

# Advanced Topics in Planet Formation

AST3020H

Fall 2015

Professor Hanno Rein

<b>Lecture</b>	Fridays, 9 am - 11 am, AB 88 - The lectures start prompt at ten past the hour. - Please be on time. - There will be no break (but the lectures will end a few minutes before 11am).								
<b>E-mail</b>	<code>hanno.rein@utoronto.ca</code>								
<b>Twitter</b>	@hannorein								
<b>Website</b>	<a href="http://rein.utsc.utoronto.ca/">http://rein.utsc.utoronto.ca/</a>								
<b>Office hours</b>	Mondays, 1:00 pm - 2:00 pm, UTSC, SW504C Wednesdays, 1:00 pm - 2:00 pm, UTSC, SW504C or by appointment								
<b>Reading/ Bibliography</b>	- Lecture notes will be posted on <a href="http://rein.utsc.utoronto.ca/">http://rein.utsc.utoronto.ca/</a> - Astrophysics of Planet Formation, Philip J Armitage, Cambridge								
<b>Assignments</b>	There will be four assignments in this course. 1) Accretion disk model (1D) 2) Planet disk interaction (2D) 3) Long term stability of planetary systems (3D) 4) Numerical integrators Collaboration for these mini-projects is encouraged, but the write-up must be independent. The write up must be done in LaTeX using a two column journal style.								
<b>Presentations</b>	We will run short presentations throughout the term. Every student will have to give two presentation of 10-15 minutes during the term. More details on these presentations will be distributed later as they depend strongly on the enrolment.								
<b>Grading Scheme</b>	There will be a one hour final exam. Neither a calculator nor an equation sheet will be allowed in the exam. The exam will focus on your understanding of the subject, rather than long mathematical calculations.								
<b>Grading Scheme</b>	The final grade will be calculated from all assignments, presentations and the final exam. The ratio is as follows: <table><tr><td>Assignments</td><td>35</td></tr><tr><td>Presentations</td><td>35</td></tr><tr><td>Final exam</td><td>30</td></tr><tr><td>Total</td><td>100</td></tr></table>	Assignments	35	Presentations	35	Final exam	30	Total	100
Assignments	35								
Presentations	35								
Final exam	30								
Total	100								

<b>Absences</b>	<p>In the case of a problem that supports an absence or an inability to hand in an assignment before the deadline, your grade will be calculated on the basis of all other tutorial work. In the case of a problem that supports the absence to the midterm, your grade will be calculated by increasing the weight of the final exam. Valid and <i>official supporting documentation</i> must be submitted within five business days of the missed tutorial or test. It is your responsibility to hand in documentation on time. Failure to do so will impact your grade.</p>
<b>Accessibility</b>	<p>Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or <a href="mailto:ability@utsc.utoronto.ca">ability@utsc.utoronto.ca</a>.</p>
<b>Academic Integrity</b>	<p>Academic integrity is one of the cornerstones of the University of Toronto. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. Detailed information about how to act with academic integrity, the Code of Behaviour on Academic Matters, and the processes by which allegations of academic misconduct are resolved can be found online: <a href="http://www.artsci.utoronto.ca/osai/students">http://www.artsci.utoronto.ca/osai/students</a>.</p> <p>According to Section B of the University of Toronto's Code of Behaviour on Academic Matters (<a href="http://www.governingcouncil.utoronto.ca/policies/behaveac.htm">http://www.governingcouncil.utoronto.ca/policies/behaveac.htm</a>) which all students are expected to know and respect, it is an offence for students to:</p> <ul style="list-style-type: none"> <li>• To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.</li> <li>• To include false, misleading or concocted citations in their work.</li> <li>• To obtain unauthorized assistance on any assignment.</li> <li>• To provide unauthorized assistance to another student. This includes showing another student completed work.</li> <li>• To submit their own work for credit in more than one course without the permission of the instructor.</li> <li>• To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.</li> <li>• To use or possess an unauthorized aid in any test or exam.</li> </ul> <p>Specifically to this course, please be reminded that you need to understand every solution that you submit. If you work together on an assignment, you still have to be able to present your submission.</p> <p>There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the Code of Behaviour on Academic Matters.</p>

## Tentative Class Schedule

Week	Date	
1	Sept 18th	Star formation, protoplanetary discs, global hydrodynamic evolution
2	Sept 25th	Numerical 1D disk model, disk instabilities, disc evaporation and dispersal
3	Oct 2nd	Planetesimal formation, meter-sized barrier, gravitational collapse, streaming instability
4	Oct 9th	Introduction to orbital mechanics, tidal effects
–	Reading week	No lecture
5	Oct 23rd	Planet-disc interactions 1/2, low mass planets, type I migration
6	Oct 30th	Planet-disc interactions 2/2, high mass planets, type II migration
7	Nov 6th	Oligarchic growth phase, planet-planet collisions, Moon forming event
8	Nov 13th	Secular and resonant dynamics of planetary systems, mean motion resonances
9	Nov 20th	Long term evolution of planetary systems, chaos, N-body integration
10	Nov 27th	Advanced N-body methods, non-symplectic integrators, IAS15
11	TBD	Advanced N-body methods, symplectic integrators, WHFast
12	TBD	TBD