Course code	20DASe0401
Course title	Simulation Astronomy
Term	後期 2nd Half
Credit(s)	2
The main day	
The main period	
School/Program	School of Physical Sciences
Department/Program	Department of Astronomical Science
Category	Common Base
Lecturers	
Instructor	

Full name
TAKIWAKI　TOMOYA
KOKUBO　EIICHIRO
MACHIDA MAMI
IWASAKI　KAZUNARI

Outline

Simulations have become fundamental techniques in a wide variety of fields, e.g. of course in theoretical astronomy, in researches based on observations, and even in developing new devices. In this lecture course, you study the basic numerical treatment of partial and ordinary differential equations and the application of the equations to many astrophysical sites. Four teachers are in charge of this couase and introduce the governing equations of their fields and related cutting-edge topics.

While no prior knowledge of astronomy or astrophysics is assumed, the knowledge of classical mechanics, waves, vector analysis, thermodynamics, statistical mechanics, and hydrodynamics will be extensively used.

Goal

The goal is to learn proper numerical methods that can solve partial differential equations and ordinary differential equations, which are related to the actual astrophysical phenomena. The appropriate knowledge of them is important regardless of the student's fields.

Grading system

01:Four-grade evaluation (A,B,C,D)

Grading policy
To receive credit, you must attend 60% of the classes and submit at least one homework, which is assigned by the four teachers individually. Based on the quality of the homework, the teachers evaluate the grade. You may have to write programs to solve the problem in the homework.
Lecture Plan
01st-03rd Many-body systems, two-body relaxation, ordinary differential equations, N-body simulation（Kokubo） 04th-07th Fundamentals of computational hydrodynamics (Smoothed Particle Hydrodynamics and finite volume method), propagation of acoustic waves, shocks, Evolution of the interstellar medium (Iwasaki) 08th-11th Gravitational potential, hydrostatic condition, wind solution, Sedov solution, supernova (Takiwaki) 12th-14th Rayleigh-Taylar and Kelvin-Helmholtz instabilities, magneto-hydrodynamics, accretion disk (Machida) The schedule may be changed.
Location
lecture room or online
Language
Japanese or English (if students cannot speak Japanese)
Textbooks and references
The textbook is not specified.
Others
Students are asked to do homework such as solving problem sets.