Liverpool John Moores University

Title:	COMPUTATIONAL ASTROPHYSICS
Status:	Definitive
Code:	**7005ASTPHY** (120802)
Version Start Date:	01-08-2018
Owning School/Faculty:	Astrophysics Research Institute
Teaching School/Faculty:	Astrophysics Research Institute

Team	Leader
Shiho Kobayashi	Y
Witold Maciejewski	
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Academic Level: FHEQ7 **Credit Value:** 30 **Total Delivered Hours:** 24

Total Learning Hours: 300 **Private Study:** 276

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Online	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	Project 1	Project Report 1	33.3	
Report	Project 2	Project Report 2	33.3	
Report	Project 3	Project Report 3	33.3	

Aims

1. To give students an understanding of programming basics
2. To provide students with practical experience of using computational techniques extensively employed by researchers in astronomy and astrophysics

Learning Outcomes

After completing the module the student should be able to:

1. Apply the techniques of a programming language used by astronomers in a relevant research context
2. Describe and critically analyse numerical modeling in astronomy and astrophysics
3. Develop a practical experience of numerical used by scientists in analysis of theoretical problems and experimental data

Learning Outcomes of Assessments

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

Project Report 1	1	2	3
Project Report 2	1	2	3
Project Report 3	1	2	3

Outline Syllabus

A series of lectures describing astrophysical problems and numerical techniques that can be used to address them. At the end of each lecture, students will be given a mini-project. Students will use a computer to carry out the projects. Assessment will be based on written reports/essay on the projects.

The elements covered will be drawn from a variety of observational and theoretical topics and will focus on numerical modelings and analysis.
Topics include:
Monte Carlo Techniques
Lutz-Kelker and Malmquist biases on a sample of stars with parallax determinations
Numerical techniques to solve ordinary differential equations: Euler and Runge-Kutta methods
Stellar motions in gravitational potentials
Wave and diffusion equations and finite difference methods

Learning Activities

Distance learning with tutorial support
Learning materials delivered by Virtual Learning Environment (Blackboard) to include directed reading, online lectures, online assessments with feedback, online discussions

Notes

There will be particular emphasis on developing independent learning skills and IT capability to access and extract relevant scientific information via Blackboard and

databases available from LJMU.
A USB memory booting system will be provided to each student. Students attach the USB memory to their own computers, and then undertake numerical tasks on the provided numerical environment.

Module will be delivered by distance learning.