Module title			Abbreviation
String Theory 1			11-STRG1-Int-201-m01
Module coordinator		**Module offered by**	
Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics and Astronomy	
ECTS	**Method of grading**	**Only after succ. compl. of module(s)**	
8	numerical grade	--	
Duration	**Module level**	**Other prerequisites**	
1 semester	graduate	--	

Contents

Classical and quantum theory of the relativistic bosonic string, in particular the Nambu-Goto action and Polyakov action, Quantization of the closed bosonic string and emergent graviton, Quantum Lorentz invariance and critical dimension, Quantization of the open bosonic string, D-Branes, Gauge Fields and Yang-Mills Theories, Relativistic Conformal Field Theory, String Path Integral, BRST Quantization, String Interactions, Effective Actions and Gravity.

Intended learning outcomes

Familiarity with the classical and quantum theory of relativistic bosonic strings, in particular with the two classical actions for relativistic bosonic strings, the Nambu-Goto action and the Polyakov action. Ability to quantize the closed bosonic string and to understand the emergence of the massless graviton in the spectrum of the closed bosonic string. Knowledge of the the quantum Lorentz anomaly and the derivation of the critical dimension of the bosonic string. Understanding of the boundary conditions for the open string and its connection to D-branes. Knowledge of open string quantization and the spectrum of massless gauge fields, as well as of Yang-Mills fields for coincident branes. In-depth knowledge of relativistic conformal field theory, the string path integral and its BRST quantization and the calculation of string interactions. Thorough understanding of the low-energy effective actions in target space and the emergence of Einstein gravity.

Courses (type, number of weekly contact hours, language — if other than German)

V (4) + R (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: English
Assessment offered: In the semester in which the course is offered and in the subsequent semester

Allocation of places

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Additional information

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Workload

240 h

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module appears in
Master's degree (1 major) Physics International (2020) exchange program Physics (2023) Master's degree (1 major) Physics International (2024)