Secondary Area of Specialization: General Theory of Relativity / Quantum Field Theory						
Identification number MN-P-PN-GR-QFT		Workload 360 h	Credits 12 CP	Terms of study 1st and 2nd semester	Frequency of occurrence Details are provided online in the table "Course Offerings".	Duration 2 semesters
1	Types of lesson a) Lecture courses b) Problem classes c) Exam	Contact times These depend on the specific choices made 1 h		Self-study times These depend on the specific choices made 24 h	Intended group size 15–20 students per problem class	
2	Aims of the module and acquired skills The aim of the core courses is for the student to master the fundamental concepts of general relativity and/or quantum field theory, to an extent where she is able to read and comprehend original research articles in these areas. The specialized courses introduce her to an expanded range of subjects including related topics in nearby areas such as astrophysics, particle physics and physics-related mathematics.					
3	Contents of the module The module is subdivided into core courses and specialized courses: 1. Core courses • Relativity and Cosmology I (4+2 HPW, 9 CP): gravity as a geometric theory, Einstein field equations, Schwarzschild solution, experimental tests, gravitational waves • Relativity and Cosmology II (4+2 HPW, 9 CP): black holes, introduction to cosmology, the early universe • Quantum Field Theory I (4+2 HPW, 9 CP): second quantization and applications, functional integrals, perturbation theory, mean-field methods • Quantum Field Theory II (4+2 HPW, 9 CP): the role of correlation functions, spontaneous symmetry breaking, lattice gauge theory, topological aspects of QFT, renormalization 2. Specialized courses • Misc. courses: Quantum Aspects of Gravity (X HPW, X CP – cf. table "course offerings") • Misc. courses: Particle– and Astrophysics (X HPW, X CP – cf. table "course offerings") • Misc. courses: Mathematics (X HPW, X CP – cf. Table "course offerings") • and others, including fitting courses from Bonn University, if approved by the module coordinator The contents of the specialized courses can be found in the "kommentiertes Vorlesungsverzeichnis" and in the course descriptions online.					
4	Teaching/Learning methods Besides the teaching in lectures, the self-study based on books and lecture notes plays an important role. The students work individually on problem sets. In discussions with others and in the problem classes, they learn to solve challenging problems in a team and to present their approaches and results.					
5	Requirements for participation The theoretical physics curriculum at the level of the bachelor courses in physics					

6	Type of module examinations The module is passed by passing an oral examination covering the topics of all attended courses. To be admitted to the exam, students must actively participate in the problem sessions (including the solution of homework problems). The grade given for the module is equal to the grade of the oral examination.
7	Requisites for the allocation of credits The Secondary AoS GR-QFT is composed of: 1. At least one core course (lectures and exercises) taken from the list above 2. At least one specialized course from the list above
8	Compatibility with other Curricula and Soft Skills May be taken as an elective subject in other M.Sc. programs. Promotes scientific reading and presentation skills, in particular those for oral presentations.
9	Significance of the module grade for the overall grade The weight of the module is 12/111 ≈ 10.8 %.
10	Module coordinator C. Kiefer
11	Additional information Details of the course offerings and contents are given online and in the “kommentiertes Vorlesungsverzeichnis”. Version: 28.08.2015 PN