Sh. L. N. Hindu College, Rohtak (Haryana)
Course Plan

Department of Physics

Program: B.Sc. (Physical Science)

SKILL ENHANCEMENT COURSE (24PHYS401SE01)

SCHEME

Course Name	Basic Instrumental Skills	**Course Type**	**Theory**
Course Code	24PHYS401SE01	**Class**	B.Sc.I Sem.
Instruction Delivery	**Per week Lectures: 2, Tutorial:0, Practical: -4** **Total No. Classes Per Sem: 72(L), 24(T), -(P)-48** **Assessment in Weightage: Sessional (30%), End Term Exams (70%)**		
Course Coordinator	Dr. Savita Devi	**Course Instructors**	Theory: Ms. Jyoti Practical: --Dr. Savita devi

COURSE OVERVIEW

Designed to provide students with value based and skill-based knowledge,and can include theory,lab work and hands on training.

PREREQUISITE

To Provide Students value and skill based Knowledge.

COURSE OBJECTIVE

The equip the students with fundamental knowledge and skills on basic instruments.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO No.	Course Outcomes
1	Demonstrate knowledge, attitudes, and skills of digital age work and learning.
2	Describe the specification of a cathode ray Oscilloscope effectively.
3	Learn about signal generators.
4	Appreciate and learn importance of specifications of various measuring instruments.

COURSE

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CONTENT

Content
Basic of instruments:Instruments accuracy ,Precision,sensitivity, resolution range etc. Errors in measurement and loading effects.Multimeter:Principle of measurement of dc voltage and dc current ,ac voltage ,ac current and resistance.Specification of a multimeter and their significance.Electronic voltmeter. Advantage over conventional multi meter for voltage measurement with respect to input impedance and sensitivity.Principle of voltage,measurement(block diagram only).Specification of an electronic voltmeter/multimeter and their significance.AC milli - voltmeter.Type of AC - milli-voltmeter: Amplifier-Rectifier,Rectifier-Amplifier.Block diagram ac milli-voltmeter, Specifications and their significance.
Cathode ray oscilloscope:Block diagram of CRO.Construction of CRT,Electron gun,electrostatic focusing and acceleration (Explanation only-no mathematical treatment),brief discussion on screen phosphor ,visual persistence and chemical composition.Time base operation,synchronization.Front panels controls .Specification of a CRO and their significance.Use of CRO for the measurement of voltage(dc and ac frequency,time period.) Special feature of dual trace ,introduction to digital oscilloscope ,probes.Digital storage oscilloscope: Block diagram and principle of working.
Generators and Transformers :DC Power sources. AC/DC Generators ,Inductance,Capacitance and Impedance.Operation of transformer.Electric motors:single phase ,three phase, and DC motors.Basic design .Interfacing DC and AC sources to control heaters and motors.Speed of power of ac motor.
Electrical protection :Relay,Fuses and disconnect switches. Circuit breakers .Overload devices.Ground fault protection.Grounding and isolating.Phase Reversal. Surge protection.Relay protection device.Electrical wiring:Different type of conductors and cables.Basic of wiring -Star and delta connection.Voltage drop and losses across cables and conductors.Instrument to measure current,voltage ,power in DC and AC circuits .Insulation . Solid and standard cable .Conduit ,cable trays,Splices: wire nuts,crimps, terminal blocks and solder.Preparation of extension boards.

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LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	Basic of instrument :Instruments accuracy ,precision ,sensitivity ,resolution range Etc.	Explanation	1
2	Error in measurements and loading effects.		
3	Multimeter:Principle of measurement of DC voltage and DC current ,Ac voltage, Ac current and resistance .	Diagram explanation , Theory	
4	Specification and significance of multimeter	Diagram explanation,Theory	
5	Electronic voltmeter:Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity	Diagram explanation,Theory	
6	Principle of voltage , measurement (block diagram only).	Explanation and theory with the help of diagram	
7	Specification of an electronic voltmeter/Multimeter and their significance.	Explanation	
8	AC Milli-voltmeter.Type of AC Milli-voltmeters:Amplifier-rectifier and rectifier-amplifier.Block diagram ac Milli-voltmeter, Specification and their significance.	Explanation and Theory	
9	Revision		

10	Cathode ray Oscilloscope:Block diagram of basic CRO .Construction of CRT, Electron gun ,electrostatic focusing and accleration.	Diagram explanation	2
11	Brief discussion on screen phosphor,visual persistence and chemical composition.		
12	Time base operation,synchronization.Front panel control.		
13	Specifications of a CRO and their significance.	Theory	
14	Use of CRO for the measurement of voltage (DC and AC frequency,time period).	Derivation and Theory	
15	Special features of dual trace , introduction to digital oscilloscope,probes.		
16	Digital storage Oscilloscope: Block diagram ,Principle of working	Diagram and Explanation	
17	Generator ,Transformers:DC Power-sources.AC/DC generators.	Theory , Explanation and Derivation	
18	Inductance, Capacitance and impedance.Operation of transformer.	Definition and Explanation	3
19	Electric Motors:single phase ,three phase and DC motors.		
20	Basic design .Interfacing DC and AC sources to control heaters and motors .Speed and power of AC motor.	Diagram and Explanation	
21	Revision		
22	Electrical protection:Relay fuses and disconnect switches.Circuit breakers,Overload devices.	Explanation and Diagram	4

23	Ground -Fault protection,grounding and isolating.Phase reversal,Surge protection.	Theory and Explanation		
24	Relay protection device.Electrical Wiring:Different types of conductor and cables.			
25	Basic of wiring-star and delta connections.Voltage drop and losses across cables and conductors.	Theory and Explanation		
26	Instrument to measure current,voltage power in ac and dc circuits.Insulation solid and standard cables.			
27	Conduit ,cable trays,splices:wire nuts,crimps,terminal blocks and solder.	Diagram and Explanation		
28	Preparation of extension board.			
29	Revision			
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Text Book

Basic Instrumental Skill by BL Theraja

Basic Instrumental Skill S Chand and Co.

Reference Books

- Basic Instrumental Skill by Tata Mc Graw Hill
- "Basic Instrumental Skill by Subrata Ghoshal

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Web/Links for e-content
https://youtu.be/RumzvW_u5zs?si=OXWfpBb8pfMvU8Oy

https://youtu.be/kUfJl0VDelk?si=a636OmVO0_UK4Uz7

https://youtu.be/429rDM2J5OI?si=fumYVMZ_pYb42q-l

PRACTICE QUESTIONS (QUESTION BANK)

S No	Problem
1	Define accuracy and precision ?
2	What is loading effects and error in measurement.
3	Write down the Specification and Significance of Multimeter.
4	Draw block diagram of Milli - volt-meter and write down their significance and specification.
5	Define resolution range and sensitivity?
6	What is CRO and DSO ?
7	Explain the working of principal and block diagram of DSO?
8	Write down the specification and significance of a CRO?
9	Give a brief discussion on screen phosphor and visual persistence?
10	Define generator and transformer.
11	What is AC /DC generators?
12	Define single phase and three phase?
13	Define power of AC motor?
14	Define circuit breakers and overload devices?
15	What do u mean by Ground -fault protection?

16	Define basic of wiring star?
17	What is Grounding and isolating?
18	What is time base operation?
19	Define type of AC millivolt meters?
20	What is front panel control.
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