10720ASTR660000

Computational Astrophysics
計算天文物理

Instructor

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Class web page: https://kuochuanpan.github.io/courses/107ASTR660_CA

Class Schedule

Lectures on Thursday from 14:20 - 17:20
General building II, R521

SYLLABUS

Preface:

This course does not require previous programming experience but with little knowledge on compiled languages and/or python is recommended. We will use mainly Fortran (or C/C++) with some python in the course. A Unix-like system (e.g. Linux, Mac OS X, or Windows 10 subsystem for Linux) is required. Students are encouraged to bring a laptop to class.

Course description:

Lectures will cover

- Computer architecture
- Introduction to UNIX (Linux/Mac OS)
- Introduction to Fortran
- Introduction to Python
- Data representation and visualization
- Linear algebra
- Root finding
- Numerical integration
- Ordinary differential equations
- Partial differential equations
- Stellar evolution
- N-body particle methods
- Fluid dynamics
- Parallel computing (CPU and GPU)

Teaching method:

Weekly lectures with several homework assignments and a final project (including a written report and a classroom presentation).

Evaluation:

Grades will be determined by homework assignments (70%), and the final project (30%).

Text books:

None

References:

1. “Numerical Recipe”, by Press, W.H. (http://www.nr.com)
2. “Numerical Methods in Astrophysics”, by Bodenheimer, P. et al.
3. “Introduction to Computational Astrophysical Hydrodynamics”, by Zingale, M. (https://github.com/python-hydro/hydro_examples)
4. “The C Programming Language”, by Kernigan, B.W.
5. “Finite Volume Methods for Hyperbolic Problems”, by Leveque, R. J.
6. “Parallel Programming with MPI”, by Pacheco P.