UNIVERSITEIT GENT

Studiefiche

Vanaf academiejaar 2024-2025

Early Universe Cosmology (C003829)

Cursusomvang *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 6.0 **Studietijd 180 u**

Aanbodsessies in academiejaar 2024-2025

A (semester 2) Engels Gent

Lesgevers in academiejaar 2024-2025

Craps, Ben	VUB	Verantwoordelijk lesgever
Hertog, Thomas	KUL	Medelesgever

Aangeboden in onderstaande opleidingen in 2024-2025	**stptn**	**aanbodsessie**
Educatieve Master of Science in de wetenschappen en technologie(afstudeerrichting fysica en sterrenkunde)	6	A
Master of Science in de fysica en de sterrenkunde	6	A

Onderwijstalen

Engels

Trefwoorden

Kosmologie, algemene relativiteit, thermische fysica

Situering

Inhoud

1 The Expanding Universe
- Kinematics and dynamics of expanding universe (cosmic evolution, Hubble law, Friedmann eqs)
- Propagation of light and horizons (geodesics, conformal diagrams, luminosity, redshift, distance)
- composition of the universe, status cosmological observations

2 The Early Hot Universe
- Thermal history
- Cosmological nucleosynthesis

3 Structure formation
- Gravitational Instability in Newtonian theory (Jeans theory)
- Gravitational Instability in General Relativity (cosmological perturbation theory, halo formation,...)

4 Inflation
- Three puzzles (flatness, horizon, monopoles)
- Slow-roll inflation
- Inflation as origin of cosmological fluctuations

5 Anisotropies in the Microwave Sky
- Generalities
- Temperature fluctuations: scalar and tensor modes
- Polarization
- Observations

6 Quantum cosmology: which universe and why?

Begincompetenties

Before taking this course, the student should be familiar with physics as a whole on a bachelor level and he/she should master the standard tools of calculus. In addition, the student should be familiar with the basics of general relativity and quantum field theory.

Eindcompetenties

1 The student becomes acquainted with the general theory of modern, relativistic cosmology and its observational vindication. This includes the thermal and nuclear history of our expanding universe, as well as the formation of large-scale structures like galaxies from seeds generated in a primordial era of inflation.
2 The student learns to appreciate the development of relativistic cosmology in the historical context of 20th century physics.

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk na gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Hoorcollege, Zelfstandig werk

Toelichtingen bij de didactische werkvormen

The 60 hours "self study" refer to the estimated time spent on homeworks. The 8 hours taught by Ben Craps normally take place in Brussels, the 18 hours taught by Thomas Hertog normally take place in Leuven.

Studiemateriaal

Geen

Referenties

Vakinhoudelijke studiebegeleiding

Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Mondelinge evaluatie

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Mondelinge evaluatie

Evaluatievormen bij niet-periodegebonden evaluatie

Werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is niet mogelijk

Eindscoreberekening

Oral exam with written preparation (67% of the final score). During the semester the students will be evaluated through take-home tasks, for which they can earn points that will be taken into account for 33% in the final score.

The points from the take-home tasks will be transferred to the second exam period. Only the regular examination can be repeated.