

SPA 301: THE DISTANT STARS STUDY GUIDE

Course Lecturer: Dr G O Okeng'o (Physics Department, School of Physical Sciences; Examinations Centre, Room G 18; Tel: +254-20-444 7552; Mob. 0701969255; email: gokengo@uonbi.ac.ke)

Course Material Available on My Website: <https://profiles.uonbi.ac.ke/gokengo/>

Semester: First

Study Level: Third Year

Year: 2015/2016

Course Overview

This course focusses on specific attributes of stars that are of crucial significance to understanding stars and the universe. It deals with topics such as: the measurement of positions of stars in the sky, proper motions of stars, distances to nearby stars, measurement of brightnesses of stars, the color-magnitude diagrams, masses and radii of the stars, pulsating stars and understanding of stellar spectra.

Aim(s): To provide you with an upto-date knowledge on concepts useful in understanding stars- the building blocks of the universe.

Course Objectives

At the end of this course the student should be able to:

- Describe how how astronomers determine positions of stars in the sky and discuss the coordinate systems used.
- Discuss the proper motions of stars and derive any associated equations.
- Describe the measurement of distances to some of the nearby stars using the relevant formulae.
- Understand how to measure the brightnesses of stars.
- Draw and discuss the significance color-magnitude diagrams.
- Understand how to derive the masses and radii of stars.
- Introduce the various classes of pulsating stars and discuss their properties.
- Understand stellar spectra in astronomy.

Programme of Lectures:

This course shall consist of three hours of lectures per week running throughout the semester together with sets of problem handouts at the end of each topic. The lecture times for the course shall be as follows: **Tuesdays 7-8 am** (Rm 229, First Floor School of Physical Science Building) and **Thursdays 7-9 am** (Rm 225, Second Floor School of Physical Science Building).

This course shall comprise of **two tests** and a series of **problem sets** that together will constitute **the coursework mark out of 25%**. There shall be a class attendance and participation mark of **5%**. The **Final exam** shall be out of **60 %** but marked out of **70%**.

Detailed Course Outline

Lecture No:	Title	Content
1	The positions of stars	<ul style="list-style-type: none">• Coordinate systems• Earth's rotation axis• The sky• The proper motions of stars.
2	Distances to nearby stars	<ul style="list-style-type: none">• The Sun distance• Trigonometrical parallaxes of stars
3	The brightnesses of stars	<ul style="list-style-type: none">• Apparent magnitudes• Colors of the stars• Correction to absorption of star light by Earth's atmosphere• The black body• Solar radiation• Absolute magnitudes of the stars
4	Color-magnitude diagrams	<ul style="list-style-type: none">• Color-magnitude diagrams of nearby stars• Color-magnitude diagrams of open clusters• Color-magnitude diagrams of globular clusters• Photometric parallaxes for star clusters• Photometric parallaxes for single stars
5	Masses and Radii of stars	<ul style="list-style-type: none">• Binary stars• The doppler effect• Radial velocities and masses for star binaries• Orbital parameters of binary systems
6	Pulsating stars	<ul style="list-style-type: none">• Types of pulsating stars• The δ-Cephei stars• The RR Lyrae stars• The Period-Luminosity relation
7	Understanding stellar spectra	<ul style="list-style-type: none">• The solar spectrum• Spectral line identification• Understanding the spectral sequence

Recommended Textbook:

E. B. Vitense “*Introduction to Stellar Astrophysics*” **Volume 1**, Cambridge University Press, 1989. ISBN 0521 34869 2.