Welcome to the NASSP Honours Course GA1
Please read everything written below to ensure that you can participate in the course as smoothly as possible.

Course Title:	**General Astrophyics 1: Stellar Structure & Evolution**
Course Lecturer:	Dr Chris Engelbrecht
Course credits:	1
Contact hours:	24 x 50-minute lectures + 6 hours of tutorials

1) Course overview:

This course covers the essential physics required to develop a robust understanding of stellar structure and evolution, plus a few applications. We will study the physical structure and interior dynamics of stars and derive the basic equations required to construct simple models of stellar interiors. Along the way, the relevant microphysics will be introduced, e.g., the equation of state, the physical description of opacity, relevant nuclear reactions, and energy transport. We will examine star formation in general, how stars of different masses evolve, the stellar remnants (e.g., white dwarfs and neutron stars) that remain at the endpoints of their evolution. You will also be introduced to key aspects of asteroseismology, the primary tool for studying stellar structure and evolution at present.

2) Course delivery:

The 24 fifty-minute lectures will be delivered at the times scheduled in the NASSP Honours timetable, starting on 16 February and ending on 24 March, **in the form of live lectures on Zoom, presented via a video link in the AST Seminar Room (or an alternative venue if so communicated to you by the NASSP Coordinators)**. **Please consult the NASSP calendar for the lecture times.**

Aside from the formal teaching slots where I will be presenting the primary course material, there will also be a number of tutorial sessions wherein the course tutor will lead you through additional learning exercises conducted in a group context in the classroom. The tutorial slots are spread through March and mid-April.

For my lectures on Zoom, I use a document camera with a wide field of view so that it can be used as a substitute for a blackboard. This simulates an actual classroom teaching environment as closely as possible, and I have been using this method very successfully in numerous courses over the past six years.

Please note that this means that you have to attend the live lectures to receive the full course content, as you will be following me on the 'whiteboard', taking your own notes as the lecture proceeds. See my comments in section 4 below in this regard.

3) Course breakdown/syllabus:

* Brief overview of stellar parameters and how we infer them
* Setting up the mathematical formalism for describing stellar structure
* Stellar interiors:
    - interaction of EM radiation with matter in stellar interiors
    - some microphysics: stellar opacity
    - energy transfer inside stars
    - the differential equations describing stellar structure
    - the Lane-Emden equation and some simple solutions
* The physics of star formation

* Stellar evolution:
    - some microphysics: nuclear energy generation in stars
    - low-stellar-mass evolution
    - high-stellar-mass evolution
* End states of stars
* The physics of stellar pulsation
* Asteroseismology

4) Resources:

Summary slides will be posted after each day's lecture(s). However, these slides will contain summaries and will not include all the detail discussed in the live online classes. *That is why it is essential to participate in the live classes at the scheduled times.*

There is no set textbook for the course. However, the following standard texts contain material that will align (closely, at times) with the lecture content:

• An Introduction to Modern Astrophysics (any edition), by B.W. Carroll & D. A. Ostlie
• Theoretical Astrophysics, Volume II: Stars and Stellar Systems, by T. Padmanabhan

Any other advanced-level text on stellar physics (e.g., Hansen, Kawaler & Trimble; Prialnik; Kippenhahn, Weigert & Weiss; etc.) will be useful to consult for further background.

Please note, though, that it will not be necessary to consult any resource besides the class notes (which you take during the live lectures) and summary slides to obtain all the formal course material.

5) Assessment

The relative weights of homework, tests/exam, and tutorials are still to be finalised and will be communicated at a later stage. The delivery mode of the mid-term test and exam will also be communicated at a later stage.

I look forward to a stimulating learning experience with you!

My contact details: engelbrecht.chris@gmail.com
[note: UCT has created a uct email address for me as well, but I have no access to it. Please use only the gmail address indicated above]