Liverpool John Moores University

Title:	ASTROPHYSICAL CONCEPTS
Status:	Definitive
Code:	**7010ASTPHY** (124781)
Version Start Date:	01-08-2021
Owning School/Faculty:	Astrophysics Research Institute
Teaching School/Faculty:	Astrophysics Research Institute

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Academic Level:	FHEQ7	**Credit Value:**	30	**Total Delivered Hours:**	48
Total Learning Hours:	300	**Private Study:**	252		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Online	45

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Online Final Exam	70	3
Test	Test	End of Chapter Tests	30	

Aims

** To develop a firm grounding in orbital mechanics and current knowledge of the formation and evolution of planetary systems*
** To provide students with an understanding of the physical processes which determine all aspects of the structure of stars and stellar atmospheres.*
** To introduce students to the nature of stellar evolution*
** To introduce students to the diversity of galaxy morphologies, dynamics evolution and*
components.
** To illustrate the importance of multi-wavelength observational approaches to the study of galaxies.*
** To provide students with an introduction to modern observational cosmology and various cosmological models.*

Learning Outcomes

After completing the module the student should be able to:

1	Demonstrate a detailed knowledge and comprehensive understanding of astrophysical concepts
2	Utilise that content to describe a detailed coherent picture of the constituent components of the universe and how they develop
3	Apply an in-depth knowledge of physical and mathematical techniques to effectively solve astronomical problems

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Online Final Exam	1	2	3
Tests	1	2	3

Outline Syllabus

1. Kepler's Laws and the generalisation to Newton's Law of Universal Gravitation; applying Gravity: Tidal interactions, Roche Limits and the Virial Theorem.
2. Formation of planetary systems, including the Solar System and techniques for detecting exoplanets.

3. Introduction to stellar properties and observables; equations of hydrostatic equilibrium, mass conservation, energy generation and transport.

4. Stellar Interiors and Atmospheres; radiative transfer, spectral lines, model stellar spectra. Main-sequence stars and their post main-sequence evolution

5. Galaxy classifications; stellar and gas contents, sizes and luminosities for different types, with the Milky Way as an important example

6. Multi-wavelength studies of galaxies, with particular emphasis on gas, and dust as

both an obscuring (optical/UV) and emitting (thermal IR, ULIRGs etc) component

7. Overview of galaxy formation and evolution in a Lambda-CDM cosmology

8. Introduction to Cosmology: Isotropy and Homogeniety; Galaxies, clusters and superclusters.

9. Geometry of the Universe and Dynamical evolution.

Learning Activities

The general teaching/learning strategy will be consistent throughout all topics on the module. Firstly, the course material that the students are expected to learn will be made available through directed reading of
textbooks (the specific textbooks will vary depending on topic, see below) or pre-prepared notes. This will be supplemented by pre-recorded lectures on the same material that the students can watch as often as required to learn the key concepts. At regular intervals (after every three lectures or so), tutorials will be held. The students will be given material to study or problems to complete and submit before the tutorial, which will test their comprehension of the material covered during the preceding lectures. The full written solution and explanation from the lecturer will be made available during the tutorial. Students will also be able to email questions they have about the course content to the lecturer in advance of the tutorial, which the lecturer will address during the tutorial.
Finally, a web-based forum will be set up to allow students to interact, ask each other questions, and help each other learn the material.

Notes

This module is designed to introduce astrophysics concepts to students who have completed undergraduate degrees in other scientific subjects.
There will be particular emphasis on developing independent learning skills and IT capability to access and extract relevant scientific information via Canvas and databases available from LJMU.

Module is delivered by distance learning.