Semester	AUG 2022
Open to semester	7,13,21
Course code	**PH4183/PH6523**
Course title	**Gravitation**
Credits	3 /3
Course Coordinator & participating faculty (if any)	Suneeta Varadarajan
Nature of Course	Lectures
Pre-requisites	A good background in multivariable calculus and some special relativity
Objectives (goals, type of students for whom useful, outcome etc)	This course is designed to introduce Einstein's general theory of relativity and will be useful for students interested in gravitation, black holes, gravitational waves, cosmology and theoretical high energy physics.
Course contents (details of topics /sections with no. of lectures for each)	Review of Special relativity (1-3 lectures depending on how much material students have already seen in previous mechanics courses) The Equivalence Principle (1 lecture) Manifolds and tensors (3 lectures) Geodesics and curvature (3 lectures) The Energy-momentum tensor (1 lecture) The Einstein equation, energy conditions, cosmological constant (3 lectures) The Schwarzschild solution, geodesics , precession of Mercury perihelion and other solar system tests of GR (5 lectures) The maximally extended Schwarzschild solution, Penrose diagrams, black holes (5 lectures at least) The rotating black hole (1 lecture) Cosmology (2 lectures) - basic introduction only since there is a dedicated cosmology course Gravitational waves (2 lectures at least) If time permits, I will talk about exciting open problems in this field.
Evaluation /assessment	End-Sem Examination-60% Mid-Sem Examination-40% Others-%

Suggested readings (with full list of authors, publisher, year, edn etc.)	Spacetime and Geometry: an introduction to general relativity, by Sean M Carroll, Pearson Education, 2004. General Relativity, Robert Wald, University of Chicago Press, 1984.