科目ナンバリング	U-LAS70 10002 SE50						
授業科目名<英訳>	ILAS Seminar-E2 :The Invisible Universe（不可視の宇宙） ILAS Seminar-E2 :The Invisible Universe			担当者所属職名・氏名	理学研究科　准教授　LEE, Shiu Hang		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール（対面授業科目）
開講年度・開講期	2026・前期	受講定員(1回生定員)	5 (5) 人	配当学年	主として1回生	対象学生	全学向
曜時限	木5	教室	理学研究科4号館328号室 (北部構内)			使用言語	英語
キーワード	宇宙物理学 / 天文学 / シミュレーション / データ可視化 / データ解析						

[授業の概要・目的]

Our Universe is far beyond what our eyes can perceive. Hidden in the tranquil ocean of stars, nebulae and galaxies pictured by optical telescopes and cameras around the world everyday, extreme energetic phenomena that can only be observed through ‘ invisible lights' (e.g., radio waves, X-rays, gamma-rays) or even messengers other than electromagnetic waves (e.g., cosmic-rays, neutrinos) are happening frequently here and there in the Cosmos. This seminar will bring students into this exciting world of the Invisible Universe. Students can carry out introductory research projects or study from a book in a subject of his/her interest under the guidance of the instructor.

Some projects pursued by past members:
1) Evolution of stars
2) Gamma-ray astronomy using a NASA satellite (Fermi Gamma-Ray Space Telescope)
3) Cosmic ray physics
4) Learn about astrophysics of blackholes, supernovae, and other fascinating celestial objects.

The way a student will proceed with her/his project varies depending on the subject. For example, the following methods were used by students in the past successfully:
1) Numerical simulations using open-source codes
2) Writing Python scripts for simple calculations and data visualization
3) Data analysis using mission-specific applications
4) Simulation for observations by future X-ray instruments

Pre-requisite knowledge is not needed for this seminar. The students will be tutored according to their pre-knowledge levels on an individual basis.

[到達目標]

1) To obtain basic knowledge and feel the excitement of forefront astronomy and astrophysics through a subject of a student's interest.

2) To briefly experience the everyday life of an astrophysicist nowadays through the process of guided independent research, report writing and oral presentations.

[授業計画と内容]

In this seminar, besides a few introductory lectures on topics surrounding multi-wavelength astronomy, the students will carry out one of the following tasks:

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ILAS Seminar-E2 :The Invisible Universe（不可視の宇宙）(2)

(1) Perform independent research on intriguing astrophysical objects of their choices. Research projects can be carried out in a group of 2 (or 3 at most) students if preferred. A final report will be due at the end of the semester, but no oral presentation will be needed.

(2) Study on a topics of their interests thru reading books and articles under the guidance of the instructor. Reading projects require a casual oral presentation (very short one, approx. 15 mins each) during the group meeting each week, but no final report will be needed.

This seminar will be delivered in an informal format and conducted mainly in English (with occasional Japanese only when necessary). Students are encouraged to ask questions and discuss on topics with their peers and instructor spontaneously at each meeting.

Total：14 classes (feedback will be provided each week)

[履修要件]

特になし

[成績評価の方法・観点]

Final grades will be assessed according to:
1) In-class participation (40%)
2) A written report or weekly short oral presentations (60%)

[教科書]

使用しない

[参考書等]

（参考書）
授業中に紹介する

[授業外学修（予習・復習）等]

Independent research or book reading. Guidance will be given in each seminar meeting.

[その他（オフィスアワー等）]

No fixed office hour will be scheduled. Students can make appointment with the instructor in-person if necessary, or simply contact by Emails.

[主要授業科目（学部・学科名）]