Fall 2024

天體力學導論

INTRODUCTION TO CELESTIAL MECHANICS

課程安排 Arrangements

教師:陳國璋 Kuo-Chang Chen 時間:T578 教室:綜三631

聯繫方式 Contact Info.

教師辦公室:綜三609 分機:33067 辦公室時間:T69 email: kchen@math.nthu.edu.tw

參考書 References

V. Arnold, V. Kozlov, A. Neishtadt: Mathematical aspects of classical and celestial mechanics, 2nd edition, Springer-Verlag 1997.

R. Fitzpatrick: An introduction to celestial mechanics, Cambridge University Press, 2012. http:// farside.ph.utexas.edu/teaching/ celestial/Celestial.html

K. Meyer, G. Hall: Introduction to Hamiltonian systems and the N-body problem, Springer- Verlag, 1992.

R. Moeckel: Lectures on central configurations, 2014. http://www.math.umn.edu/~rmoeckel/ notes/Notes.html

C. Siegel, J. Moser: Lectures on celestial mechanics, Springer-Verlag 1971.

A. Wintner: The analytical foundations of celestial mechanics. Princeton University Press, 1941.



課程簡介 Course Description

This course is a mathematical introduction to celestial mechanics. The classical celestial mechanics, also known as the Newtonian n-body problem, deals with the motions of celestial bodies governed by Newton's law of universal gravitation. Many important concepts in dynamical systems and topology were first developed in attempts to understand the Newtonian n-body problem.

As an introductory course, we will mainly focus on the Kepler problem (n=2) and the three-body problem, and we will briefly introduce mathematical theories related to these problems. Some numerical experiments will be demonstrated and some research topics will be briefly introduced.

See the syllabus for topics to be covered.



MATH5770: Intro.Celestial Mech.

評分方式 Grading

作業 Homework 50% Homework will be assigned every 3 weeks. Due dates will be two weeks later.

期末報告 Final Project 50% Available topics will be handed out in late October. Details will be available later.

出席與缺席 Attendance

Students are expected to attend every scheduled class. It is the student's responsibility to keep informed of any announcements, syllabus adjustments or policy changes made during scheduled classes. This course is intended for graduate students and advanced undergraduate students who are in- terested in classical mechanics and with solid undergraduate-level mathematical training. Required prerequisite knowledge includes ordinary differential equations, real analysis, and linear algebra. Some knowledge in topology will be also helpful. Other than that, we will try to make this course as self-contained as possible.

課程大綱 Syllabus

There will be a total of 15 lectures, each of them will be 3 hours long. They are scheduled as follows.

週次	日期	進度	備註
1	9/3	General introduction	
2	9/10	Newtonian potential	
3	9/17	(停課)	中秋節
4	9/24	Kepler's laws	
5	10/1	Kepler equation	
6	10/8	Lambert problem	
7	10/15	Restricted 3-body problem	
8	10/22	Euler & Lagrange solutions	
9	10/29	Regularization	
10	11/5	Central configurations	
11	11/12	Asymptotic behavior	
12	11/19	Perturbation & continuation	
13	11/26	Topological methods	
14	12/3	Variational methods	
15	12/10	Kepler problem revisited	
16	12/17	(停課)	期末考