AST 591 **SYLLABUS** **FALL 2025**

COURSE: AST/PHY 591, **STELLAR STRUCTURE & EVOLUTION**
Tuesdays & Thursdays 11:00am - 12:15pm, CP 179

INSTRUCTOR: **Prof. Isaac Shlosman**
Office - CP 117C (phone 257-3461)
Office Hours – Tuesdays, Thursdays, 4:00 to 5:00pm
I am flexible: you can just walk in
e-mail: isaac.shlosman@uky.edu
Course homepage on the web:
http://www.pa.uky.edu/~shlosman/591.html

TEXTBOOK:
1. *Stellar Interiors: Physical Principles, Structure and Evolution,* 2^{nd} edition by C.J. Hansen, S.D. Kawaler & V. Trimble (Springer), 2004 (recommended)
2. Lecture notes and suggested material
3. Additional recommended books:
   Principles of Stellar Evolution and Nucleosynthesis by D. Clayton (Chicago: Univ. of Chicago) 1968, 1984
   Stellar Structure and Evolution by R. Kippenhahn and A. Weigert (Berlin: Springer) 1994. This is an excellent reference book
   Structure and Evolution of the Stars by M. Schwarzschild (New York: Dover) 1958, 1965. Classic textbook
   An Introduction to the Theory of Stellar Structure and Evolution by D. Prialnik (Cambridge University Press) 2000. It is at a lower level than the others, but has an excellent physical description

HOW DO WE MEET: We"ll have regular class sessions. Homeworks, solutions and everything else will be posted on our website.

COURSE DESCRIPTION & OBJECTIVES: This course will deal with the basic physics of stellar interiors and stellar evolution. It is designed to introduce the theory of stellar structure to beginning graduate or upper level undergraduate students, emphasizing the basic underlying physics. The course will include elements of the statistical physics, a discussion of the stellar structure equations, and an introduction into how the equations are solved. We will also look at the basics of stellar atmospheres as well as include an introduction to more exotic phenomena, including stellar pulsation, binary evolution and accretion disks in binary systems, if the time will permit. Although this is a theoretical course, the latest observational results will be used to supplement the physical modeling.

COURSE EVALUATIONS: Course evaluations are an important (and mandatory!) component of our Department's instructional program. The evaluation window for Fall 2022 will be open during the last 2 weeks of classes. This semester we shall use the TCE student evaluations system which is used university wide.

COURSE REQUIREMENT: Problem sets will be usually distributed to students on Thursdays (online). These problem sets must be handled in on time (next Tuesday, hard copy only!) and must reflect student's own work. Graduate students will be judged on a deeper understanding of the subject. Late submissions will be panished.

TESTS: The student will be evaluated based on homework, Midterm test (around mid-October), Final test, and in-class participation.

GRADES: The final letter grade in this course will be determined by your scores from the in-class *Midterm exam* (30%) the *Problem Sets* (30%), and the *Final exam on Thursday, 12/19, 10am-noon* (35%), and in class participation (5%). The letter scores are defined as: A (89-100%), B (76-88%), C (63-75%), D (50-62%) and E (49% and less). The passing score for graduate students is C and for undergraduate students is D.

SERVICES OF THE TEACHING ASSISTANT: *NONE*. However the students are welcomed to discuss any subject of interest with the instructor.

COURSE OUTLINE (may be re-shuffled!):

1. Introduction to the Universe
2. Stars and basic properties of matter
3. Observational characteristics of stars
4. Hydrostatic equilibrium
5. Radiative transfer
6. Stellar opacity
7. Introduction to stellar evolution
8. Main sequence stars
9. Post-main-sequence evolution
10. Advanced stages of stellar evolution
11. End products of stellar evolution: the compact objects
12. Star formation
13. Binary stellar evolution
14. Accretion disks in stellar systems