Welcome to NASSP Honours Course OT2

Course Title: **Observational Techniques 2 (OT2) – Radio Astronomy**
Course Convener: Dr Kenda Knowles
Course Lecturer(s): Dr Ntsikelelo Charles, Dr Samuel Legodi
Course Prac Lead: Course Lecturers
Lecturer contact hours: 24 x 45 minutes
Prac contact hours:3 x 2 hours

1) Course overview:
This course introduces observational methods in radio astronomy, emphasising the detection, analysis, and interpretation of radio emission from astrophysical sources. It covers the physical mechanisms underlying radio wave generation, including continuum and polarisation processes. Key concepts in coordinate systems, signal analysis, and Fourier methods are introduced as foundations for data processing. The course also examines radio emission from a range of cosmic environments, from solar system bodies to extragalactic sources. Instrumentation topics include the principles of radio telescopes and receivers. Practical components involve radio data handling and image analysis using the Python programming language.

2) Course breakdown / syllabus:
- Introduction to radio astronomy
- Radiation fundamentals and emission mechanisms
- Types of astrophysical radio sources (Solar system, Galactic, extragalactic)
- Brief introduction to radio telescope antennas and receivers
- Basic introduction to radio interferometry and aperture synthesis

3) Resources:
Online and interactive resources for the course
Lecture notes
iPython notebooks for some lectures
Lecture slides

4) Breakdown of practicals / tutorials:
Practicals using scientific data from the MeerKAT radio telescope and from the Hydrogen Epoch of Reionization Array (HERA), detailing concepts of data analysis and science extraction.

5) Additional skills to be developed during the course:
Fundamentals of radio Astronomy observational techniques
Scientific data processing using radio data.
Use of Python programs for radio data processing
Scientific reporting.

6) Assessment:
3 Individual assignments (60%)
Tutorials tests (10%)
Exam (30%)