NASSP Honours Course Template

Course Title: GA2: Galactic/Extragalactic Course
Course Lecturer: Dr. Fangxia An, Dr. Hao Chen, and Dr. Marcin Glowacki
Course credits: 1
Lecturer contact hours: 24
Tutorial/practical hours: 6

1) Course overview:

The course aims at providing a description of all the important concepts in galactic and extragalactic astronomy, more at the phenomenology level than at the mathematical level, which is kept for the practical part. As shown in the syllabus, the following broad themes are covered: classification, luminosity and density profiles, ISM, kinematics, distance scale, formation and evolution of galaxies, Milky Way (components) and its satellites, high-z galaxies, etc. (Note: some of the items below take more than 1 hour).

2) Course breakdown/syllabus:

Lecture 1: Global properties of galaxies & Classification

Lecture 2: Global properties of galaxies & Luminosity Function (LF)

Lecture 3: Luminosity profiles: ellipticals, spirals & dwarfs
Density profiles, disks structure

Lecture 4: Kinematics & mass distribution of spiral & dwarf galaxie

Lecture 5: Kinematics of Elliptical galaxies, Dark matter,
Semester homework (mass models)

Lecture 6: Neutral Hydrogen (HI)

Lecture 7: Ionized Hydrogen (HII) & Molecular Hydrogen (H_2)

Lecture 8: Distance scale
Distance indicators
TF & FJ relations

Lecture 9: Formation and evolution of galaxies:
Environmental mechanisms

Lecture 10: Milky Way & its satellites
Bulge, bar, thin & thick disk
Halo (stars & globular clusters)

Lecture 11: High-redshift galaxies
Formation of spiral and elliptical galaxies
Galaxy evolution

Lecture 12: From the Local Group to the Large Scale Structures and Dark Matter

3) Resources:

The recommended textbook is "Galaxies in the Universe" by L. S. SPARKE and J. S.GALLAGHER. Students are also given access to all the powerpoint presentationsl.

4) Breakdown of practicals/tutorials:

Beside an introductory assignment on galaxy classification, a more detailed assignment is given to the students where they are asked to build a mass model of a galaxy for which they are given a luminosity profile and a rotation curve. Each year I ask to use a different density law for the dark halo. This summarized a lot of the theory that was seen in the lectures.

5) Additional skills to be developed during the course:

Students are asked to use ds9 to view the fits imaging data and also use TOPCAT to analysis the extragalactic catalog;
Students are asked to use Python for the mass model assignment.

6) Assessment

- Classification 20%
- Semester homework: mass model 40%
- Final Exam (open-book exam) 40%