# Daniel Grumiller Institute for Theoretical Physics

# BLACK HOLES I (136.028)

### Winter semester 19/20

# Location: SEM 3<sup>rd</sup> floor, yellow tower (FH)

## Time: 9:00-11:00, Tuesday (starting October 1)

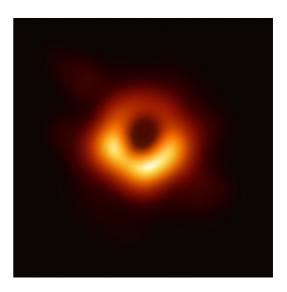
#### Summary:

Black holes have advanced to the forefront of current research in various disciplines: besides the obvious ones, general relativity, mathematical physics and astrophysics, also string theory, quantum chromodynamics, cosmology, computational physics, quantum gravity and even part of condensed matter physics devote a significant fraction of their resources to the study of black holes. It is thus both a fascinating and timely subject to investigate.

#### The main purpose of this lecture is a comprehensive introduction to black hole physics.

## Contents:

History of black holes Phenomenology of and experiments with black holes Gravitational collapse and Chandrasekhar limit Metric and geodesic equation Geodesics for Schwarzschild black holes Curvature and basics of differential geometry Hilbert action and Einstein equations Spherically symmetric black holes and Birkhoff theorem Rotating black holes: the Kerr solution Geodesics for Kerr black holes Accretion disks and black hole observations Black hole analogs in condensed matter physics



webpage: http://quark.itp.tuwien.ac.at/~grumil/teaching.shtml