

**Modules:**

astro830 **Elective Advanced Lectures**  
 astro840 **Observational Astronomy**

**Course:**

# Multiwavelength Observations of Galaxy Clusters

**Course No.:** astro849

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	2+1	4	ST

**Requirements:****Preparation:**

Introductory Astronomy lectures

**Form of Testing and Examination:**

Written or oral examination, successful exercise work

**Length of Course:**

1 semester

**Aims of the Course:**

To introduce the students into the largest clearly defined structures in the Universe, clusters of galaxies. In modern astronomy, it has been realized that a full understanding of objects cannot be achieved by looking at just one waveband. Different phenomena become apparent only in certain wavebands, e.g., the most massive visible component of galaxy clusters - the intracluster gas - cannot be detected with optical telescopes. Moreover, some phenomena, e.g., radio outbursts from supermassive black holes, influence others like the X-ray emission from the intracluster gas. In this course, the students will acquire a synoptic, multiwavelength view of galaxy groups and galaxy clusters.

**Contents of the Course:**

The lecture covers galaxy cluster observations from all wavebands, radio through gamma-ray, and provides a comprehensive overview of the physical mechanisms at work. Specifically, the following topics will be covered: galaxies and their evolution, physics and chemistry of the hot intracluster gas, relativistic gas, and active supermassive black holes; cluster weighing methods, Sunyaev-Zeldovich effect, gravitational lensing, radio halos and relics, and the most energetic events in the Universe since the big bang: cluster mergers.

**Recommended Literature:**

Lecture script and references therein