Liverpool John Moores University

Title:	TIME-DOMAIN ASTROPHYSICS
Status:	Definitive
Code:	**7016ASTPHY** (124779)
Version Start Date:	01-08-2021
Owning School/Faculty:	Astrophysics Research Institute
Teaching School/Faculty:	Astrophysics Research Institute

Team	Leader
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Academic Level:	FHEQ7	**Credit Value:**	30	**Total Delivered Hours:**	35
Total Learning Hours:	300	**Private Study:**	265		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Online	32

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	End of course Exam	50	3
Test	Test	Mid course Test	25	2
Essay	Essay	<2500 word Essay	25	

Aims

The main aim of this module is to develop an understanding of the variable/transient Universe, and the techniques and facilities used to investigate this realm.

Particularly, a good understanding of the physical processes driving phenomena such as, for example, explosive transients, will be sought, along with an appreciation of the wider importance and impact of such systems.

Learning Outcomes

After completing the module the student should be able to:

1	Demonstrate a detailed knowledge and understanding of time-domain astrophysics.
2	Use the course content to coherently describe the physical nature of variable/transient astrophysical phenomena (e.g. SNe, GRBs)
3	Show familiarity with the specific observational techniques and facilities used to identify and study variable/transient phenomena

Learning Outcomes of Assessments

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

End of course Exam	1	2	3
Data Exercise	1	2	3
Case Study Essay	1	2	3

Outline Syllabus

1. Historical time domain astrophysics; the context leading to the general state of the field today (e.g. expansion parallax, proper motions, pulsars, etc.)
2. Techniques specific to and developed for time domain astrophysics (e.g. difference image analysis)
3. Facilities developed for or supporting time domain observations; existing and future (e.g. LT2, LSST, SKA, etc)
4. Explosive transient phenomena; Novae, thermonuclear Supernovae, core collapse Supernovae, 'exotic' SNe, Gamma Ray Bursts – characteristics, progenitor systems including formation, populations, importance – general concepts, e.g. Luminosity vs time-scale plot
5. Selected variable (periodic and quasi-periodic) phenomena; e.g. pulsating variables, Cepheids, Miras (link to cosmic distance scale, as with type Ia supernovae), pulsars – characteristics, formation, populations
6. General transients, e.g. tidal disruption events, Luminous blue variables, dwarf novae, general cataclysmic variables, x-ray transients, active galactic nuclei, potential gravitational waves sources – characteristics, formation, populations
7. Extra solar planet discovery techniques, e.g. transits, radial velocity, astrometric, gravitational microlensing

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 tutorials will be held. The students will be given 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 forum on the VLE will be available to allow students to interact, ask each other questions, and help each other learn the material.

Notes

This module is designed to introduce the concepts of time domain astrophysics to students, both the astrophysical sources showing strong variation over time and the techniques used to analyse and understand these.
There will be particular emphasis on developing independent learning skills and IT capability to access and extract relevant scientific information via the VLE and databases available from LJMU.

Module delivered by distance learning.