

## Syllabus Reference

Course title	Optical/Infrared Astronomy V		
Term	前期 1st Half		
Credit(s)	2		
The main day		The main period	
School/Program	School of Physical Sciences		
Department/Program	Department of Astronomical Science		
Category	Infrared Astronomy		
Lecturers	Masami Ouchi		

## Instructor

Full name

\* OUCHI MASAMI

Outline	<p>Recently, we see the significant progresses of deep surveys with large optical near-infrared (NIR) telescopes such as Subaru and Hubble Space Telescope. These telescopes extend the observable universe from a redshift <math>\sim 4</math> to <math>\sim 11</math>, and allow us to track formation history of galaxies representing cosmic structures back to the first few hundred million years after the Big Bang. In this series of lectures, I focus on optical NIR observations that drive galaxy formation studies. First, I will introduce the basic structures and technology of optical NIR telescopes/instruments, and review the theoretical background of galaxy formation. Sharing this basic knowledge, I will review pictures of galaxy formation history established by the latest deep optical NIR observations. The lectures will cover cosmic reionization that is tightly related to galaxy formation in the early universe, and show the frontier of observational studies. The lectures will also touch the multi-wavelength observations such with ALMA, complementing these optical NIR observation studies. I will then discuss open questions and puzzles that are raised by recent deep observations. At the end of this lecture series, I will introduce the next generation telescope projects and galaxy observation programs including the James Webb Space Telescope projects that are expected to achieve the further growth in this study field.</p>
Goal	<ul style="list-style-type: none"> <li>- Explaining basic technology of optical NIR telescopes and instruments</li> <li>- Explaining framework of galaxy formation theory in the Big Bang Universe</li> <li>- Showing examples of deep observations so far conducted</li> <li>- Explaining cosmic star-formation history</li> <li>- Explaining galaxy morphology/environmental effect, dust, and chemical evolution</li> <li>- Understanding open questions in galaxy formation and expressing his/her own opinion</li> <li>- Explaining galaxy, group/cluster of galaxies, large-scale structure, and dark-matter halo</li> <li>- Explaining cosmic reionization and first generation galaxy based on the current state of observational studies</li> <li>- Showing examples of future deep survey programs</li> </ul>
Grading system	
	Grading system
Grading system	01:Four-grade evaluation (A, B, C, D)
Grading policy	<ul style="list-style-type: none"> <li>- Quiz answer sheet submission 20%</li> <li>- Group discussion and presentation 40%</li> <li>- Final report 40%</li> </ul>
Lecture Plan	<p>I will deliver the lectures about the topics shown below. In each lecture day, we will spend more than 60 out of 90 minutes for the lecture and quiz. For the rest of &lt;30 minutes on each day, we will have a student group discussion and presentation to promote understanding and knowledge retention.</p> <ul style="list-style-type: none"> <li>- Introduction</li> <li>- Basics of Optical NIR Telescopes and Instruments</li> <li>- Framework of Galaxy Formation Theory in the Big Bang Universe</li> </ul>

	<ul style="list-style-type: none"> <li>- Deep Observations</li> <li>- Cosmic Star-Formation History</li> <li>- Galaxy Morphology/Environmental Effect, Dust, and Chemical Evolution</li> <li>- Open Questions in Galaxy Formation (incl. LAB, AGN, GRB etc.)</li> <li>- Galaxy, Group/Cluster of Galaxies, Large-Scale Structure, and Dark-Matter Halo</li> <li>- Cosmic Reionization and First Generation Galaxy</li> <li>- Future Deep Survey Programs</li> </ul>
Location	Mitaka Campus/Online (Depending on the latest pandemic status)
Language	English or Japanese (If there is a student who does not speak Japanese, the lectures will be held in English.)
Textbooks and references	<p>Reference Books :</p> <p>「宇宙論 I」 シリーズ現代の天文学、日本評論社、2008</p> <p>「宇宙論 II」 同上、2007</p> <p>「銀河 I」 同上、2007</p> <p>「銀河 II - 銀河系」 同上、2007</p> <p>「宇宙の観測 I - 光・赤外線天文学」 同上、2007</p> <p>「現代宇宙論」 松原隆彦、東大出版会、2010</p> <p>「銀河進化の謎」 嶋作一大、UT Physics シリーズ、東大出版会、2008</p> <p>「Introduction to Cosmology」 Barbara Ryden, Benjamin Cummings, 2002</p> <p>「Galaxy Formation and Evolution」 Mo, van den Bosch and White, Cambridge University Press, 2010</p>
Related URL	<a href="https://sci.nao.ac.jp/MEMBER/ouchi/index.html">https://sci.nao.ac.jp/MEMBER/ouchi/index.html</a>
Explanatory note on above URL	Homepage of the lecturer's research group
Keyword	Optical NIR observations, Galaxy, Galaxy Formation, Cosmic Reionization, Deep Survey, Cosmic History, Observational Astronomy, Observational Cosmology

[Close window](#)