Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim – Goa.

Name of Faculty: Ms. Anushka Panjikar	**Subject:** Physics	
Paper code: PHY-321 Experimental Physics	**Program:** TY BSc	**Division: -**
Academic year: 2025- 2026	**Semester: V**	**Total Lectures: 45L + 30P**

Course Objectives: This course provides a comprehensive overview of the skills and knowledge that students are expected to gain related to physical measurement, laboratory instruments, experimental methods, experimental logic, and signal-to-noise considerations in measurement systems.

Expected Course Outcome: The student will be able to:

1. Demonstrate a thorough understanding of fundamental concepts and principles in physical measurement.

2. Understand the functioning and limitations of different instruments & design experimental setups for specific measurements.

3. Design experiments based on the principles of experimental logic.

4. Differentiate between signal and noise in a measurement system & Identify source of noise in measurement systems.

5. Apply signal-to-noise considerations in practical applications &

understand the impact of signal-to-noise ratios on measurement

accuracy.

Student Learning Outcome: The course will enable students to understand fundamental concepts and principles in physical measurement, the functioning and limitations of different instruments & design experimental setups for specific measurements, Design experiments based on the principles of experimental logic, Differentiate between signal and noise in a measurement system & Identify source of noise in measurement systems.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
JUNE	20-06-25	21-06-25	0				

JUNE	23/06/25	28/06/25	3L + 2P	1. Measurement, The result of a measurement, 2. Sources of uncertainty 3. Experimental errors, Types of error- Systematic & random, **Practical 1**	Group discussion	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
JUNE, JULY	30/06/25	05/07/25	3L + 2P	1. Systematic & random errors analysis 2. The analysis of repeated measurements. 3. problems	Group discussion	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael

				Practical 2			Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
JULY	07/07/25	12/07/25	2L + 2P	1. Mathematical description of data and distribution Function 2. Problem solving 3. Problem solving **Practical 2**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
JULY	14/07/25	19/07/25	3L + 2P	1. Properties of Binomial and Poisson function 2. Properties of Gaussian function 3. Propagation of error	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh.

				Practical 3			Practical Physics by G. L. Squires.
JULY	21/07/25	26/07/25	3L + 2P	1. Propagation of error 2. Analysis of data, multiparameter experiments 3. Problem solving **Practical 5**	Group discussion	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
JULY, AUGUST	28/07/25	02/08/25	3L + 2P	1. Common sense in errors 2. Meter rule, vernier callipers & micrometre screw gauge. 3. Temperature effect on length measurement, beat method of measuring frequency **Practical 6**	Group discussion	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.

AUGUST	04/08/25	09/08/25	3L + 2P	1. negative feed-back amplifier 2. servo systems 3. natural limits of measurement **Practical 7**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
AUGUST	11/08/25	16/08/25	3L + 0P	1. Experiment design, Transducers 2. Choice of transducers 3. Modelling external circuit components **Practical - HOLIDAY**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
AUGUST	18/08/25	25/08/25	4L + 2P	1. Circuit calculations 2. Circuit calculations	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael

				3. Instrument probes, power measurements **Practical 8**			Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
SEPTEMBER	02/09/25	06/09/25	2L + 2P	1. Measurement methods. 2. DC & AC bridge measurements 3. Problem solving **Practical 9**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
SEPTEMBER	08/09/25	13/09/25	3L + 2P	1. Cause of experimental mistakes, Apparent symmetry in apparatus. 2. sequence of measurements, intentional & unintentional changes.	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.

				3. drift, systematic variations. **Practical 10**			
SEPTEMBER	15/09/25	20/09/25	3L + 2P	1. ISA II WRITTEN 2. Calculated and empirical corrections. 3. Need for precise measurements. **Practical Revision**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
SEPTEMBER	22/09/25	27/09/25	3L + 2P	1. Experimental common sense. 2. Fluctuations & noise 3. noise in frequency domain. **Practicals** Revision	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.

SEPTEMBER, OCTOBER	29/09/25	04/10/25	3L + 2P	1. sources of noise. 2. signal to noise & experimental design. 3. Frequency & band width considerations, band width control, **Practicals :** Revision	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.
OCTOBER	06/10/25	11/10/25	3L + 2P	1. ISA III 2. band width control 3. signal to noise enhancement – Phase sensitive lock-in amplification & detection. **Practical EXAM**	MCQ Quiz	Powerpoint presentation	Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.

OCTOBER	13/10/25	18/10/25	3L + 2P	1. signal to noise enhancement – Phase sensitive lock-in amplification & detection. 2. digital & auto correlation methods 3. Frequency measurements using Fourier analysis and Fast Fourier transform. **PRACTICAL EXAM**			Measurement Instrumentation & Experiment Design in Physics & Engineering, Michael Sayer & Abhay Mansingh. Practical Physics by G. L. Squires.

Assessment Rubrics

Component	Max Marks
ISA 1 Assignment	7.5
ISA 2 Written Test	7.5
ISA 3 Presentation	7.5
Practical	25
Semester End Exam	60