

# Administrative Matters

## Your lecturer

for this course is:

- Joris Verbiest
- Office: D4-142
- Office hours: typically weekdays 09:00-16:00, preferably on appointment (through e-mail)
- e-mail: [verbiest@physik.uni-bielefeld.de](mailto:verbiest@physik.uni-bielefeld.de)
- All course material will be provided on the web-page:  
[http://www.physik.uni-bielefeld.de/~verbiest/Teaching/Galactic\\_Astronomy/](http://www.physik.uni-bielefeld.de/~verbiest/Teaching/Galactic_Astronomy/)

## Recommended course books

The book on which the lectures will be based, is:

Title: Galactic Astronomy

Authors: Binney & Merrifield

Publisher: Princeton Series in Astrophysics

ISBN: 978-0-691-02565-0

The university library has several copies of this book (but note these have not been reserved in a “Semesterapparat”). Reading of the book is not mandatory, although it does provide more details for those interested.

### Lecture Plan and Times

Lectures take place on Mondays between 10:00 and 12:00 in room X-E0-214; and on Fridays between 14:00 and 16:00 in room D6-135. An indication of the topics and relevant chapter numbers is given in the table below. (Note this table is not definite and changes are likely to occur.) An up-to-date version of this table will be kept on the course web page.

Week No.	Lecturing Dates	Chapter	Subject(s)
1	9-13 Apr	1, 2	Introduction & Basic Measurements
2	16-20 Apr	2, 3	Stars
3	23-27 Apr	4	Galaxy Morphology
4	30 Apr - 4 May	5	Stellar Evolution, Stellar Populations
5	7-11 May	6	Star Clusters
6	14-18 May	7	The Cosmic Distance Scale
7	21-25 May	–	5-minute project outline presentations
8	28 May - 1 Jun	8	The Interstellar Medium
9	4- 8 Jun	9	The Milky Way's Interstellar Medium
10	11-15 Jun	10	Milky Way Components
11	18-22 Jun	11	Galactic Kinematics
12	25-29 Jun	–	Project Presentations
13	6 Jul	–	Project Presentations (Note no class on 2 July!)
14	9-13 Jul	–	Project Presentations
15	16-20 Jul	–	Buffer

### Course Components

This course consists of two components:

**Lectures:** The lectures will provide an overview of the various aspects and components of galactic astronomy; and the tools that are used to investigate galaxies, their constituents and their history. The purpose is to gain knowledge on the basis of which currently-ongoing galaxy-related research can be understood. The lectures will not go into a lot of detail on the present frontiers of galactic research, which would require several more specialised courses.

**Project:** As part of the course, each student will investigate in depth a particular aspect of galactic astronomy; and look into the recent literature on the topic. Halfway through the term (in the week of 21-25 May), all students will have to give brief presentations outlining their topic of

choice. At the end of the term, your literature review will be presented in the form of a short written report and through an oral presentation in class.

## **Credits and Grading**

To obtain full credits for this course, you will have to hand in a brief ( $\sim 10$  pages) written report on your literature research (see below) and present this research in a brief ( $\sim 25$  min) oral presentation in class. The final grade gets decided during an oral exam in late July/early August. This oral exam will have three components like the course itself:

1. Part of the exam will be based on the material covered in the lectures.
2. A second part concerns your own research project. Questions in this part will mostly be based on the report and presentation and may reflect questions asked in class after your presentation, but may also investigate the connection between the project and the more fundamental science discussed in the lectures.
3. A final part will concern the project of a fellow student. To this end, everyone will be randomly assigned a classmate whose report and presentation they'll have to study; and about which they'll be quizzed during the exam.

If you do not require a grade, you are still encouraged to do the literature review and the presentations, as these are the most educational parts of the course, providing you with practical experience fundamental to scientific research.

The course is conducted entirely in English and everyone is encouraged (but not obliged) to make his/her report and presentation in English as well.

## **The Literature Review Project**

As an important part of this course, you will perform some literature research of your own. Specifically, you are to choose a topic from the field of galactic astronomy and research both the historical background and the recent literature on your topic, in order to gain an understanding of the current questions and ongoing investigations in this (sub)field. A summary of our current understanding of this topic along with the research presently ongoing is to be presented in the oral presentation and the written report. The depth of your literature research and your understanding of your own research will then be tested in the oral exam.

Important deadlines for this project are as follows (please contact me asap if you have a good reason to get your deadline postponed):

Date	Task due
18 May	Project selection completed (preferably sooner)
21-25 May	5-minute presentation to outline your topic (and some possible relevant references).
1 June	Project outline handed in (at least a list of headings expected in your final report and a collection of five relevant papers to be discussed in your final report)
18 June	First full draft of written report due
25 June - 13 July	Oral presentations
16 July	Final written report due
23 July – 3 Aug	Oral exam

As a complement to your own research and in order to gain experience with critical and constructive reading, you will be randomly assigned a fellow student whose report and presentation you'll have to study for your exam. Consequently, it is important to stick to the above deadlines, in order to allow your fellow students ample opportunity to come to grips with your topic!

The deadline for the final written report is *after* the oral presentations are to be given, but early versions of your report can be handed in at any time, to allow feedback throughout the process from both me (and possibly your fellow students). In particular, a complete (but not necessarily final) copy should be handed in in mid June, before the presentations are given. Note that early commenting will help your project and increase your confidence for the presentation and final exam. The final report should differ from the first full draft to the extent that any received comments may be implemented along with any further clarifications and additions that may be inspired by the discussion that follows your presentation.

Project-related questions or issues can be discussed either personally after making an appointment ([verbiest@physik.uni-bielefeld.de](mailto:verbiest@physik.uni-bielefeld.de)), or in class at the start and end of lectures.

Below is a proposed project list with some references to get you started. However, any project within galactic astronomy may be chosen. Simply ask in case of doubt.

Note that the references listed below are to be used as *starting points* only and that more up-to-date references will need to be sought to complement and update the references below.

Topic	Suggested reference (to start from)
The Spectral Energy Distribution of Galaxies	Conroy, C., 2013, ARAA Vol. 51, pp. 393–455.
Black Holes and their Host Galaxies	Ferrarese, L. & Merritt, D., 2000, The Astrophysical Journal, Vol. 539, pp. L9-L12.
The Interstellar Medium of the Milky Way	Ferrière, K. M., 2001, Reviews of Modern Physics, Vol. 73, Issue 4, pp. 1031–1066.
The Intergalactic Medium	McQuinn, M., 2016, ARAA Vol. 54, pp. 313–362 .
Evolution of massive stars	Langer, N., 2012, ARAA Vol. 50, pp. 107-164.
Pulsar Populations	Lorimer, D. R., 2008, Living Reviews in Relativity, Vol. 11, No. 8.
Star Formation	McKee, C. F. & Ostriker, E. C., 2007, ARAA Vol. 45, pp. 565–687.
Mapping the Galaxy’s Spiral Arms	Reid, M. J. et al., 2014, The Astrophysical Journal, Vol. 783, issue 2, pp. 14–.
Galaxy Evolution	Springel, V. et al., 2005, Nature, Vol. 435, Issue 7042, pp. 629–636.
Galactic Magnetic Fields	Widrow, L. M., 2002, Reviews of Modern Physics, Vol. 74, Issue 3, pp. 775–823.

In addition to the suggested topics in the table above, you can choose your own topic freely. To gain inspiration, you could browse the contents of review journals such as the “Annual Review of Astronomy and Astrophysics (ARAA)” (<http://www.annualreviews.org>) or the “Reviews of Modern Physics” (<http://journals.aps.org/rmp/recent>). A search on Google might work, although a search on the NASA Astrophysical Data System (ADS) ([http://ads.ari.uni-heidelberg.de/abstract\\_service.html](http://ads.ari.uni-heidelberg.de/abstract_service.html)) is probably more appropriate.

Note that there will be many interesting and important papers (particularly in ARAA and Monthly Notices of the Royal Astronomical Society) which the Bielefeld University network does not provide access to. However, the large majority of these are also available on free preprint servers – the easiest way to obtain those, is by looking them up on ADS.

A note on Wikipedia. These days, Wikipedia is an essential tool when

trying to understand basic concepts; and on the whole its reliability is fairly good. However, Wikipedia only summarises and collates research that was initially presented elsewhere. Therefore it is important to **always cite the original sources** instead of Wikipedia. Do use Wikipedia to get an initial idea of the concepts and relevant topics, but continue by checking it all in the more scientifically refereed publications. In any case: **do not cite Wikipedia**. (Similar restrictions exist for any internet site: if the source is not clearly fully reliable, trustworthy or scientific, do not cite it and do not use the information on those pages. In case of doubt, please ask.)