

本科全英语课程采用如下英文版教学大纲

Syllabus Sample of Fudan University

(2024)

Department: Department of Physics

Date: 2024-10-26

Course Code	PHYS130046.01						
Course Title	General Relativity						
Credit	3	Experiment (including Computer) Credit	0	Practice Credit	0	Aesthetic Education Credit	0
Credit Hours Per Week	3	Education on The Hard-Working Spirit Credit Hours	0	Language of Instruction	Engl ish	Honors Course	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Course Type	<input type="checkbox"/> Core General Education Course <input type="checkbox"/> Specific General Education Course <input type="checkbox"/> Basic Course in General Discipline <input checked="" type="checkbox"/> Others			2+X Major : <input type="checkbox"/> Professional Core Course <input type="checkbox"/> Professional Advanced Course <hr/> Non 2+X Major : <input type="checkbox"/> Professional Compulsory Course <input checked="" type="checkbox"/> Professional Elective Course			
Course Objectives	The aim of the course is to provide the students a background in Special and General Relativity, cultivating students' ability to discuss about an active research field. The course will promote the formulation of questions from the students and discussions between students and teacher in order to cultivate students' critical spirit and improve their oral communication skills.						
Course Description	The course will start with some introductory material: concepts of scalars, vectors, and tensors, Principle of Least Action, geodesics equations, and inconsistency between Galilean Relativity and Maxwell's Equations. The first part of the course will be devoted to the study of Special Relativity: Lorentz Transformations, relativistic mechanics, electrodynamics in covariant form. The second and main part of the course will be devoted to the study of General Relativity: Riemannian geometry, Einstein's gravity, Schwarzschild spacetime, classical tests of GR, black holes, cosmological models in GR, gravitational waves.						
Course Requirements: 1) Good command of differential calculus and Newtonian mechanics 2) Good oral communication skills in English 3) Critical spirit							

4) Ability to identify problems, ask questions, think, and solve problems

Teaching Methods:

Lectures (with the use of a projector), discussion

Course Director's Academic Background:

Cosimo Bambi is currently Professor at the Department of Physics at Fudan University. He received the Laurea Degree from Florence University in 2003 and the Doctoral Degree from Ferrara University in 2007. He worked as a postdoctoral research scholar at Wayne State University (2007-08), The University of Tokyo (2008-11), and LMU Munich (2011-12). He joined Fudan University at the end of 2012. He has published more than 200 research papers as first or corresponding author on high impact factor refereed journals, has over 12,000 citation, and his h-index is 58 (Google Scholar). He has published several books as author and as editor. In the past 12 years, he has taught Introduction to Cosmology, Introduction to Astrophysics, and General Relativity at Fudan University. Email: bambi@fudan.edu.cn

Instructor's Academic Background:

Cosimo Bambi is currently Professor at the Department of Physics at Fudan University. He received the Laurea Degree from Florence University in 2003 and the Doctoral Degree from Ferrara University in 2007. He worked as a postdoctoral research scholar at Wayne State University (2007-08), The University of Tokyo (2008-11), and LMU Munich (2011-12). He joined Fudan University at the end of 2012. He has published more than 200 research papers as first or corresponding author on high impact factor refereed journals, has over 12,000 citation, and his h-index is 58 (Google Scholar). He has published several books as author and as editor. In the past 12 years, he has taught Introduction to Cosmology, Introduction to Astrophysics, and General Relativity at Fudan University.

Members of Teaching Team

Name	Gender	Professional Title	Department	Responsibility
Cosimo Bambi	Male	Professor	Physics	Teaching

Course Schedule (Please supply the details and objectives about each lesson):

Week 1: Scalars, vectors, tensors, Galilean transformation, Least Action Principle

Week 2: Newton's gravity, Kepler's Laws, Maxwell's Equations

Week 3: Einstein's Principle of Relativity, Lorentz transformations

Week 4: Relativistic mechanics, particle collisions

Week 5: Lagrangian formalism for fields, energy-momentum tensor

Week 6: Electromagnetism, Maxwell's Equations in covariant form

Week 7: Riemannian geometry (covariant derivative, Riemann tensor)

Week 8: Einstein Equivalent Principle, locally inertial frames

Week 9: Mid-term test

Week 10: Einstein Equations, Einstein-Hilbert Action

Week 11: Schwarzschild spacetime

Week 12: Motion in the Schwarzschild metric

Week 13: Classical tests of General Relativity

Week 14: Black holes

Week 15: Cosmological models

Week 16: Gravitational waves

Week 17: Beyond Einstein's gravity

Week 18: Final exam

The design of class discussion or exercise, practice, experience and so on:

Class discussion or exercise in the second part of the class

If you need a TA, please indicate the assignment of assistant:

The TA is necessary to help with the administrative forms in Chinese.

Grading & Evaluation (Provide a final grade that reflects the formative evaluation process):

Mid-term exam and final term exam, each of them counts for 50% in the final mark. The mid-term exam will be in the 9th week and will cover the topics discussed in the weeks 1-8, the final term exam will be in the 18th week and will cover the topics studied in the weeks 10-17. Each test has 3-4 problems and every problem has 3-8 questions.

Usage of Textbook: ☒ Yes (complete textbook information form below) ☐ No

Textbook Information (No more than two textbooks) :

Title	Author	ISBN	Publishing Time	Publisher	Type I	Type II
Introduction to General Relativity	Cosimo Bambi	9789811310898	2018	Springer Singapore	<input type="checkbox"/> Self-compiled Textbook (Published) <input type="checkbox"/> Non-mainland Textbook <input checked="" type="checkbox"/> Other Textbook (Published)	<input type="checkbox"/> National Planning Textbook <input type="checkbox"/> Provincial and Ministerial Planning Textbook <input type="checkbox"/> School Level Planning Textbook <input type="checkbox"/> Others

					<input type="checkbox"/> Self-compiled Textbook (Published) <input type="checkbox"/> Non-mainland Textbook <input type="checkbox"/> Other Textbook (Published)	<input type="checkbox"/> National Planning Textbook <input type="checkbox"/> Provincial and Ministerial Planning Textbook <input type="checkbox"/> School Level Planning Textbook <input type="checkbox"/> Others
Teaching References (Including author, title, publisher, publishing time,ISBN):						

Table column size can be adjusted according to the content.