

Special Topics in Observational Astrophysics

Syllabus

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S-605 (X. Bai) and S-517 (H. Li)

Time: Fridays, 3:15-4:45 pm (note special time)

Location: Mong Man-wai Building (蒙民伟科技楼) S-727

General Rationale

This course is offered to graduate students in astrophysics as well as interested undergraduate students. The goals are three-fold:

- Learn astrophysical topics beyond your own area of research.
- Improve your English, especially reading and speaking English.
- Develop and improve your skills for scientific presentation.

Through this course, we hope to expose students to a wide range of topics to develop both breadth and depth in astrophysical knowledge. Moreover, it trains students in aspects that are not normally covered by standard courses and research, but the corresponding skills are crucial for your future careers, regardless of whether you stay in academia or not.

This course is offered on yearly basis, focusing on topics in observational astrophysics. Its sister course, "Special Topics in Theoretical Astrophysics", will be offered in alternate semesters.

Format

The organizers will decide on the general theme, and divide the theme into a list of topics. For each topic, a few references are suggested as the starting point based on which the students will construct their talks. There will also be a faculty contact to help with preparation.

At the beginning of the semester, students are provided a list of topics and select a few topics of their interest. We stress that students should **select topics that are different from their current areas of research.**

Afterwards, the organizers will assign individual students with a topic and a date considering the overall preferences. Depending on the nature of the topic, it can be covered by a single talk by one student, or by a talk series by a group of 2-3 students together. In the latter case, the students are expected to work together to divide the task and build up a coherent set of talks. **We expect 2 to 3 student talks per week** in general.

Students are expected to read the references associated with their assigned topics, and are encouraged to explore other relevant literature as needed. **A good practice is to start preparing the talk at least two weeks ahead of time.** During the preparation, students should feel free to consult with the faculty contact and/or other faculty members. **At least two days before the talk, the student must get ready and discuss with the faculty contact for approval.** If approved (see "Evaluation" section for details), the faculty contact will further comment and help improve the presentation, and the student should further practice and polish the talk. **If not approved, the talk will be cancelled.** For graduate students, this not only means that you lose the opportunity to improve your presentation skills, but also, you will no longer be eligible for the AMD scholarship.

Each presentation is expected to be **20 minutes for the talk**, plus 10 minutes for question and discussion. The talk is expected to cover standard ingredients such as motivation/background, methodology, main results, implications, and a summary. We require every presenter to **give the talk in English**. English is also strongly encouraged during the question session, but it is OK to switch to Chinese if necessary.

Participation and Enrollment Policy

This course is part of the standard curriculum at DoA. We require all 2nd-3rd year graduate students to participate in the course and give presentations. First year graduate students are required to attend the course to be eligible for the AMD scholarship, and are encouraged to give presentations. Note that the online system only allows one to enroll a course once. To avoid conflict, we ask graduate students to **enroll only when it is the last time he/she is going to participate in this course**. On the other hand, we do record the performance of all students, and grading will also be based on previous performance. Graduate students are excused for not participating in this course when he/she is on leave (e.g., studying abroad for extended period).

Senior undergraduate students are welcome to participate in the course and give presentations. You can enroll in the course if 1). You register to give presentations and 2). you are **NOT** planning to enter DoA for graduate school.

Student talks from this course will be advertised to all members of DoA, and we anticipate certain faculty and postdoc to attend the talks as well. They will also offer feedback to the presenters.

Evaluation and Grading

The faculty contact will judge the overall quality of the talk based on the level of understandings the student possesses on the topic, and how well the talk is prepared. **The bottom line is that an audience with no background on the topic should be able to learn something useful from talk.** Please note that the fact you think you understand the topic does not necessarily mean that you can give a good talk. In fact, it is the other way round in general: only when you manage to make the audience understood about the subject and are ready to address any questions that may arise, it best demonstrates your understanding of the topic.

Some **guiding principles** include:

- 1). The content of the talk is well organized in a logical way. It should contain introduction, method, results, and summary sections, and please also pay attention to the transition between slides.
- 2). Be confident about all the information you show in each slide. Don't simply read the slides, but rather explain the content, discuss the implications, and highlight the key results.
- 3). Be able to answer basic questions that may arise from anywhere in your slides and/or your words.

Right after the presentation, everyone in the audience will be provided an **evaluation QR code** to offer the speaker instant feedback. The presenter, upon receiving the evaluation, should feel free to talk to the organizers to discuss his/her performance.

The nature of this course means that students themselves are primarily responsible for their performances: the more you invest in preparing your talk, the more you will learn and grow. While grading will be judged according to the history of performances on a P/F basis, we do not easily fail anyone unless his/her performance is exceptionally unacceptable.

Theme of the Semester: Science with JWST

The successful launch and deployment of the James Webb Space Telescope (JWST) marks a new era for astronomy and astrophysics. Being the largest telescope in space equipped with cutting-edge instruments, it is destined to revolutionize many fields in astronomy, especially in galaxy and cosmology, as well as in exoplanetary science. Since the release of early science data in mid-2022, we are seeing the exquisite quality of JWST data and witnessing an explosion of publications that drive quantum leaps of the frontiers in nearly every field. JWST provides extraordinary opportunities to nearly all of us, provided we are sufficiently familiar with the JWST capabilities and its scientific applications. We are thus excited to focus on JWST science as the theme of this semester to help all of us embrace this new era in astronomical history.

We have composed individual topics of JWST science thanks to the contributions from many of the DoA faculty. The topics are spread over the remaining 14 weeks of the semester, and each topic is expected to be covered by 1-3 students, as indicated in the topic list. Students form groups and should talk to the faculty contact regarding the division of labor and the final presentation of their selected topics. While some students have already been working on JWST data or even published papers using JWST data, we advise that these students should choose topics in a different area to maximize their scientific gain. Finally, the science capability of JWST is going to be far beyond the given topics. You are also strongly encouraged to explore your own topics, which we have specified one particular week for such cases.