all class meetings. I am not inclined to make accommodations for problems resulting from (avoidably) poor attendance. If you cannot be present for a quiz or exam, see me ahead of time to make arrangements. This is especially important in the labs, since room scheduling prohibits running the lab exercises outside the allotted meeting times. Legitimate excuses include participation in academic conferences, university athletic events, etc. But please don’t ask to reschedule because of “social events,” an early vacation departure, and things like that.

Classroom behavior: Nature has a certain level of complexity, and it won’t simplify itself to accommodate distraction or a short attention span—so it’s best 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. 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 for details. I take this 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 Coordinators of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (227-1737 or disserv@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.”