AST320-Intro to Astrophysics
(Winter 2020)

MAIN SYLLABUS

Aim of the course

This is a required course in all of the Astronomy & Astrophysics programs. This course aims to teach the physics underlying the formation, the equilibrium, and the evolution of structure on all astronomical scales. Two main topics will be discussed:

Stars

Hydrostatic equilibrium, virial theorem;
Collapse of molecular clouds, star formation;
Equation of state in stellar interiors;
Simple stellar models: polytropes;
Radiative energy transport, opacity sources;
Convective energy transport;
Hayashi track; pre–main sequence evolution;
Energy balance: contraction, nuclear fusion;
Stellar model building;
The main sequence, brown dwarfs;
Low-mass stars: giant phases, shell burning;
High-mass stars: fusion up to iron;
Supernovae.

The Universe

Distance Ladders;
Cosmological principle, basic parameters;
Simple relativistic cosmology;
Big Bang nucleosynthesis;
Times, distances, horizons, diameters;
Cosmic microwave background, inflation;
Fluctuations and structure formation.
Galaxy Formation
Galaxy Evolution

Pre-requisites: AST 221H & 222H, and PHY 252H (the latter can be taken concurrently), or pending instructor permission.

Grading

. 10 Problem sets (60%)
. Individual on-the-board discussion (5%) .
. class participation (10%)
. Final examination (25%), closed-book, calculator allowed, mid April, 3 hours

There will be 10 problem sets due Fridays before class. Late submissions are not accepted. You are strongly encouraged to **collaborate** on the problem sets but are not allowed to copy each other. The University has strict guidelines and grave punishments for academic misconduct.

Individual on-the-board discussion: each student will lead a ~5 minutes discussion after my main lecture, in which they pose a well considered question on the lecture material and attempt to give a concise and physical explanation to the same question. You will be judged by how interesting/relevant/physical the discussion is. Check the calendar for your assigned slots, and send me your question/short answer at least a day ahead of the lecture.

Textbook

1. **Introduction to Modern Astrophysics**, Carroll & Ostlie, 2nd edition, 2006
2. Pols, On-line lecture notes for a graduate level course, last update 2011, detailed and physical
3. *Stellar Structure and Evolution*, Kippenhahn, Weigert & Weiss (Springer-Verlag, 2012); detailed and rigorous
4. *An introduction to the theory of Stellar Structure and Evolution*, Prialnik, 2009, undergraduate level, clearly written

Contact: who, when, where

Instructor: Prof. **Yanqin Wu**;
Lectures: M2-3pm, F12-1pm, AB107
Email: wu_at_astro.utoronto.ca

Teaching Assistant: Alysa Obertas (obertas_at_astro.utoronto.ca)
office hours: Wu: Thursday 3-4pm (MP1210)
Obertas: Wed 2-3pm (??)

Office hours: If you wish to talk to me or the TA individually, please visit us during the office hours; failing that, you can try to arrange an appointment with us by email. Do not expect detailed answers to course-related questions by e-mail.