

Welcome to ASTR 504

**COURSE TITLE:** Theory

**COURSE INSTRUCTOR:** Arif Babul

**CONTACT:** [babul@uvic.ca](mailto:babul@uvic.ca)

Normally this graduate course has between 2 and 5 students. The number varies from year to year. Over the years, I have experimented with a number of different approaches and over the past 7 years, settled on a scheme that seems to work well. Here's how it works — and how the grades will be assigned. I will spend a fair amount of time during our first class going through this. If you have suggestions for improvement, I am happy to mull it over and make the appropriate adjustments.

### **TERM LENGTH**

January 6th to April 4th 2025

Last course drop date with

\*100% fee reduction: Jan 19th;

\* 50% fee reduction: Feb 9th;

\* 0% fee reduction: Feb 28th

### **VENUE AND TIME**

The class will be held on **Wednesdays from 12pm to 3pm** (if there is to be a change, it will be by unanimous consent)

### **MODE**

The class will be conducted in mix-mode: in-person (70%) and via zoom (30%).

In-person classes will be held in Elliott 038

On-line classes will be held at this

link: <https://uvic.zoom.us/j/83196972815?pwd=bFoRa7mbSqzxbZqcc2OSZXM5ZJgqvy.1>

### **COURSE STYLE**

Given that this is a small class, I will use the informal “discussion seminar” style format. Over the course of the semester, I will send you a series of papers to read.

**READINGS** (I will continue to add papers here over time):

(1) <https://arxiv.org/abs/1909.07976>

**The expectation is that everyone will read the assigned pages and think about the content.**

Please read it actively — reminding yourselves of concepts and ideas you learnt in undergraduate school and leveraging that to read each paragraph in-depth and critically. Annotate your digital or paper copy with comments, questions, critique. You may need to read other papers and

references to grasp the basic content. Annotations are meant to dig a bit deeper, to go beyond the text.

As you read the papers, please write:

(a) a summary of each paragraph on a separate “page”

For these summaries, focus on the key ideas in each paragraph as well as caveats. Draw attention explicitly to these in your overview. If there are concepts you are not familiar with, do take some time to look up these up and come prepared to explain.

(b) annotations in the margin of the paper we plan to cover.

Please do not fill the margin (annotations) with a summary of the paragraph. Annotations should be insights, comments, questions, discussion points. Please do this independently. We will, of course have ample opportunity to compare notes and discuss during class time. After all, this is one of the main feature of this course.

At the start of start of each class, please email me your annotations for the paper/sections we plan to cover, but not your summaries.

I will be marking these.

**I will assign the discussion lead in class, who will lead the discussion for about an hour (or when a natural break point is reached, like the end of a section) and then, another person will take over. I do not wish you to use powerpoint or any other such tools.**

You are welcome to use new AI tools to produce your summaries but your annotations, questions and critiques must be the product of your active thinking — your personal intelligence. That is what we are trying to develop here...

Discussion lead is just that. I am expecting everybody to **INTERRUPT** with their comments/questions and criticisms.

I will do so too. I expect that in the beginning, I may be doing more of this than you but after we finish the first paper, your contributions should become comparable.

Comments like “this wasn’t mentioned here but I thought it was an important/interesting related issue...” is very welcome.

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In the past, we have reviewed several papers on galaxy formation (each with different perspective and focus), we have reviewed a couple of pages on galaxy formation and supplementing these with review of other important and relevant topics (like AGN feedback turbulence, thermal instability, CGM, etc.). If you have suggestions, I’d be happy to consider these.

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In addition to our weekly discussions, members of this class are expected to attend all colloquia and seminars that address “extra-galactic” topics.

After the first two/three weeks, I strongly encourage you to ask questions at these seminars and colloquia. Don't be concerned if you think your question is too simple. Sometimes, the simplest are also the most piercing. This is to promote active listening and engagement, and to encourage you to be using your new knowledge on galaxy formation.

### **FORMAL REFERENCE BOOK**

For three years prior to 2015, I used the following book as a basis for readings and classroom discussions: *Galaxy Formation and Evolution* by [Houjun Mo](#), [Frank van den Bosch](#), [Simon White](#). The book offers a fairly thorough coverage of subject - usually in gory detail. As a result, it is difficult to separate out the key concepts and ideas. Most students in the past have tended to not see the "forest for the trees". I recommend this book as a reference. If you are going to work on galaxy formation or need a source to read up on some specific issue, this is as good a starting point as any.

### **GRADING**

30% of your final mark will come from graded annotations

30% of your final mark will come from quality of your engagement during the class. This includes your level of preparedness, indications that you have made an effort to understand the readings, **how well you summarise and highlight the key points, identify the caveats and assumptions as well as the questions you pose and effort that goes into generating discussion.**

**The emphasis is on quality, not quantity.**

At seminars or we colloquia on relevant topics, I'd like to see you draw on your readings - and improving understanding of the subject - to ask the speakers interesting and even challenging questions. To encourage you,

40% of your final mark will come from a final presentation

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### **FINAL PRESENTATION**

Close to the end of the semester, everybody will pick and discuss a paper. Basically, pick a recent (within the past year) theoretical/data science-focused paper on a topic relevant to this course topic.

Send the paper to me by the start of March for approval.

Then, own the paper — I will discuss what this means at our first meeting, but it basically will involve reading more than one paper — and then, of course **you will give a formal - with powerpoint/keynote - presentation (35-40 minutes).**

The grading rubric for the presentations (subject to revision) is as follows:

Choice of Paper (Weighty etc.) : 20%

Mastery (2 Papers etc.): 30%

Slides: 15%

Verbal / Onstage Presence: 5%

Structure / Design of Presentation: 5%

Organization: 10%

Q&A: 15%