

Build-a-Detector Workshop:

(Collaboration between Newton-Bhabha & LIGO-India)



For Whom:

Masters and Ph.D. students

Potential date: last two weeks of May (May 24th - June 4th)

Aim :

The workshop will teach students about gravitational wave (GW) science and the necessary considerations taken in order to design and concept-build a gravitational wave detector as well as the likely signals to be measured. A set of lectures will be given on the main budget noises as well as the possible sources to detect. There will be assignments at the end of each lecture which will be discussed on each Q&A session. The last three days of the workshop will be focused on the teams designing their own gravitational wave detector with it's own noise budget and source plot. The team with the best design will be awarded a prize.

Program Features:

- Learn GW science from expert GW scientists from all around the globe!
- Opportunity to learn about requirements and demands needed for gravitational wave detectors.
- Exciting opportunity for the students to collaborate and design their own detector and win prizes.

Basic Requirements :

- Availability of the speakers to conduct the workshop, lectures will be pre-recorded and Q&As will be done live.
- Evaluation on detectors + sources concept design.
- Certificates, virtual badges, prizes.

Important Points to be noted:

- **Duration** : two week long programme (10 days)
- **Selection:** students to be shortlisted based on the application.

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Expected Outcome:

- Increased interest & engagement of students in GW science (experimental and data analysis).
- Opportunity for students to learn from GW experts.
- Detector design will be presented to a panel & best design will be chosen.
- Understanding of the noise budgets, GW sources and requirements for building a detector.

Workshop Schedule and Duration:

- Duration: two weeks (10 days)
- Time: each workshop session = 1 hour approx lectures, average ~4 hrs a day.
1 hour pre-recorded lecture ending with an assignment + Q&A session
Last 3 days of workshop: students to team up and design their own detector
Multiple drop-in sessions where students can ask Qs or for guidance during the designing period.
- Assignments to be discussed during each Q&A session as ice breakers.
- Presentation of design by each team to experts panel.
- Participation certificates: To be awarded after successful completion and presentation. Prizes for team with best detector design.

Draft Schedule: (tentative) Names are not confirmed (in the process of being asked / awaiting responses).

Sr No	Day	Tentative Topics	Duration (approx)
	Day 1	Opening statements (Prof. Somak Raychaudhury)	30 min
	Day 1	Thermal noise - Prof. Giles Hammond	1 Hour
	Day 2	Quantum noise - Prof. Stefan Hild	1 Hour
	Day 2	Newtonian gravity -	1 Hour
	Day 2	Q&A - Thermal noise	1 Hour
	Day 3	Coating Brownian noise - Prof Stuart Reid	1 Hour
	Day 3	Seismic gravity - Dr. Conor Mow-Lowry	1 Hour
	Day 3	Q&A - Quantum noise	1 Hour
	Day 3	Q&A - Newtonian gravity	1 Hour
	Day 4	Coalescing compact binary - Prof. Archana Pai	1 Hour
	Day 4	Stochastic sources - Dr. Shivaraj Kandhasamy	1 Hour
	Day 4	Q&A - Coating Brownian noise	1 Hour
	Day 4	Q&A - Seismic gravity	1 Hour
	Day 5	Other transient sources	1 Hour

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	Day 5	Continuous / periodic sources(Pulsars/Low mass X-ray +)	1 Hour
	Day 5	Q&A - Coalescing compact binary	1 Hour
	Day 5	Q&A - Stochastic sources	1 Hour
	Day 6	Basics of searching for signals in the data – Dr. John Veitch	1 Hour
	Day 6	Basics of PYGWINC - Sebastian Steinchlener	1 Hour
	Day 6	Q&A - Other transient sources	1 Hour
	Day 6	Q&A - Continuous / periodic sources(Pulsars/Low mass X-ray +)	1 Hour
	Day 7	Building a detector - Mike Zucker	1 Hour
	Day 7	Motivation: Why do we need larger networks - Prof Gaby Gonzalez	1 Hour
	Day 7	Q&A - Building a detector	1 Hour
	Day 7	Q&A - Basics of searching for signals in the data	1 Hour
	Day 7	Q&A - Basics of GWINC	1 Hour
	Day 8	Q&A - Why do we need larger networks	1 Hour
	Day 8	Working in groups on building detector / Drop in sessions	All day
	Day 9	Working in groups on building detector / Drop in sessions	All day
	Day 10	Working in groups on building detector / Drop in sessions	All day
	Day 10	Presenting their project to panel	
	Day 10	Panel delivering	30-1hr
	Day 10	Closing + Awards	30 mins

Potential panel: Rana Adhikari, Archana Pai, Giles Hammond, Samaya Nissanke (awaiting responses).

Assignments: up to each lecturer.

Requirements for Students to Earn a Certificate:

- Attend the Workshop with 100% Attendance (circumstances).
- Attempt all assignments and complete the final task.