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**Modulbezeichnung:** Ringseminar 'Aktuelle Themen der Astroteilchenphysik' (PS-RingATP) 2.5 ECTS  
 (Modern Topics in Astroparticle Physics)

Modulverantwortliche/r: Stefan Funk, Anna Nelles  
 Lehrende: Stefan Funk, Anna Nelles

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|-----------------------------|-----------------------|--------------------------------|
| Startsemester: WS 2020/2021 | Dauer: 1 Semester     | Turnus: unregelmäßig           |
| Präsenzzeit: 30 Std.        | Eigenstudium: 45 Std. | Sprache: Deutsch oder Englisch |

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**Lehrveranstaltungen:**

Ringseminar 'aktuelle Themen der Astroteilchenphysik' (WS 2020/2021, Hauptseminar, 2 SWS, Anwesenheitspflicht, Stefan Funk)

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**Empfohlene Voraussetzungen:**

Introductory lectures in particle physics and/or astroparticle physics.

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**Inhalt:**

- Early Universe: Big Bang, Inflation and Thermal Evolution of the Cosmos. Freeze-out and heavy relics. Cosmic neutrino background.
- Propagation of high-energy particles: absorption processes, extragalactic radiation fields, plasmas in interstellar and intergalactic space, particle interactions.
- Dark matter: Models beyond the standard model of particle physics, indicators, halo formation and development, range of services for density fluctuations, direct and indirect search for dark matter with ground- and space-based experiments.
- AGN models: Leptonic and hadronic models for blazars. Inverse Compton scattering, internal and external radiation fields, photohadronic and pp models, implications for gamma and neutrino observations.
- Gravitational waves: experimental detection methods and multi-messenger astronomy.

**Lernziele und Kompetenzen:**

Students develop an understanding and learn to explain the experimental basics and the theoretical interpretation of astroparticle physics and cosmology according to the topics in the table of content. They will apply the physical laws and respective mathematical methods to specific problems in modern astrophysics and the scientific-critical reading and classification of current experimental and theoretical publications.

**Literatur:**

- Cosmic Ray Astrophysics, Reinhard Schlickeiser, Berlin Heidelberg New York 2002.
- Gravitation and Cosmology: Principles And Applications Of The General Theory Of Relativity, Steven Weinberg, Wiley India, 2017.
- Gravity, Black Holes, and the Very Early Universe. An Introduction to General Relativity and Cosmology, Tai L. Chow, Springer 2007.

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**Studien-/Prüfungsleistungen:**

Ringseminar Astroteilchenphysik (Prüfungsnummer: 71991)  
 Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 30  
 Anteil an der Berechnung der Modulnote: 100% Prüfungssprache: Deutsch oder Englisch

Erstablesung: WS 2020/2021, 1. Wdh.: WS 2020/2021 (nur für Wiederholer)  
 1. Prüfer: Stefan Funk (060566)  
 1. Prüfer: Anna Nelles (060580)

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