SOKENDAI CampusPlan Web Service

Syllabus Reference

Course title	Special Lecture ⅩⅡ		
Term	通年(前期開始) Whole Year		
Credit(s)	1		
The main day		The main period	
School/Program	School of Physical Sciences		
Department/Program	Department of Astronomical Science		
Category	Common		
Lecturers	Paolo Mazzali, Elena Pian		

Instructor

Full name
* MORIYA TAKASHI

Outline	The course covers theoretical and observational aspects of Supernovae and other astrophysical transients related to the end of stellar life. The course also covers high-energy aspects, from both an observational and theoretical point of view, that are relevant for supernova theory: detection of keV-to-TeV energy radiation, gamma-ray bursts, relativistic jets and afterglows, gravitational waves, kilonovae.
Goal	This course aims at providing students with a broad overview of Supernovae and other astrophysical transients. The students will also get a broad picture of high energy phenomena related to stellar explosions, by learning the methods, experiments and theory used to extract the physical information.

Grading system

	Grading system
Grading system	01:Four-grade evaluation (A,B,C,D)

Grading policy	80% attendance, 20% report
Lecture Plan	Lecture 1. Supernovae. (Mazzali) Here we introduce Supernovae as the final event in the life of different types of stars, discussing the evolutionary paths that may lead to stellar explosions. Lecture 2. Supernovae: Observed properties. (Mazzali) This lecture deal with the observational properties of Supernovae, and how they can be used to infer the propeties of the progenitor stars. Lecture 3. Type Ia Supernovae. (Mazzali) In this lecture discuss some current aspects of research in Type Ia Supernovae. Lecture 4. (Pian) X-ray and gamma-ray detectors and satellites Multiwavelength imaging Cosmic air showers Cherenkov radiation Cherenkov detectors The TeV Sky Long and short Gamma-ray bursts GRB localizations: BATSE vs BeppoSAX Lecture 5. (Pian) observations of multi-wavelength Afterglows Optical spectra of afterglows and redshifts optical flashes and robotic telescopes theory of afterglows Jet breaks and collimation

	GRB host galaxies Lecture 6. Gamma-ray Bursts and Supernovae. (Mazzali) Here we discuss the properties of GRB/SNe, othere stripped-envelope SNe and their relation to the explosion of massive stars. Lecture 7. (Pian) Gravitational waves The case of PSR1913+16 Sources of GWs Laser interferometry GW150914: first GW direct detection GW170817/GRB170817A/AT2017gfo: the first electromagnetic counterpart to GW signal the thermal (kilonova) and non-thermal (GRB jet) components
Location	Mitaka Campus, NAOJ
Language	English
Textbooks and references	A useful resource for the material is Gray's book: The Observation and Analysis of Stellar Photospheres Author David F. Gray; Andrew King (Contribution by); Douglas Lin (Contribution by); Stephen Maran (Contribution by); Jim Pringle (Contribution by); Martin Ward (Contribution by) ISBN 978-0-521-40868-4 Publisher Cambridge University Press Publication Date 04 June 1992 Rybicki & Lightman 1979 Radiation Processes in Astrophysics Shapiro & Teukolsky 1983, Black Holes, White Dwarfs and Neutron Stars, The Physics of Compact Objects Kajino et al. 2019: Current status of r-process nucleosynthesis, Progress in Particle and Nuclear Physics, Volume 107, p. 109-166 Pian et al. 2017, Nature, 551, 67: Spectroscopic identification of r-process nucleosynthesis in a double neutron-star merger Pian 2021, Binary neutron star mergers: a multi-messenger revolution Frontiers in Astronomy and Space Sciences, Volume 7, id.108 (2020) 10.3389/fspas.2020.609460 Reviews on TeV Astronomy: http://tevcat.uchicago.edu/reviews.html R. Giacconi 2003: Nobel Lecture: The dawn of X-ray astronomy Reviews of Modern Physics 75, 995

Close window