

PHYS 6980/8980 — Spring 2006

## Syllabus — Draft 3

**Time:** MWF 12:00–12:50

**Instructor:** Dr. N. D. Morrison

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**Room:** MH 4012

**Office:** Ritter Observatory 205, 530-2659

**Office hours:** MTWR 3–4 PM

**Web page:** <http://astro1.panet.utoledo.edu/~ndm/6980.html> and also see the course pages in MyUT

**Prerequisite:** ASTR 4810/PHYS 5810, or equivalent preparation

### Required Texts

D. Emerson, *Interpreting Astronomical Spectra* (1998, Wiley)

C. Jaschek & M. Jaschek, *The Classification of Stars* (1990, Cambridge)

### Requirements

- Awareness of any changes to this syllabus that may be announced
- Homework assignments will be due occasionally, as announced.
- Term project
  - Oral presentation (20 minutes) and written report
  - Review of properties of a type of peculiar star
  - Analysis of Ritter spectra with IRAF and with synthetic spectra
- Final examination, 12:30–2:30 Monday, May 1, 2006. Questions will be mainly descriptive and based on the learning objectives below. More detailed statements of these objectives will be provided later.

### Learning objectives for course

Know the defining features of the spectra of each of the types of normal star  
Understand the physical basis of how the defining features vary with spectral type  
Understand the physics of the special character of each spectral type  
Understand how stellar temperatures, gravities, and abundances are determined  
Understand the main reasons why some stars have emission lines

### Learning objectives for project

Master skills of basic spectrum analysis with IRAF  
Be able to download and use synthetic spectra for comparison  
Know the defining features of the type of peculiar star studied  
Have physical understanding of the type of star studied  
Gain experience with writing a technical report

### Weights to be used in computing final grade

Homework: 10%  
Project: 50%  
Final exam: 40%

## Course Outline

Week	Topic	Books, Chapter(s)
Jan. 16	Classification of normal stars	Jaschek 2, 3
Jan. 23	Spectral lines	Jaschek 2; Emerson 3
Jan. 30	Energy distributions	Emerson 5
Feb. 6	Physical basis; A stars as example	Jaschek 10, Emerson 5
Feb. 13	B: spectrum of He I	Jaschek 9, Emerson 5
Feb. 20	O: UV, winds, non-LTE, emission lines	Jaschek 8, Emerson 10
Feb. 27	F: Li	Jaschek 11
Mar. 6	[No classes — spring break]	—
Mar. 13	G: chromospheres, coronae	Jaschek 12, Emerson 4, 11
Mar. 20	K: Wilson-Bappu; M: molecules	Jaschek 13, 14; Emerson 5, 9
Mar. 27	<b>T Tauri stars</b>	Jaschek 12
Apr. 3	Student presentations	
Apr. 10	Student presentations	
Apr. 17	L, T	[Source materials TBD]
Apr. 24	White dwarfs	Jaschek 15

### Available Topics for Term Projects: Peculiar Stars

The paper resulting from this project should have the format and flavor of a research report. The introduction should review the published literature on the type of star, including at least one primary, refereed research paper. Then it should describe your own analysis of archival data (preferably Ritter spectra) on one or more examples of the type. As many spectra as needed to make the main points should be studied.

You may not choose a type that is the subject of your own thesis research or of a presentation you have given in another graduate course, including Bag Lunch. The list below is a minor revision of that in Draft 1.

Before making a definite choice of one of the asterisked topics below, check to make sure the Ritter Archives have enough spectra of sufficient quality for a project.

- |                          |                  |
|--------------------------|------------------|
| 1. Wolf-Rayet            | 7. $\delta$ Cep* |
| 2. Classical Be          | 8. RS CVn        |
| 3. S Dor/LBV             | 9. Carbon*       |
| 4. Herbig Ae/Be          | 10. R CrB*       |
| 5. Ap ( $\alpha^2$ CVn)* | 11. RV Tau*      |
| 6. $\beta$ Cep           | 12. Mira*        |
|                          | 13. Symbiotic    |

### Deadlines

- Choice of topic; definition of computer resources to be used: Wed., Feb. 1
- Outline—listing of data set to be used, major scientific issues to be covered, major references: Wed., Feb. 15
- Draft of term paper: Fri. Mar. 24