



Inter-University Centre for Astronomy & Astrophysics
Astronomy Centre for Educators

Foundations of Gravitational Waves: Theory, Sources, and Detection

A two and a half week rigorous foundation course
in gravitational-wave physics

Eligibility: *College and university faculty members, post-doctoral fellows, and research scholars.*

Prerequisites: *Graduate-level General Relativity and proficiency in Python.*

Course dates: *May 19 – June 4, 2026*

Venue: *IUCAA, Pune*

Support: *Travel reimbursement as per norms and free hospitality will be provided to all participants.*

Application link: <https://www.bit.ly/gw2026ace>

Application deadline: *March 09, 2026*

Contact information: ace_info@iucaa.in

Description:

This course offers a rigorous and unified foundation in gravitational-wave (GW) physics, the essential theoretical background needed to deeply understand the science behind LIGO/Virgo/KAGRA detections and future breakthroughs. It covers the complete arc from linearized gravity and GW propagation to generation mechanisms, advanced approximations, and numerical approaches. The course also includes dedicated introductory modules on observations and instrumentation, covering the principles of current and future detectors together with core data-analysis techniques. These modules provide a complete, well-rounded view of GW physics and research, bridging theory to real-world detection and interpretation challenges.

Core focus:

- + Linearized gravity, TT gauge, GW stress-energy tensor, quadrupole & multipole radiation, post-Newtonian dynamics and numerical relativity
- + GW generation from compact binaries, rotating bodies, black-hole perturbations, and cosmological sources
- + Data Analysis Fundamentals – Searches and Bayesian parameter estimation
- + Introduction to interferometers, calibration and detector characterization
- + Tutorials on binary dynamics, waveform modelling, GW data analysis, Finesse and feedback control

Format: 36 hours of lectures + 36 hours of interactive tutorials and coding sessions. Discussion sessions, exploring collaborations, and special lectures on Saturdays.

Course faculty:

Sayan Kar, IIT Kharagpur

Chandra Kant Mishra, IIT Madras

Anand Sankar Sengupta, IIT Gandhinagar

Shivaraj Kandhasamy, IUCAA

plus other instructors and tutors to be confirmed.

Apply here: <https://www.bit.ly/gw2026ace>