

# Stars and the Galaxy

AST 6215

**Class Periods:** MWF-7, 1:55pm-2:45pm

**Location:** Bryant Space Science Center, room 3

**Academic Term:** Spring 2020

## **Instructor:**

Dr. Rana Ezzeddine

[rezzeddine@ufl.edu](mailto:rezzeddine@ufl.edu)

Bryant Space Science Center – Office 324

Office Hours: After class or email me to setup time

## **Course Description**

This course is intended to give you a solid foundation in the subject of stellar structure and properties, and how it relates to our understanding of the Milky Way.

## **Course Pre-Requisites / Co-Requisites**

In addition to a general familiarity with astronomy at the introductory level, this course requires knowledge of calculus, differential equations, as well as basic knowledge of thermodynamics and nuclear physics.

## **Course Objectives**

This course is one of several core courses required in the graduate astronomy curriculum but is also open to interested students in other departments. We will discuss both the theoretical and observational aspects of the topic. In all facets of the course, relevant journal articles from the active research in the literature will be used to augment and extend the topics discussed in lecture. During the course we will aim to:

- understand the global properties of stars: energetics and timescales
- study the micro-physics relevant for stars: the equation of state, nuclear reactions, energy transport and opacity
- derive the equations necessary to model the internal structure of stars
- examine (quantitatively) the properties of simplified stellar models
- survey (mostly qualitatively) how stars of different masses evolve, and the endpoints of stellar evolution (white dwarfs, neutron stars, etc..)
- discuss a few ongoing research areas in stellar evolution
- place stars in the context of the Milky Way Galaxy

## **Required Textbooks and Software**

“*The Physics of Stars*” by A. C. Phillips, 2<sup>nd</sup> edition, John Wiley publication (required).

“*Stellar Interiors*” by C.J. Hansen, Kawaler, & Trimble, 2<sup>nd</sup> edition, Springer publication (required).

## **Recommended Materials and other Useful Text**

“*Stars and Stellar Processes*” by M. Guidry, 1<sup>st</sup> edition, Cambridge University Press publication.

“*An Introduction to Modern Stellar Astrophysics*” by Carroll & Ostlie, 2<sup>nd</sup> edition, Cambridge University Press publication.

“*Stellar Structure and Evolution*” by R. Kippenhahn & A. Weigert, 1990, Springer-Verlag publication.

## **Evaluation of Grades**

Assignment	Percentage of Final Grade
Projects	30.00%
Review Lectures	20.00%
Midterm Exam	20.00%
Final Exam	30.00%

### **Course Schedule:**

As the semester progresses and depending upon class interest, we may deviate from this plan.

Weeks 1 and 2: Basic Concepts, and Overview of Stellar Structure and Evolution, Readings: Chapter 1 of Phillips, Chapters 1 and 2 of HK&M.

Weeks 3 and 4: Matter and Radiation, Readings: Chapter 2 of Phillips, Chapter 3 of HK&M.

Weeks 5 and 6: Heat Transfer, Readings: Chapter 3 of Phillips, Chapters 4 and 5 of HK&M.

Weeks 7 and 8: Energy Generation, Readings: Chapter 4 of Phillips, Chapter 6 of HK&M.

Weeks 9 and 10: Structure of Stars and Stellar Death, Readings: Chapter 5 of Phillips, Chapters 7 and 9 of HK&M.

Weeks 11 and 12: Stars & the Milky Way Galaxy Part I, Readings: Chapter 6 of Phillips, Chapters 9 and 10 of HK&M.

Weeks 13 and 14: Stars & the Milky Way Galaxy Part II, Readings: Chapter 7 of Phillips as well as literature papers TBD.

### **Attendance Policy and Class Expectations**

Class attendance is expected, and special accommodation will not be made for students with unexcused absences. Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Project assignments (estimated at 3 in number) will be handed out in class and are due in class two weeks later. Point assignments will be associated with each problem. Project assignments must be completed on time to receive full credit. Partial credit will be assigned where work has been carried out the full correct answer is not provided. Projects handed in after the graded, corrected projects have been distributed out to the rest of the class will not be accepted.

Oral and written communication skills are very important for a scientist. You will thus be required to present an in-class lecture, as well as a summary paper (5-10 pages) on a topic related to stellar structure. The Annual Reviews of Astronomy & Astrophysics is a good place to look for topics. Your chosen topic must be approved before midterm. Students should submit a rank-ordered list of preferred articles to present, two weeks before the midterm. Paper assignments and presentation dates will be assigned immediately following. Presentations will take place every Friday, right after midterms. Each presentation is expected to last roughly 15 minutes if carried out interruption free. A grading rubric will be assigned.

### **Grading Policy**

The following is given as an example only.

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00

78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>  
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

### ***Campus Resources:***

*Stars and the Galaxy, AST 6215*  
*Dr. Rana Ezzeddine, Spring 2020*

Health and Wellness

**U Matter, We Care:**

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.